Travaux publics et Services gouvernementaux Canada

Public Works and Government Services Canada

RESTORATION OF PLACE GEORGE V
QUÉBEC, QUÉBEC

Project no. R.094682.101

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PROFESSIONAL SEALS

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 52 00 – Construction Facilities.

.3 Section 01 56 00 – Temporary Barriers and Enclosures.

.4 Section 02 41 13 – Selective Site Demolition.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work covered under this contract includes but is not limited to:

.1 Restoration of Place George-V located at 805 Avenue Wilfrid-Laurier, Quebec City, Quebec, Canada.

.2 Specifically work including but not limited to the supply of all materials, equipment and operations required for:

.1 Demolition of concrete surfaces, grass and gravel surfaces, furniture and lighting fixtures.

.2 Dismantling, transporting, cleaning and reassembling of commemorative monuments (four monuments and commemorative stone plaques). General contractor is responsible for carrying out specialized period masonry. Specialized work is:

- Loosening stones, removal of stones, fabrication of shoring, supply and construction of pallet protection, cleaning stone components, reassembling stones including fabrication and installation of anchors, placement of mortar, sealants and pallet arrangement.
- Protective packaging, loading, transportation, unloading and temporary storage.

.3 Design of a paved concrete event venue, grassed parade ground, commemorative and protocol area in concrete and stone.

.4 Excavation, transportation and disposal of contaminated soil.

.5 Construction of underground technical room (electrical room, drainage ditch with pumps).

.6 Lighting.

.7 Electricity for events.

.8 Stormwater management system.

.9 Furniture.

.10 Plants and grass.

.3 Related work included in the project:

.1 Site installations include storage and/or access to Work.

.2 Environmental protection.

.3 Protection of existing public utilities.

.4 Road and pedestrian signage.

.5 Restoration of site.

.6 Any other works or special requirements necessary to carry out the works.

.4 Centre de conservation du Québec (CCQ):

.1 Contractor must retain the services of an expert from the Centre de Conservation du Québec (CCQ) of the Stone and Bronze Workshop to supervise repair work.

.2 The Centre de conservation du Québec is responsible for the following tasks:

- Ongoing specialist supervision of the dismantling work (loosening stones, removal of stones, fabrication of shoring and palleting, recording of existing components including anchors).
- Restoration of bronze components by and/or at the CCQ's workshop, including fabrication of anchors for bronze components only.
- Ongoing specialist supervision during cleaning of stone components, reassembly of stones, including installation of anchors, mortar and sealants.

1.3 DETAIL SCHEDULE

.1 Scope:

.1 Final completion of Work must be completed by June 16, 2023, including correction of deficiencies and commissioning of facilities.

.2 Contractor must include in work schedule three (3) buffer periods of 5 days-duration on the critical schedule. Two of these periods, during the 2022 construction and the third one during the 2023 construction. Buffer periods to be used to cover additional delays caused by additional work resulting from unsuspected site conditions or additional requests from Departmental Representative to limit or even cancel impact on Contractor's schedule. Buffer period durations for each phase are shown in Section 01 32 16.07 Work Scheduling - Bar Chart (GANTT).

.3 In addition to the buffer periods, Contractor must plan for site closure up to three days per year due to major events taking place in the vicinity of the work site (e.g. Quebec City Summer Festival, International Cycling Grand Prix).

.4 If delays in the execution time are encountered for reasons other than unsuspected site conditions or requests for additional work from Departmental Representative, Contractor must as far as possible add resources required to meet the schedule. Otherwise, all costs related to accelerating the work or performing the work during the winter period in order to meet the objectives of the execution schedule will be borne by the Contractor. Adverse weather conditions (rain, snow and cold) will not be considered as grounds for claiming additional time.

.5 It is imperative that milestones for completion of the work and demobilization of the identified areas of the site are met. Any delay in the completion of project completion or demobilization milestones of certain sectors could result in monetary and strategic disadvantages for Canada and its partners.

.6 See Section 01 32 16.07 Work Scheduling - Bar Chart (GANTT) for all specifics and requirements related to the project schedule and work scheduling.

1.4 MAIN ISSUES AND CONSTRAINTS - SITE ORGANIZATION AND MOBILIZATION

.1 Storage areas and management of materials to be recovered

.1 Provide off-site storage as specified in Section 01 52 00 - Construction Facilities.

.2 Section 02 41 13 — Selective Site Demolition.

.3 Refer to Section 04 03 43.19 - Period Stone Dismantling.

.2 Four monuments to be recovered, stored, transported off-site during duration of the work, brought back to the site, cleaned, repaired and reassembled.

.1 Section 02 41 13 — Selective Site Demolition.

.2 Section 04 03 01.13 – Period Masonry Cleaning.

.3 Refer to Section 04 03 43.19 - Period Stone Dismantling.

.4 Section 04 03 43.13 - Period Masonry Mortaring.

.3 Major events

.1 Several major events will take place in the Parliament Hill area during the work and will influence the normal pace of the work site (Saint-Jean-Baptiste Day, Canada Day, Quebec City Summer Festival, Grand Prix cycliste, Marche Pierre Lavoie, Fêtes de la Nouvelle-France, etc.). A more detailed list will be provided to the Contractor at the beginning of the work so that the work site operations can be planned accordingly. Provide for the following constraints in relation to major events:

.1 Provide that access to the site will be unusable up to 3 days per year (weekdays between May and November excluding public holidays).

.2 Provide that access to the site will be unusable up to 3 days per year (weekdays between May and November excluding public holidays).

.4 Signage and construction site fences.

.1 Signallers will be required to control the access of trucks to the site and to ensure public safety. Their presence is mandatory during the transhipment of materials by truck, particularly during backfilling and excavation work. Mark the use of the signallers according to the outcome of discussions with the Ministry's representative.

.2 A signage plan signed and sealed by an engineer who is a member of the OIQ must be produced by the Contractor to clearly identify the signage that will be put in place for the entire duration of the work in order to ensure the safety of users circulating in the vicinity of the work site (truck exit, blocked pavement, pedestrian diversions, etc.). This signage plan must be submitted to the City of Québec when applying for a permit to occupy the public domain. The occupation of the public domain must also specify the north pavement in the vicinity of the Grand Allée and the safe pedestrian passage on the paved roadway on Grande Allée, the east pavement, the south pavement and a traffic lane on Wilfred-Laurier Avenue.

.3 The traffic plan and the obstructions on the public domain must also be the subject of requests for specific occupancy, notably for the connection of services to the City of Québec and Hydro-Québec network.

.4 Enclose entire site with fencing to protect against trespassers. Provide for the removal and cleaning of banners and netting covering the fences if necessary.

.5 Keep access to neighbouring buildings safe and free of access at all times.

.6 Install work signs, site fencing and maintain road and pedestrian traffic in accordance with Section 01 52 00 Construction Facilities and Section 01 56 00 Temporary Barriers and Enclosures.

.5 Other particularities related to construction site organization and work.

.1 At no time are Contractor's employees or subcontractors allowed to park within the site boundaries. Only tool vehicles are allowed.

.2 Particular attention must be paid to dust control (both on and off site) and to the cleaning of nearby streets used for the purposes of the work. Provide mitigation measures to limit dust emissions during execution of the work in accordance with Section 01 35 43 Environmental Protection.

1.5 MAIN ISSUES AND CONSTRAINTS - TECHNICAL

.1 The functional and technical requirements must not in any way interfere with the quality and identity of the site.

.2 Integration of materials and equipment that facilitate the use of the site by the various developers is one of the principles to be put forward.

.3 Existing trees are an integral part of the value of the site; all the necessary protective measures must be implemented to avoid a deterioration of their condition.

.4 Traffic in the streets adjacent to the project is subject to special restrictions.

.5 There is a potential for archaeology on the work site.

.6 Excavation of rock must be rigorously monitored at the site.

.7 Rainwater management is carried out in accordance with the R.R.V.Q. Chapter B-2 of the City of Québec and has a sustainable development strategy with the implementation of green infrastructure aimed at infiltrating rainwater.

.8 Protective measures are required for the 750 mm diameter aqueduct pipe crossing the Place George-V site, as well as for the underground Bell and Hydro-Québec networks.

.9 Mark on the ground and ensure compliance of loads in proximity to Ville de Quebec's water main throughout work period with CL-625 of CSA S6 : 19 standard.

.10 Maintain physical markers at all times on the site of the work so as to locate the right-of-way of the pipe.

.11 The four monuments to be dismantled, stored, transported and reassembled.

.1 Section 02 41 13 – Selective Site Demolition.

1.6 MAIN ISSUES AND CONSTRAINTS - TECHNICAL

.1 Coordinate management of residual materials and contaminated soils with Departmental Representative, subject to increased surveillance at the site. Give at least 48 hours' notice to have a person present on the site.

1.7 IMPLEMENTATION

.1 Based on the control lines and levels indicated on the plans, Contractor must establish main landmarks necessary for execution of the work and provide all required equipment.

.2 Take the necessary measures to prevent landmarks (location points) from being moved during Work.

.3 Provide all necessary equipment to enable Departmental Representative to carry out any checks deemed necessary.

.4 Prior to commencing Work, verify all measurements on site and notify Departmental Representative of any errors or discrepancies.

.5 During Work, if non-conformities are detected as a result of staking or siting errors made by Contractor, redo Work at own expense.

1.8 WORKING HOURS, NOISY WORK AND DELIVERIES

.1 Respect, as far as possible, standard working hours (from 7 a.m. to 5 p.m., Monday to Friday, for a 45-hour week) in order to limit impact of the work on nearby residents and the public.

.2 For all work carried out outside the standard schedule, request a derogation at least 72 hours in advance for approval by Departmental Representative. This derogation must comply with regulations of the City of Quebec.

.3 Noise by-laws must be observed at all times. Do not carry out noisy work from Monday to Friday (between 5 p.m. and 7 a.m.). The following are considered noisy work: demolition, dismantling, sawing, drilling and pile driving, starting machinery before 7:00 a.m., use of machinery, trucks and mechanical tools, delivery of materials, etc. The Ministry's representative reserves the right to prevent work if it is deemed too noisy.

1.9 VIDEO SURVEY

.1 Before beginning Work, record, in digital video format, in the presence of Departmental Representative, the sectors where Work is to be performed or be present for the needs of the work site, in order to record existing conditions before Work begins (state of the roadway, monuments, walls and low walls, landscaping, trees, pavements, lighting equipment and furniture of the City of Québec, etc.), and to restore the initial conditions at the end of the work. A separate evening survey must be carried out to validate the operating condition of the luminaires.

.2 A copy of the video (computer file) must be given to Departmental Representative.

1.10 CONTRACTOR USE OF PREMISES

.1 Co-ordinate use of premises under direction of Departmental Representative.

1.11 EXISTING SERVICES

.1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Provide alternative routes for personnel, pedestrian and vehicular traffic.

.3 Install site walkways to maintain normal and safe pedestrian traffic at locations specified on the plans.

.4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.

.5 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.

.6 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.7 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

.8 Record locations of maintained, re-routed and abandoned service lines.

.9 Construct barriers in accordance with Section 01 56 00 Barriers and Enclosures.

1.12 SITE EXAMINATION:

.1 In order to become familiar with the conditions of the project and in order to obtain all the information necessary for the proper execution of the contract, examine the site of the work. Ignorance of the conditions of the site shall not, under any circumstances, constitute a valid reason for claiming additional payment.

1.13 PUBLIC COMMUNICATION

.1 All public communications referring to the project, including the work sites within it, are prohibited or must be approved in advance by Departmental Representative. This includes social media, advertisements, photo sharing, and job postings and portfolios.

1.14 SURVEYS, FINAL PLANS AND TELEVISED PIPE INSPECTIONS

.1 Complete a full X, Y, Z coordinate survey (SCOPQ NAD 83) of the work performed. Submit computer file of survey (.dwg) to Departmental Representative prior to final completion of project.

.2 Survey to include, but not be limited to, the following:

.1 Paved surfaces, grassed surfaces, pavements, curbs, curb walls, stairs, monuments, flagpole

.2 Drainage grates, manholes and other equipment

.3 inverts of underground pipes

.4 Lighting fixtures, vegetated ditch

.5 Trees

.6 Manholes and catch basins (centre cover/grate)

.7 Pipe inverts

.8 Concrete slabs

.9 Road profile at ten (10) metre intervals and changes in slope

.10 Buildings, fences, gates, monument bases, etc.

1.15 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 Copy of approved PPE

.11 Health and Safety Plan and Other Safety Related Documents.

.12 Other documents as specified.

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 32 16.07 - Work Scheduling - Bar Chart (GANTT).

.2 Section 01 56 00 - Temporary Barriers and Enclosures.

1.2 ACCESS TO WORK

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including lanes of traffic independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

.2 Remove all furniture and structures obstructing access to site, particularly benches, lampposts and signs. Store furniture and structures safely until they are put back in place at the end of the Work.

1.3 USE OF SITE AND FACILITIES

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

.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 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

1.4 ALTERATIONS, REPAIRS

.1 Execute work with least possible interference or disturbance to 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 to a minimum.

.3 Provide for personnel, pedestrian and vehicular traffic.

.4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.6 SPECIAL REQUIREMENTS

.1 Carry out noise generating Work Monday to Friday from 7 a.m. to 5 p.m.

.2 Submit schedule in accordance with Section 01 32 16.07 - Work Scheduling - Bar Chart (GANTT).

.3 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.4 Keep within limits of work and avenues of ingress and egress.

.5 Working hours and access to site for Contractor's vehicles are Monday to Friday from 7:00 a.m. to 5:00 p.m. No equipment maintenance is allowed outside of working hours. Idling engines outside working hours is prohibited.

.6 Deliver materials outside of peak traffic hours between 9 a.m. and 3 p.m. unless otherwise approved by Departmental Representative. Deliveries outside working hours is prohibited.

1.7 OPERATIONAL REQUIREMENTS

.1 No traffic lane may be completely closed for execution of Work. Traffic circulation must be allowed in both directions. If partial hindrance to traffic is necessary, Contractor must first obtain authorization of Departmental Representative and approval of signposting plan from Ville de Quebec before proceeding. Adapt signage plan to site conditions in compliance with MTQ and Quebec City road signage standards, have signed and sealed by an engineer in good standing of the Ordre des ingénieurs du Québec, and submit at least seven days prior to installation as indicated above.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 UNIT PRICE SCHEDULE AND STIPULATED PRICE

.1 Total amount of the contract is broken down into a description of certain works that are paid on a unit basis and the balance of the works and/or special requirements and/or other expenses related to the contract are paid on a single stipulated price.

.2 Each of the unit prices and stipulated prices include all expenses, all work, disbursements, payments, direct or indirect costs, mobilization, demobilization; Contractor's actions and deeds, and all liabilities, obligations, omissions and errors related to the performance of this work. These prices also include all general expenses of Contractor and subcontractors: administration, insurance, contributions, interest, rent, taxes and other incidental expenses. Prices must cover the losses and damages resulting from the nature of the work, the fluctuation of prices and wages, business risk, strikes, delays not caused by the Departmental Representative, restrictions on transport, accidents and the action of natural forces.

.3 Unit prices and stipulated prices submitted at the time of tender represent Contractor's total payment and include all expenses for the entire project. The total of prices submitted includes all costs for work shown on drawings and described in specifications, including costs for all special requirements of the construction specifications or general clauses of the contract. Contractor must diligently prepare tender to ensure that costs submitted for all work and general or special requirements of the contract are included in tender. No claim for additional costs for work shown on drawings or described in specifications, the description of which is not explicitly mentioned in the tender schedule, will be accepted.

.4 Each of the unit prices and stipulated prices must also include without being limited to:

.1 Tests.

.2 Shop drawings including drawings signed and sealed by an engineer.

.3 Compliance confirmations including attestations signed and sealed by an engineer.

.4 Measures related to environmental protection and health and safety, including specific measures related to COVID-19 pandemic.

.5 Material, equipment and machinery, including access or specialized work equipment.

.6 Temporary works required for work including scaffolding and shoring.

.7 Supply of materials, including certificates of conformity and transport and handling.

.8 Installation.

.9 Disposal of excavation waste and surplus, and cleaning and restoration of site.

.10 All other costs related to the various requirements shown on plans or described in the specifications.

1.2 DEFINITIONS:

.1 Stipulated price (fixed): work is globally determined with accuracy and in detail on drawings and in specifications and a price is agreed upon and accepted by both parties.

.2 Unit price: work specifications are determined accurately and in detail and all quantities on the bid form are estimates.

1.3 BID SCHEDULE

.1 Bid schedule is a combined contract. PART A is lump sum and includes a single price. PART B is a unit contract and includes items whose quantities may vary according to site conditions and items with a predetermined allocation. PART C is prices for optional work.

.2 PART A - Single lump sum contract

.1 Complete and submit with the bid the lump sum breakdown in Appendix D. Upon request by the contracting authority, submit the duly completed Appendix D within forty-eight (48) hours. Failure to do so may result in the rejection of the bid

.3 PART B – Unit contract and allocation

.1 Quantities in the unit price table in relation to the work are approximate.

.2 In establishing the various unit prices of this part, the Contractor shall ensure that any indirect costs associated with each unit price are included to avoid a variation in quantities affecting the Contractor's overall compensation. Instead, indirect costs should be included in the single lump sum price (setting up and removal of equipment, scaffolding, site organization specific to the work, etc.).

.4 PART C – Optional work

.1 In establishing the unit prices in the optional work of this part, Contractor must ensure to include all indirect costs must be included in the single lump sum price (installation and removal of equipment, scaffolding, site organisation specific to the work, etc.).

1.4 DESCRIPTION OF ITEMS IN UNIT PRICE SCHEDULE

.1 Under "Continuous Supervision by the Centre de Conservation du Québec", the Contractor shall retain the services of an expert supervisor from the Centre de Conservation du Québec (CCQ) of the Ministère de la Culture du Québec. Supervisor will provide ongoing supervision during dismantling, reassembly, cleaning, loading and unloading and repair of commemorative monuments.

.1 Work will be paid for upon presentation of supporting documents from the CCQ, with no mark-up or profit for the Contractor. This allowance provides for, but is not limited to:

.1 Professional fees and travel and living expenses for the Quebec Conservation Centre supervisor.

.2 Under the item "Restoration of Bronze Components on Commemorative Monuments", the Contractor shall retain the services of a conservator from the Centre de Conservation du Québec (CCQ) under the authority of the Ministère de la Culture du Québec, to carry out the cleaning of the bronzes and waxing of the bronzes at the CCQ's workshop, in accordance with the restoration options selected by the Canadian Government. Work will be paid for upon presentation of supporting documents from the CCQ, with no mark-up or profit for the Contractor. This allowance provides for, but is not limited to:

.1 Professional fees of restorers, temporary storage of the bronze components at the CCQ workshop, all equipment and supplies required for restoration work. This article provides for an allocation.

.2 The manufacture of pallets and shoring required to handle and transport bronzes.

.3 Under "Fabrication of memorial anchors", Contractor fabricate the anchors necessary for reassembling of commemorative monuments. Documentation plan of existing components that was done during the dismantling will specify the number and dimensions required. This article provides for an allocation.

.1 Work will be paid for upon presentation of supporting documents from the CCQ, with no mark-up or profit for the Contractor.

.4 Under the item "Cleaning of Commemorative Monuments", Contractor must be paid at an hourly rate, for the cleaning of all commemorative monuments to be performed prior to reassembly. Bid price includes two workers including a mason's apprentice to brush and/or hose down all facing surfaces to be repointed, stripping masonry joints and removing iron, oil, copper, dirt or other organic stains.

.5 Under "Dismantling, Reassembling of Commemorative Monuments", Contractor is paid at an hourly rate. Bidder must consider the following details in establishing hourly price:

.1 Cost includes loosening of joints, sawing of anchors and dismantling of stones, their temporary marking.

.2 Cost includes numbering, documentation of components of each monument to ensure reassembly, measuring and sizing of existing anchors, recording of detailed information in a log containing all information necessary to ensure fabrication and installation of anchors, stone and bronze components as existing.

.3 Unit cost also includes all work required to reassemble components, according to the numbering established during dismantling: installation of existing stones, installation of levelling mortar, installation of anchors (in the required number and quantity to be determined), repointing of stones, curing, installation of bronzes, sealing of waterproofing in required places (such as existing) as well as any other related expense.

.6 Under "Management of contaminated soils A-B (with VOCs)", Contractor must provide a price per tonne (T) including cost of labour, all materials, equipment and services necessary for complete execution of Work including, but not limited to, the temporary storage of contaminated soils for characterization and determination of degree of contamination, loading of trucks, shipping and disposal of contaminated soils in a site authorized by the MELCC according to the criteria and degree of contamination.

Contractor must prioritize reuse of A-B contaminated soils on site, if their geotechnical properties are suitable for the purpose.

.1 Contractor must limit the spread of dust and ensure the cleaning of equipment in contact with contaminated soils. Trucks used for loading must be watertight and equipped with protective canvas to prevent dispersion during transport.

.2 All shipments must be weighed, and weight tickets and shipping manifests completed by the receiving site manager must be submitted to Departmental Representative.

.7 Under "Management of contaminated soils A-B (HP, PAHs, Pb)", Contractor must provide a price per ton (T) including cost of labour, all materials, equipment and services necessary for complete execution of Work including, but not limited to, the temporary storage of contaminated soils for characterization and determination of degree of contamination, loading of trucks, shipping and disposal of contaminated soils in a site authorized by the MELCC according to the criteria and degree of contamination.

.1 Contractor must prioritize reuse of A-B contaminated soils on site, if their geotechnical properties are suitable for the purpose.

.2 Contractor must limit the spread of dust and ensure the cleaning of equipment in contact with contaminated soils. Trucks used for loading must be watertight and equipped with protective canvas to prevent dispersion during transport.

.3 All shipments must be weighed, and weight tickets and shipping manifests completed by the receiving site manager must be submitted to Departmental Representative.

.8 Under "Management of contaminated soils B-C (PAH)", Contractor must provide a price per ton (T) including cost of labour, all materials, equipment and services necessary for complete execution of Work including, but not limited to, loading of trucks, shipping and disposal of contaminated soils in a site authorized by the MELCC according to the criteria and degree of contamination.

.1 Contractor must limit the spread of dust and ensure the cleaning of equipment in contact with contaminated soils. Trucks used for loading must be watertight and equipped with protective canvas to prevent dispersion during transport.

.2 All shipments must be weighed, and weight tickets and shipping manifests completed by the receiving site manager must be submitted to Departmental Representative.

.9 Under "Management of contaminated soils C-D (Pb)", Contractor must provide a price per ton (T) including cost of labour, all materials, equipment and services necessary for complete execution of Work including, but not limited to, excavation, loading of trucks and disposal of contaminated soils in a site authorized by the MELCC according to the criteria and degree of contamination.

.1 Contractor must limit the spread of dust and ensure the cleaning of equipment in contact with contaminated soils. Trucks used for loading must be watertight and equipped with protective canvas to prevent dispersion during transport.

.2 All shipments must be weighed, and weight tickets and shipping manifests completed by the receiving site manager must be submitted to Departmental Representative.

.10 Under "Management of contaminated soils >D (PAH)", Contractor must provide a price per ton (T) including cost of labour, all materials, equipment and services necessary for complete execution of Work including, but not limited to, excavation, loading of trucks, shipping and disposal of contaminated soils in a site authorized by the MELCC according to the criteria and degree of contamination.

.1 Contractor must limit the spread of dust and ensure the cleaning of equipment in contact with contaminated soils. Trucks used for loading must be watertight and equipped with protective canvas to prevent dispersion during transport.

.2 All shipments must be weighed, and weight tickets and shipping manifests completed by the receiving site manager must be submitted to Departmental Representative.

.11 In the item "Temporary Storage of Contaminated Soil and Loading for Disposal", Contractor must provide the costs associated with the temporary stockpiling of contaminated soil and subsequent loading for off-site or on-site disposal. This item represents the additional handling costs associated with temporary piling versus loading directly into trucks for disposal. The placement of a protective membrane on the soil and over the pile (if required) is also included in this item. Contamination results will be forwarded to the contractor within 7 days of piling the material. This item will be paid for on the basis of soils disposed of off-site after temporary stockpiling upon presentation of supporting documentation (haulage ticket/weight) in $/metric tonnes.

.12 Under "Granular Residual Materials", Contractor must provide a price per tonne (T) including cost of labour, all materials, equipment and services required to complete Work including, but not limited to, temporary storage of contaminated soils for characterization, required waiting time, loading into trucks, shipping and disposal of soils at a MELCC authorized site.

.1 Contractor must limit the spread of dust and ensure the cleaning of equipment in contact with contaminated soils. Trucks used for loading must be watertight and equipped with protective canvas to prevent dispersion during transport.

.13 Under "Arboriculture Work on Existing Trees", Contractor must provide a unit price for all arboriculture work on existing trees requested on site by Departmental Representative, including pruning, trimming, wound treatment, or any other work associated with arboriculture and tree preservation. This work is paid per unit of time worked and validated by Departmental Representative. One hour of work corresponds to: one (1) certified tree pruner with more than 10 years' experience, and two apprentices. All equipment and accessories are included. These hours are for time spent on site and not for off-site disposal of waste. This item includes all requirements outlined in Sections 32 01 90.33 - Tree and Shrub Preservation of these specifications and the plan specifications. Minimum time paid is set at three hours.

1.5 DESCRIPTION OF ITEMS IN TABLE OF PRICES FOR OPTIONAL WORK

.1 Under item "P2 type lighting fixture (Gobo projector)", the Contractor provides a unit price which includes the supply, installation, connection and control of P2 type fixtures (Gobo projector).

.2 Under item "Additional Excavation in Rock", the Contractor provides a unit price that includes first class excavation and off-site disposal of the material, for a quantity additional to what is shown on the plan.

PART 2 PRODUCT

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 32 16.07 - Work Scheduling - Bar Chart (GANTT).

.2 Section 01 33 00 - Submittal Procedures.

.3 Section 01 52 00 - Construction Facilities.

.4 Section 01 56 00 - Temporary Barriers and Enclosures.

1.2 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Departmental Representative will: notify Contractor of each meeting in writing [three] days in advance of meeting date.

.3 Indicate location for meetings.

.4 Preside at meetings.

.5 Record meeting minutes, identify actions by parties, include significant proceedings and decisions.

.6 Reproduce and distribute copies of minutes within [seven] days after meetings and transmit to meeting participants and, affected parties not in attendance.

.7 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.3 PRE-CONSTRUCTION MEETING

.1 Within 15 days after award of Contract, Departmental Representative will request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, major Subcontractors and field inspectors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum [7] 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 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

.3 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 Work method and materials handling on slope.

.6 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

.7 Refer to Section 01 56 00 - Temporary Barriers and Enclosures.

.8 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.9 Products provided by Departmental Representative.

.10 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.

.11 Section 01 78 00 - Closeout Submittals.

.12 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.

.13 Monthly progress claims, administrative procedures, photographs, hold backs.

.14 Appointment of inspection and testing agencies or firms.

.15 Insurances, transcript of policies.

1.4 PROGRESS MEETINGS

.1 During course of Work, schedule progress meetings bi-weekly.

.2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.

.3 Preside at meetings.

.4 Record meeting minutes, identify actions by parties, include significant proceedings and decisions.

.5 Reproduce and distribute copies of minutes within [seven] days after meetings and transmit to meeting participants and, affected parties not in attendance.

.6 Agenda to include but not limited to:

.1 Review, approval of minutes of previous meeting.

.2 Co-ordination between parties.

.3 Review of Work progress since previous meeting.

.4 Health and Safety:

.5 Communication plan, emergency measures and respondents.

.6 QUALITY CONTROL

.7 Reviewed shop drawings, product data, and samples.

.8 Field observations, problems, conflicts.

.9 Problems which impede construction schedule.

.10 Review of off-site fabrication delivery schedules.

.11 Corrective measures and procedures to regain projected schedule.

.12 Revision to construction schedule.

.13 Progress schedule, during succeeding work period.

.14 Review submittal schedules: expedite as required.

.15 Review proposed changes for affect on construction schedule and on completion date.

.16 Proposed changes.

.17 Other business.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Action and Informational Submittals.

1.2 DEFINITIONS

.1 Work Activity 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 DETAIL 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] [DCC Representative] [Consultant] to enable monitoring of project work in relation to established milestones.

1.3 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedule 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 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit to Departmental Representative within fifteen (15) working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.3 Submit Project Schedule to Departmental Representative within five [5] working days of receipt of acceptance of Master Plan.

1.5 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.

.1 Work may begin as soon as the contract is awarded and continue until spring 2023. Final completion of Work must be completed by June 16, 2023, including correction of deficiencies and commissioning of facilities.

.2 Work to be carried out by Contractor before winter 2022 is:

- Dismantling, transportation and storage of (4) monument components.
- Excavation, changing, transportation and disposal of rock, clean and contaminated fill.
- Electrical room, electrical supply lines.
- Concrete monument bases
- Electrical supply lines, lighting fixture bases.
- Drain pipes, manholes, catch basin, gutters, landscaped drainage ditch.

- Earthwork.
- Concrete bases for staircase, low walls.
- Installation of sub-bases and foundations for surface coverings.
- Restoration and reassembly of memorial monuments.
- Curbs, curb walls, facings, copings, stone steps,
- sodding.
- On November 18 2022, relocation of construction fence on Grande Allée to allow pedestrian traffic .

.3 Works to be completed in spring 2023:

- Surface coating in prefabricated concrete and stone.
- Electrical equipment and connection of electrical chamber.
- Installation of lampposts.
- Planting.
- Furnishings, handrail, guardrail.
- Testing and Commissioning.

1.6 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Submit schedule in MS Project 2013. Submit electronic copy and PDF to Departmental Representative with each revised schedule.

.3 Departmental Representative will review and return revised schedules within five [5] working days.

.4 Revise impractical schedule and resubmit within [5] working days.

.5 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.7 DETAIL SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Baseline schedule to include:

.1 Contractor must submit at beginning of project a project schedule to be used as a baseline schedule for monitoring project and granting deadlines, if any.

.2 Schedule must fully comply with specifications listed by Departmental Representative. Departmental Representative will issue a Notice of Compliance, or alternatively provide Contractor with detailed list of corrections to be made.

.3 Once Notice of Compliance is issued, schedule will be considered the baseline schedule.

.4 Activities in schedule must be detailed and grouped in a structured manner. As a minimum, this structure should include the following:

.1 Project management (administration, mobilisation, permitting, approval of plans and methods, demobilization).

.2 Procurement (awarding of subcontractors, preparation of shop drawings, samples, drawing review and approval, fabrication and delivery).

.3 Construction (by activity, scheduling, duration, stakeholder, approval and monitoring time).

.4 Changes to baseline schedule.

.5 Contractor must submit a schedule at all site meetings indicating updates to the status date when unforeseen site conditions or changes requested by the Departmental Representative or any other reasons alter baseline schedule. All changes to schedule must be justified to and approved by Departmental Representative.

1.8 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on bi-weekly 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.

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 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

.10 Keep one reviewed copy of each submission on site.

1.2 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 province of Quebec, Canada (OIQ).

.3 Submit shop drawings and data sheets for all products required under specification sections.

.4 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.

.5 Allow seven (7) business days for Departmental Representative’s review of each submission.

.6 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.

.7 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.

.8 Accompany submissions with transmittal letter, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each shop drawing, product data and sample.

.5 Other pertinent data.

.9 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.

.10 After Departmental Representative's review, distribute copies.

.11 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections.

.12 Submit one (1) electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.13 Submit test reports for requirements requested in technical specification sections and as requested by DCC Representative.

.1 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.

.2 Testing must have been within three (3) years of date of contract award for project.

.14 Submit test reports for requirements requested in technical specification sections and as requested by DCC 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 be dated after award of project contract complete with project name.

.15 Submit test reports for requirements requested in technical specification sections and as requested by DCC Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.16 Submit Manufacturer's Field Reports for requirements requested in technical specification sections and as requested by DCC Representative.

.17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.18 Submit Operation and Maintenance Data for requirements requested in technical specification sections and as requested by DCC Representative.

.19 Delete information not applicable to project.

.20 Supplement standard information to provide details applicable to project.

.21 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.

1.3 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.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.

1.4 MOCK-UPS

.1 Construct mock-ups using prescribed materials and methods.

.2 Construct mock-ups in location approved by Consultant.

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 SCOPE OF THE WORK

.1 The work covered by these specifications is intended to ensure the proper environmental management of the soil (contaminated and non-contaminated) and residual materials (non-hazardous and hazardous, if applicable) that will be excavated, as well as the water accumulated in the excavation, as part of the rehabilitation of Place George V in Québec City, Québec, Canada.

Environmental monitoring for this project will be carried out by the Departmental Representative.

.2 The work covered by these specifications includes the excavation; the segregation, piling (if necessary), loading, transportation, and/or off-site disposal in a Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) approved site of the excavated soil and residual materials; the management of any water that collects in the excavations; and all related work prescribed in these specifications, in compliance with the applicable laws, regulations, and policies. Depending on their contamination levels, soils are to be either loaded directly onto trucks for transportation to the Contractor's chosen disposal sites or reused on the site if they comply with the applicable federal guidelines and the contaminated soil management plan.

.3 The Contractor must supply all labour, materials, equipment, tools, and personnel needed to perform the work described in these specifications.

.4 As indicated in section 01 35 43 of the specifications, the Contractor must prepare a general environmental protection plan that includes a contaminated soil management plan, which in turn must include a description of the chosen disposal sites and the methods to be used for managing contaminated soils.

.5 The work described in these specifications must be consistent with all other work being done as part of this project. The Contractor will need to cooperate with the Departmental Representative and organize the site layout and workflow in such a way as to minimize any delays caused by the work described in these specifications.

1.2 ANTICIPATED ENVIRONMENTAL CONDITIONS

.1 The environmental site characterization study conducted in February 2021 in the area where work is to be done indicates the presence of soils contaminated with polycyclic aromatic hydrocarbons (PAHs) with concentrations exceeding criterion B of the MELCC's *Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés* (*Guide d'intervention*) and soils with concentrations of PAHs, C_{10}–C_{50} petroleum hydrocarbons (PHCs), and/or monocyclic aromatic hydrocarbons (MAHs) in the A–B range of the same guide. However, these concentrations are below criterion C, which is the criterion that applies to the site's intended use (as a park without a playground). Concentrations of metals (arsenic, barium, and molybdenum) above criteria B and C were also noted, but the report concluded that they are of natural origin. Contaminated soils are present from a

.2 The environmental site characterization study conducted in November 2021(ref: QR0287A) on the intended site revealed the presence of PAH- and PHC-contaminated soils with concentrations exceeding criteria B and C of the MELCC's *Guide d'intervention*, with one PAH concentration exceeding the limit values (and therefore the site use criterion) of the *Regulation respecting the burial of contaminated soils* (RBCS). Several concentrations in the A–B range for PHCs and PAHs were also noted. A lead concentration above criterion C was noted; it is of anthropogenic origin. Concentrations of metals (arsenic and barium) above criteria B and C were also noted, but the report concluded that these concentrations are of natural origin. Maps 2, 3 and 4 of this report are presented in Schedule C of these specifications. This study will be made available for the Contractor once the contract is awarded.

.3 The November 2021 characterization study also notes the presence of residual granular materials (RGMs) on the site. A sample was submitted for chemical analysis in the laboratory to classify these materials under the *Regulation respecting the reclamation of residual materials* (RRRM). The results revealed concentrations below the first column of Table 1 for the parameters analyzed. The concentrations obtained place the RGMs in RRRM category 1.

.4 Map 4 of the report in Schedule C, illustrates the quality of the soils to be excavated as part of the work. The Contractor must understand that while the report delineates the vertical and horizontal boundaries of the contaminated soils to be excavated, the actual boundaries encountered on the site may differ. Furthermore, the Contractor must understand that the quantities of material to be excavated may be different from those indicated in the tender schedule. As such, the Contractor must understand that the quantities of compactable excavated materials may also differ.

1.3 ASSOCIATED REQUIREMENTS

.1 Section 02 41 13 – Selective Site Demolition

.2 Section 31 23 33.01 – Excavating, Trenching and Backfilling

1.4 REFERENCES

.1 Government of Canada:

.1 *Canadian Environmental Protection Act, 1999.*

.2 *Transportation of Dangerous Goods Act, 1992.*

.3 *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.*

.4 *Transportation of Dangerous Goods Regulations.*

.5 Documentation from the Canadian Council of Ministers of the Environment (CCME).

.6 Any other legislation, regulations, or guidelines relevant to the project.

.7 Greening Government Strategy.

.2 Government of Québec:

.1 *Guide de caractérisation des terrains*, MELCC, 2003, 130 pages.

.2 Sampling Guide for Environmental Analysis, Booklet 1 – General (Centre d'expertise en analyse environnementale du Québec – CEAEQ, 2008); Booklet 3 – Sampling of Groundwater (CEAEQ, 2012); Booklet 5 – Soil Sampling (CEAEQ, 2010); and Booklet 8 – Sampling of Hazardous Materials (CEAEQ, 2008).

.3 *Environment Quality Act* (CQLR, c. Q-2).

.4 *Regulation respecting the burial of contaminated soils* (CQLR, c. Q-2, r. 18).

.5 *Regulation respecting contaminated soil storage and contaminated soil transfer stations* (CQLR, c. Q-2, r. 46).

.6 *Petroleum Products Regulation* (*Petroleum Products Act*, c. P-30.01, ss. 5 and 96).

.7 *Regulation respecting the landfilling and incineration of residual materials* (CQLR, c. Q-2, r. 19).

.8 *Regulation respecting hazardous materials* (CQLR, c. Q-2, r. 32).

.9 *Transportation of Dangerous Substances Regulation* (CQLR, c. C-24.2, r. 43, *Highway Safety Code*).

.10 *Land Protection and Rehabilitation Regulation* (CQLR, c. Q-2, r. 37).

.11 *Regulation to amend the Land Protection and Rehabilitation Regulation*, effective August 8, 2019.

.12 *Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés* (*Guide d'intervention*) (MELCC, 2021).

.13 *Regulation respecting the reclamation of residual materials* (RRRM) (CQLR, c. Q-2, r.49).

.14 *Regulation respecting the regulatory scheme applying to activities on the basis of their environmental impact* (CQLR, c. Q-2, r. 17.1).

.14 *Regulation respecting the traceability of excavated contaminated soil.*

.15 Applicable standards for the discharge of water into surface waters and/or sewers.

.16 Any other legislation, regulations, or guidelines relevant to the project.

.17 The Contractor is responsible for compliance with all federal, provincial, and municipal environmental protection legislation that applies to the work area (including any areas outside of the Place George V site where it is doing work associated with this rehabilitation).

1.5 DEFINITIONS

.1 Generic criteria: Soil quality criteria taken from the *Guide d'intervention* and updated on the MELCC electronic portal.

.2 Construction waste: Any material from the construction, renovation, or demolition of immovables or other structures, including stone, gravel, pieces of concrete or asphalt, wood, glass, etc. as defined in section 101 of the *Regulation respecting the landfilling and incineration of residual materials* (CQLR, c. Q-2, r. 6.02).

.3 Duplicate: A duplicate is a second sample taken from the same location for control and quality assurance purposes. It is used to determine the replicability (if analyzed in the same laboratory) or reproducibility (if analyzed at two different laboratories) of sampling. The duplicate should therefore be as representative as possible of the original sample and the two samples should be sent to the laboratory under two different identification numbers.

.4 Residual materials: Any residual material eligible for a landfill site under the *Regulation respecting the landfilling and incineration of residual materials* (CQLR, c. Q-2, r. 6.02) or any residual granular material where at least 50% of particles have a diameter greater than 2.5 mm.

.5 Hazardous materials: Hazardous materials as defined in the *Regulation respecting hazardous materials* (CQLR, c. Q-2, r. 15.2).

.6 Hazardous residual materials: Hazardous residual materials as defined in the *Regulation respecting hazardous materials* (CQLR, c. Q-2, r. 15.2).

.7 MELCC: Ministère de l'Environnement et de la Lutte contre les changements climatiques.

.8 RES: MELCC *Critères de résurgence dans les eaux de surface* (surface water resurgence criteria), updated on the MELCC electronic portal.

.9 RCSSTS: *Regulation respecting contaminated soil storage and contaminated soil transfer stations.*

.10 RRRM: *Regulation respecting the reclamation of residual materials*.

.11 Contaminated soils: Soils with concentrations above criterion A of the *Guide d'intervention*.

.12 ≤A soils: Soils with concentrations less than or equal to criterion A of the *Guide d'intervention*.

.13 A–B soils: Soils with concentrations above criterion A but below criterion B in the *Guide d'intervention* (A–B range).

.14 B–C soils: Soils with concentrations greater than or equal to criterion B, but less than or equal to criterion C of the *Guide d'intervention* (B–C range).

.15 C–RBCS soils: Soils with concentrations above criterion C but below the standards of the *Regulation respecting the burial of contaminated soils* (C–RBCS range).

.16 ≥RBCS soils: Soils with concentrations greater than or equal to the standards of the *Regulation respecting the burial of contaminated soils*.

1.6 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 The Contractor is responsible for preparing the required documents and obtaining all necessary authorizations from the MELCC and the City of Québec, if applicable, including but not limited to: agreements and authorizations for off-site storage and disposal of soil and other excavated materials, sewer discharge permits, etc. The Contractor must comply with the terms and conditions of such authorizations, if any.

.2 At least two days before the start-up meeting, the Contractor must submit a copy of all authorizations or permits required for excavation, and other work described in these specifications, to the Departmental Representative. Such authorizations or permits shall be at the Contractor's expense.

.3 For all materials disposed of off-site, the Contractor must send the Departmental Representative copies of the weight tickets from the disposal or treatment sites on a daily basis.

.4 A copy of each weight ticket (including certification of the exact weight, time of weighing, type of load, and delivery location) from the disposal or treatment sites must be submitted to the Department Representative within one day of weighing.

.5 At the start of the work, the Contractor must have, in its possession and on the site, the equipment needed to carry out the work prescribed in these specifications. The Contractor must respond immediately to any event that may cause environmental damage or that is deemed harmful by the Departmental Representative.

.6 Before work begins, the Contractor must submit a detailed plan for the management of hazardous materials and hazardous residual materials. Once a month, it must also provide written documentation of weekly hazardous waste inspections.

.7 Documents to be submitted for progress meetings: the following documents must be submitted at least 24 hours in advance.

.1 Up-to-date timeline of the work progress, with details of the activities. Results of the progress review, indicating whether the deadlines for starting and completing each stage have been met; notes on any major problems that have arisen and the corrective actions that have been taken; accident reports; notes on equipment breakdowns; and reports on equipment breakdowns and the removal of materials or equipment must be attached.

.2 Any other information required by the Departmental Representative or that can be included in the agenda of the next progress meeting.

.8 A general environmental management plan, as described in section 01 35 43 – Environmental Procedures, including a contaminated soil management plan. This environmental management plan must be submitted at least 15 working days before work begins.

1.7 REGULATORY REQUIREMENTS

.1 Disposal of waste, debris, and scrap materials must comply with federal, provincial, and local pollution laws, ordinances, codes, and regulations.

.2 The work must meet or exceed the minimum requirements of applicable federal, provincial, and municipal laws and regulations.

.1 The Contractor must comply with any amendments to these laws or regulations once they come into force.

.3 If regulatory agency requirements exceed the scope of work or conflict with specific contract requirements, the Contractor must notify the Departmental Representative immediately.

.4 The Contractor is responsible for providing the Departmental Representative with a list of authorized storage and disposal sites. It must also obtain and provide the Departmental Representative with any storage and disposal site authorizations required under the applicable federal and provincial laws and regulations. Additionally, the Contractor must provide evidence that the proposed sites meet the applicable regulations and can accommodate the category of excavated material it intends to dump.

.5 The management methods for excavated soil must comply with the MELCC's *Guide d'intervention*.

.6 The Contractor is responsible for choosing the storage and disposal sites. It is solely responsible for any consequences of the excavated material being refused at the chosen disposal site or failing to comply with any legislation in effect.

.7 The Contractor must comply with the RCSSTS. Furthermore, it must submit to the Departmental Representative a copy of the notice sent to the MELCC under the regulation and comply with the requirements therein.

.7 Following the application of the *Regulation respecting the traceability of excavated contaminated soil*, the Contractor must make every effort to be able to use the provincial Traces Québec traceability system. This involves creating an account in the Traces Québec system, installing the mobile app on the smartphones of the carrier's drivers, and filling in all the information required by the system.

.8 Trucks must meet the requirements of the *Transportation of Dangerous Substances Regulation*.

1.8 SCHEDULING AND EXECUTION OF THE WORK

.1 Work involving contact with potentially contaminated materials and equipment cannot begin until the temporary storage facilities, if required, are operational, approved by the Departmental Representative, and compliant with any other approvals obtained (if applicable).

1.9 SOIL STOCKPILING AREAS

.1 Direct loading of soils for disposal or treatment is preferred, but if evidence at the site suggests contamination levels that differ from those indicated in characterization reports, the Contractor will need to provide, operate, and maintain storage/stockpiling areas in accordance with applicable regulations, including the RCSSTS.

.2 The Contractor must, at minimum, prevent contact with contaminated soils by covering the stockpiling area with an impermeable polyethylene membrane. Furthermore, it must have impermeable tarpaulins designed to cover the deposited material to prevent piles from eroding into the surrounding environment, stop precipitation from entering, and prevent any volatile compounds from evaporating.

.3 If any area of the property is used as a soil stockpiling area, it must be restored to its original condition once work ends. It is the Contractor's responsibility to demonstrate that the chemical quality of the soils underneath the storage area has not been altered. If contamination occurs due to its activities, the Contractor must rehabilitate the site at its own expense.

1.10 DUST AND PARTICULATE EMISSIONS

.1 The Contractor must work in a manner that produces as little dust as possible.

.2 The Contractor must immediately implement dust and particle control measures, as required by the Departmental Representative, and maintain them during construction in accordance with the applicable provincial regulations.

.3 The Contractor must take effective measures to prevent airborne particles from dispersing into the atmosphere.

.4 Trucks used for the transport of fine or dusty materials must be equipped with appropriate covers.

.5 The Contractor must prevent dust from spreading to adjacent properties.

.6 The Departmental Representative may interrupt work at any time if they feel that the Contractor's dust- and particle-reduction measures are insufficient given the wind conditions on the site.

.7 Work must be stopped if the Contractor's dust- and particle-reduction measures are insufficient. If this occurs, the Contractor must state how it intends to correct the situation, then modify its operations as soon as possible before resuming any activity (excavation, handling, treatment, etc.) that may generate dust or particles.

PART 2 EXCAVATION AND MANAGEMENT OF EXCAVATED MATERIAL

2.1 SCOPE AND NATURE OF THE WORK

.1 Soils contaminated with hydrocarbons (C_{10}–C_{50} PHCs), metals, and/or polycyclic aromatic hydrocarbons (PAHs) are present at various locations on the site.

.2 Excavation:

.1 The rehabilitation and restoration of Place George V will consist of excavating the soils to the design depths of the infrastructure shown on the civil plans and on Map 3 of the Appendix C. Subsequently, the environmental monitor will characterize the soils in the walls and bottoms of the excavations. If areas reveal concentrations beyond criterion C, over-excavation will not be done.

.3 Soils below the design depth shown on Map 3 of Appendix C that were previously identified as having a concentration >C **<u>are not to be removed</u>, even if a sample taken after excavation of the soils to the design depth reveals concentrations equal to or less than criterion C.**

.4 Soils with concentrations beyond MELCC criterion C and for which the following limitations apply may be left in place:

.1 Contaminated soils present below the depths indicated in Map 3 of Appendix C.

.2 Contaminated soils whose excavation would require underpinning work that could affect the structural integrity of the street, an embankment, existing utilities to be maintained (under a utility bed to be retained, etc.), or other structures. However, if excavation is necessary to build elements that require underpinning, the excavated contaminated soil must be managed.

.3 Contaminated soils whose excavation could compromise the stability of lands or structures adjacent to the study site boundaries.

.4 The Contractor must nevertheless adapt its methods when the aforementioned limitations are present in order to excavate and dispose of as much soil with concentrations beyond criterion C as possible.

.5 The soils constituting the final walls and bottoms of the excavations left in place due to the aforementioned limitations must be sampled by the environmental monitor and submitted for chemical analysis in a laboratory duly accredited by the MELCC.

.6 A polyethylene waterproofing membrane must be installed on the sidewalls of excavations in areas where **hydrocarbon**-contaminated soils (or soils showing evidence of hydrocarbon contamination) will be left in place. **This membrane must remain below the design line to prevent water flow from being obstructed.**

2.2 GENERAL

.1 Rehabilitation work on Place George V that involves the management of contaminated soil must comply with the MELCC's *Guide d'intervention*. Map 4 of Appendix C illustrates the quality of the soils to be excavated as part of the work.

.2 For the entire project, approximately 7,126 metric tons of excavated material will need to be managed off-site or reused on-site (if it complies with applicable federal guidelines and the contaminated soil management plan. **All excavated material must be managed in accordance with the *Grille de gestion des sols excavés* in the MELCC's *Guide d'intervention* and the *Regulation respecting the reclamation of residual materials* (RRRM).**

.1 The volumes of soil estimated for each contamination range are indicated in the schedule.

.2 Map 4 included in Schedule C of these specifications, illustrates the environmental quality of the soils for each of the sectors to be excavated and subjected to contaminated soil management.

.3 The Contractor must manage the excavated material in accordance with provincial regulations.

.4 During excavation, the environmental monitor must remain on the site at all times to ensure that the excavation work and the management of the excavated materials comply with the plans and specifications, as well as all provincial regulations.

.5 All samples collected (regardless of medium) are to be analyzed by an MELCC-accredited laboratory in accordance with the law.

2.3 LOCATION OF UNDERGROUND UTILITIES

.1 The Contractor must locate all public and private underground utilities before beginning any excavation work.

.2 The Contractor must consult the Info-Excavation service to locate buried infrastructure in the area before beginning excavation.

.3 The Contractor must also verify the presence of other buried infrastructure with companies that are not members of Info-Excavation, notably, but not limited to: municipal sewer and water systems and optical cable services.

.4 It is important to mention that a municipal water main runs through the site. It must be left in place. The Contractor must provide, and is responsible for, all necessary measures to protect workers. The main in question is identified on the civil plans.

.5 The Contractor is solely responsible for locating public and private underground utilities and must take all necessary measures to locate them accurately. No party other than the Contractor may be held liable for the failure of underground utilities.

.6 The Contractor must, at its own expense, protect and restore any above-ground or underground equipment and infrastructure in use that is encountered, disturbed, or damaged during excavation.

2.4 WATER MANAGEMENT

.1 The groundwater levels at the site were measured on September 17th and on October 28th in the observation tubes installed on the site as part of the geotechnical study presented in Schedule A of these specifications. The groundwater level was between 0.90 and 3.23 meters below the current ground level. It is important to note that the water in the soil is likely to fluctuate up or down with the seasons or climatic variations and therefore may be at different depths at ofther times of the year.

.2 If groundwater is present in the excavations while work is being done, the water will have to be managed according to the regulations in force.

.3 The work must minimize the volume of water in need of management. The Contractor must minimize or avoid excavation during heavy rainfall. It must also minimize the surface area of excavations by backfilling as the work progresses, whenever possible.

.4 The Contractor must take all necessary measures to prevent the land, sewer systems, or watercourses from being contaminated by the disposal or discharge of liquids, hazardous materials, or any other materials that exceed regulatory limits.

.5 If water collects in the excavations and is pumped out, the environmental monitor will need to monitor the water quality regularly to ensure that it complies with the standards and regulations in force.

.6 If analyses for the water in the excavations reveal that it does not meet the applicable standards and/or criteria, or if there are obvious signs of contamination (e.g. hydrocarbons on the surface), the Contractor must dispose of the contaminated water or treat it on-site before discharging it. The treatment and/or disposal must comply with the applicable laws and standards.

.7 Should the Contractor decide to treat the water on-site, the environmental monitor will verify the effectiveness of its treatment before the treated water is discharged. To do this, the Contractor must pump and treat the water to be managed, and store it temporarily in a tank that it must provide for that purpose. The environmental monitor will have the raw and treated water tested by an accredited laboratory. Water management must have as little impact on the progress of the work as possible, and treatment equipment must be chosen and installed accordingly.

.8 In order to monitor the effectiveness of the temporary treatment equipment, the environmental monitor will be responsible for carrying out a sampling program for the effluents to be treated by the equipment and released into the environment. If water is to be disposed of off-site, the Contractor must provide the Departmental Representative with written proof that it has been disposed of at an MELCC-approved site and that it has been subject to a recognized traceability program. If a vacuum truck from an authorized company is used, the company's recovery balance (in litres) must be submitted to the Departmental Representative on a regular, daily basis.

.9 If a mobile contaminated water treatment unit is installed, the Contractor must ensure that it has all the necessary authorizations for the use of the unit, in particular the authorization required under section 22 of the *Environment Quality Act*.

2.5 MANAGEMENT OF EXCAVATED SOIL

.1 Excavation and sorting of excavated soil

.1 All excavated soils must be managed in accordance with the Contractor's contaminated soil management plan.

.2 At the time of excavation, the Contractor must follow the environmental monitor's instructions regarding the selective excavation of soils based on their degree of contamination and/or if residual materials or construction debris are present, the nature and environmental characteristics of which require different methods of off-site disposal.

.3 Direct loading of contaminated soils should be prioritized. If direct loading is not possible, excavated soils may be temporarily stored on- or off-site if necessary. In this case, they must be stored on a waterproof surface and covered entirely with an impermeable cover to prevent contaminants from leaking into the environment. Furthermore, the Contractor must comply with the applicable standards and regulations (see section 2.5.4 and others).

.4 "Soil excavation" includes the removal of all loose material of any kind that is not considered rock, including boulders, compacted clays, and miscellaneous materials and debris that can be cleared and lifted with heavy excavation equipment.

.5 Contaminated excavated soils will have to be disposed of off-site in MELCC-approved locations and in accordance with the regulations in effect at the disposal or treatment sites. They may also be reused on the site, provided that they comply with the applicable federal recommendations, the contaminated soil management plan, and the geotechnical requirements (see Appendix A).

.6 During work, the Contractor must take all necessary precautions to avoid mixing soils or residual materials of different types or with different contamination levels.

.7 If indicators on the site suggest that the excavated soils have different contamination levels than those identified during previous environmental characterizations, or if certain disposal site requirements must be met, the environmental monitor may need to resample the soils prior to their off-site disposal, in accordance with the MELCC's *Guide d'intervention* and other applicable guides and standards.

.2 Off-site transport of soils and other excavated materials

.1 When travelling on public roads, trucks used for the off-site transport of excavated soil must, without limitation, obey the *Highway Safety Code* (CQLR, c. C-24.2) and the *Transportation of Dangerous Substances Regulation* (CQLR, c. C-24.2, r. 4.2.1).

.2 The Contractor must obey section 17 of the *Transportation of Dangerous Substances Regulation* (CQLR, c. C-24.2, r. 43); soils whose contamination levels exceed criterion B of the *Guide d'intervention* must be transported in a vehicle whose dump body is covered with an impermeable tarpaulin that keeps the load contained in the vehicle. If the soils have contamination levels equal to or beyond criterion C, the top of the dump body must be covered completely to prevent rain or snow from entering or contaminants from escaping. As liquid may be released from these soils, the container or dump body must be leakproof.

.3 Before trucks leave the site with materials to be disposed of off-site, they must be given a transport manifest, and instructions on their destination.

.4 Trucks are not permitted to leave the site without following these procedures.

.3 Off-site disposal of soils and other excavated materials

.1 Excavated contaminated soils will have to be disposed of off-site at MELCC-approved sites and in accordance with the regulations in effect at the disposal or treatment sites. The soil disposal sites chosen by the Contractor must be identified in the contaminated soil management plan (part of the general environmental protection plan), submitted to the Departmental Representative, and approved before excavation begins. Additionally, the Contractor must provide evidence that the proposed sites meet the applicable regulations and can accommodate the category of excavated material it intends to dump.

.2 For all materials disposed of off-site, a copy of the weight tickets from the disposal site must be sent to the Departmental Representative on a regular, daily basis. These tickets must specify the name of the disposal site, the contamination range of the material, the weight of the material dumped, the registration number of the truck used, and the date and time of the weighing (see section 2.8).

.3 When choosing soil disposal sites, the Contractor must consider the excavated soil management options provided in Schedule 5 of the MELCC's *Guide d'intervention*.

.4 For rehabilitation purposes, excavated soils may be reused as backfill on the site if they comply with applicable federal recommendations and the contaminated soil management plan.

.5 It is important to note that the contamination level is not the only criterion for acceptance at a reuse, disposal, or treatment site. Regulatory requirements or certain disposal sites may set limits on soil particle size, hydraulic conductivity, organic matter content, and type and/or percentage of debris in the soil.

.6 The Contractor is responsible for choosing the disposal and treatment sites. The Contractor will become the owner of the materials that are not being reused and must dispose of them according to the applicable regulations. Furthermore, the Contractor is responsible for ensuring that the soils will be accepted at the proposed sites. It is solely responsible for any consequences of the soil being refused at the chosen disposal and/or treatment site or failing to comply with any legislation in effect.

.4 Temporary stockpiling of soil and other excavated materials

.1 If contaminated soils (A–B, B–C, C–RBCS, and ≥RBCS soils) are stockpiled ahead of off-site disposal, they must be placed on an impermeable surface (asphalt or suitable impermeable membrane) and covered with a second polyethylene membrane at the end of each workday to prevent infiltration of precipitation, erosion of the piles into the surrounding environment, or evaporation of volatile compounds, if any.

.2 The Contractor will be responsible for securing an off-site storage area at its own expense, if necessary.

.3 Should the Contractor decide to temporarily store excavated contaminated soil outside the Place George V site, it must provide the Departmental Representative with a copy of its agreement with the Landowner. All measures applicable to the storage of contaminated soils set out in the specifications, as well as in the MELCC's *Regulation respecting contaminated soil storage and contaminated soil transfer stations* (RCSSTS), must be rigorously followed. The Contractor must also submit to the Departmental Representative a copy of the notice sent to the MELCC under this regulation. If temporary storage is governed by a ministerial authorization, the storage must comply with the requirements defined therein.

Upon completion of the work, a copy of the Landowner's release must be provided to the Departmental Representative.

.4 The Contractor must demonstrate that it has obtained the necessary authorizations, that it is following the laws and regulations in force, and that the storage and sampling activities on the temporary storage sites are always supervised.

.5 If required by the MELCC's *Guide d'intervention*, other applicable guides, or the requirements of the disposal sites, the environmental monitor may take additional samples of soils that have organoleptic properties that differ from those anticipated.

.6 Upon receiving the analytical results of the characterized stockpiled soils, and according to the environmental monitor's instructions, the Contractor must reload the soils for off-site disposal at an MELCC-approved site.

.7 Soils to be characterized or disposed of off-site must be stockpiled in an approved temporary location. The volume of each soil pile to be characterized must not exceed the recommendations in the *Guide d'intervention*.

.8 The temporary storage area for excavated soil piles must, at minimum:

.1 Allow excavated material to be stored in separate piles for segregation, sorting, or screening based on its type, environmental quality, waste content, and/or origin;

.2 Allow soil piles to be clearly identified based on their degree of contamination;

.3 Allow an impermeable covering to be placed over and under the soils when they are not in use;

.4 Prevent contact between contaminated soils and prevent leachate from the contaminated soils from coming into contact with existing soils;

.5 Prevent leachate from the contaminated soils from leaching outside of the storage area;

.6 Prevent contaminated soil from leaving the storage area through rainwater runoff, snowmelt, or wind;

.7 Prevent unauthorized access to the soil storage area.

.9 The portion of the site being used for temporary soil storage must be restored to its original condition once work ends.

.10 It is the Contractor's responsibility to demonstrate, if required by the Departmental Representative, that the chemical quality of the air or soil and groundwater underlying the storage area has not been altered during the course of the work. If contamination occurs due to its activities, the Contractor must rehabilitate the site at its own expense.

2.6 MANAGEMENT OF EXCAVATED RESIDUAL MATERIALS

.1 The environmental monitor will be responsible for assessing the residual material content of excavated materials.

.2 If necessary, the Contractor must use material screening to segregate the residual materials from the excavated materials to meet regulatory requirements and the requirements of the authorized disposal sites. The method and use of screening are at the Contractor's discretion, but must comply with all applicable regulations.

.3 Non-hazardous residual materials (e.g. slag) must be stored and disposed of according to the regulations in force. The manifests for the disposal of non-hazardous residual materials in an engineered landfill site (ELS) authorized under the *Regulation respecting the landfilling and incineration of residual materials* must be sent to the Departmental Representative. It is the Contractor's responsibility to obtain the necessary permits and to comply with the conditions indicated therein, if any. Excavated residual granular materials (RGMs) must be managed in accordance with the regulations in force, particularly the *Regulation respecting the reclamation of residual materials* (RRRM). RGMs should be prioritized for on-site reuse as backfill for excavations.

2.7 MANAGEMENT OF EXCAVATED HAZARDOUS RESIDUAL MATERIALS

.1 If hazardous residual materials are discovered, they must be stored and disposed of in accordance with the regulations in force. The manifests for the disposal of hazardous residual materials at a site authorized under the *Regulation respecting hazardous materials* must be sent to the Departmental Representative.

2.8 TRANSPORT OF CONTAMINATED EXCAVATED MATERIAL TO AN MELCC-AUTHORIZED DISPOSAL OR TREATMENT SITE

.1 Truck drivers must insure to comply with the Regulations respecting the traceability of excavated contaminated soil measures. This involves to register in the Trace Québec system, install the mobile application on transporter smartphones and insure the monitoring process required by the system, of which the moving real time monitoring. Truck drivers transporting the excavated material must obtain hazardous waste manifests for each load of soil to be transported to an MELCC-authorized disposal/treatment site. Transportation manifests must be obtained from the Contractor. The manifest must be recorded in the traceability system. The following information must be included:

.1 Name of the carrier

.2 Vehicle registration

.3 Date

.4 Departure and arrival times of the load

.5 Origin of the load

.6 Type of soil transported (<A, A–B, B–C, C–RBCS, or ≥RBCS)

.7 Destination of the load

.8 Signature of the Departmental Representative (issuer)

.9 Signature of the disposal site representative

.2 Distribution of the copies of the hazardous waste manifests:

.1 One copy of the manifest must be kept on-site by the Departmental Representative.

.2 One copy of the manifest must be kept by the disposal site representative.

.3 One duly completed copy of the manifest must be sent to the Contractor for inclusion in the payment form.

.4 One copy must be kept by the carrier.

.3 Weighing:

.1 Each load must be weighed at the disposal/treatment site.

.2 A copy of the weight tickets from the disposal/treatment sites must be provided to the Departmental Representative.

.3 Payment will be made upon presentation of the weight tickets from the disposal site.

PART 3 SITE SUPERVISION

3.1 CONTRACTOR'S RESPONSIBILITIES

.1 The Departmental Representative will be responsible for the environmental monitoring of the work. The Contractor must understand that the Departmental Representative will be present the entire time excavation is underway and that they may stop work in an area at any given time for observations, sampling, or analyses. The Contractor is not permitted to charge additional fees for these stoppages.

.2 If soils must temporarily be stored off-site, the Contractor must comply with applicable regulations. The chemical quality of the soils underlying the storage areas will have to be monitored and, where applicable, the monitoring plan will have to document these aspects in order to ensure that the storage has not altered the soils in the course of the work.

.3 The Contractor must prepare and provide a general environmental protection plan that includes a contaminated soil management plan. The plan must be comprehensive and cover all phases of the environmental component of the contract. The general plan must include, but is not limited to, the methodology for the environmental protection measures it intends to take, in accordance with the specifications of section 01 35 43. The contaminated soil management plan must include the methodology for every stage of the environmental monitoring of the excavation and soil management (such as the excavation process; the storage of soils in piles if necessary; the loading and transportation of soils to disposal/treatment sites; and the management of residual materials and water that collects in the excavations).

.4 The Contractor must provide any coordination and assistance needed to allow the Departmental Representative to take samples as part of the environmental monitoring. The excavations may need to remain open for three to five working days to allow the analytical results from the walls and bottoms of the excavations to arrive.

.5 The Contractor must submit a list of storage, disposal, or treatment sites to be used and provide certificates of authorization for these sites to the Departmental Representative before excavation begins.

.6 The Contractor is responsible for ensuring the suitability of the storage, disposal, or treatment sites it plans to use; this includes ensuring that each of its recommended sites has scales. It must also ensure that contaminated materials can be transported to the site without any problems due to their contamination level, regardless of their particle size, water content, or other factors.

.7 The Contractor must follow the Departmental Representative's instructions at every stage of the environmental monitoring and soil management work.

.8 Upon completion of the work, the Contractor must remove all remaining granular materials and debris from the site. Additionally, it must replace any surfaces that have been damaged during the work; the site must be restored to the general condition it was in before the work began.

.9 The Contractor must provide all necessary equipment for excavating and segregating materials. The buckets used must allow contaminated materials to be segregated. They must also be able to create a smooth surface at the bottom of the excavation to facilitate sampling.

.10 If excavations are required on sloped surfaces, the regraded areas must be stabilized as the work is completed. The Contractor must employ erosion control measures to capture eroded material in sloped areas that have been regraded.

.11 The Contractor must make reasonable efforts to allow soils and residual materials to be segregated whenever technically feasible.

.12 Soils and residual materials must be segregated in a way that allows soils to be sorted based on their level of contamination and residual materials to be sorted based on type and recoverable residual materials to be reclaimed in order to lower overall disposal costs.

.13 During loading, special care must be taken to limit the loss of materials around and on the sides of the trucks.

.14 Each load of contaminated soil transported off-site must be controlled by the Departmental Representative. Control involves, in particular, issuing weight tickets, as well as transport manifests signed by the Departmental Representative and the Contractor. No load of any kind may leave the site until the Departmental Representative has given the driver a transport manifest. The Departmental Representative is also responsible for completing the tracking slip for the off-site disposal (but not temporary storage) of contaminated soils on the government's mobile tracking app. For each load of contaminated soil to be disposed of off-site, the Departmental Representative will need to fill out a virtual tracking slip in the Trace Québec governmental traceability system. Drivers for the Contractor's designated carriers must have smartphones so that they can complete the necessary tracking.

.15 The Contractor is responsible for obtaining any necessary waivers for the disposal of soils contaminated with metals beyond the limits of RBCS Schedule I from the MELCC, as well as any other authorizations needed for materials to be accepted at the recovery and disposal sites.

.16 The Contractor is solely responsible for the consequences of soils or residual materials being refused at disposal sites. PWGSC will not be responsible for any costs associated with materials being refused at the recovery/disposal/treatment sites.

END OF SECTION

PART 1 GENERAL

GENERAL NOTE: In this section “site” means all installations on site or taking place on site (site itself, buildings, accesses, infrastructures, parking lots, docks, etc.).

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 56 00 - Temporary Barriers and Enclosures.

.3 Section 31 23 16.26 - Rock Removal.

1.2 REFERENCES

.1 Province of Quebec.

.1 Act Respecting Occupational Health and Safety, R.S.Q., c. S-2.1.

.2 Safety Code for the Construction Industry, R.S. Q., c. S-2.1, r.4.

.2 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.4 FC 301 — Fire Protection Standard, Fire Commissioner of Canada.

.5 Workplace Sanitary Standards Guide for the Construction Sector – COVID-19, available on www.cnesst.gouv.qc.ca.

.6 CSA S269.1, Falsework and Framework.

.7 CSA S269.2 Access Scaffolding for Construction Purposes.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Action and Informational Submittals.

.2 Submit to the Departmental Representative and CNESST the site-specific prevention program as describecd under COMMON PRODUCT REQUIREMENTS, at least 10 days prior to beginning of work.

.3 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 30 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative. Departmental Representative reserves right to suspend Work until the content of the prevention program is satisfactory. Revise plan as appropriate and resubmit plan to Departmental Representative if the scope of work changes, if the Contractor's work methods differ from initial plans or for any new applicable condition.

.4 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.5 Submit copies of Contractor's authorized representative's work site health and safety inspection reports weekly to Departmental Representative.

.6 Submit a copy of inspection report, notice of corrective measures and recommendations issued by federal, provincial and territorial health and safety report to Departmental Representative within 24 hours.

.7 Submit to Departmental Representative within 24 hours an investigation report for any accident involving injury and any incident exposing a potential hazard.

Investigation report must contain the following:

1. Date, time and location of accident.
2. Name of subcontractor involved in accident.
3. Number of persons involved and description of injuries.
4. Identification of witnesses.
5. Detailed description of tasks executed at time of accident.
6. Equipment used for tasks executed at time of accident.
7. Corrective measures taken immediately following accident.
8. Causes of accident.
9. Preventive accidents taken to prevent a similar accident.

.8 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00. Contractor must keep copy of sheets on site.

.9 Medical Surveillance: Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work. Submit additional certifications for any new site personnel to Departmental Representative.

.10 Submit emergency response plan at the same time as the prevention program. Emergency response plan must contain the elements listed under General in this section.

.11 Submit copy of training certificates for construction site workers to Departmental Representative, particularly for the following training (where applicable):

.1 First aid in the workplace and cardiopulmonary resuscitation.
.2 Lockout procedures.
.3 Preventive operation of forklift trucks.
.4 Preventive operation of aerial work platforms.
.5 Any other requirement of Regulations or the safety program.

Health and safety training certificates must be available at all times on site.

.12 Engineer's compliance plans and compliance: the Contractor must submit to Departmental Representative and the *Commission des normes, de l'équité, de la santé et de la sécurité du travail* (CNESST) a copy signed and sealed by an engineer of all plans required under the Safety Code for the Construction Industry (2.1, r.4), another law, another regulation or another clause of the specifications or contract. The Contractor must also submit a compliance certificate signed by an engineer once the installation for which the plans have been drawn up is completed and prior to use of the installation. A copy of the documents must be available on site at all times.

1.4 FILING OF NOTICE

.1 Notice of site opening shall be submitted to the CNESST before work begins . Submit copy of the notice of opening and CNESST acknowledgement of receipt to Departmental Representative.

When work is completed, submit copy of notice of site closing to Departmental Representative.

.2 Contractor shall be responsible and assume the Principal Contractor role within the limits of the construction site and wherever work must be carried out as part of this project. Contractor must acknowledge this responsibility in the notice of opening submitted to the CNESST.

.3 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.5 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project work requirements.

.2 Plan and organize work to eliminate source of danger of falls and safety of all persons and reduce recourse to individual safety equipment to a minimum. When individual safety equipment is required, workers must use a safety harness in accordance with CAN - CSA- CSA-Z-259.10 - 10-M90. Safety belt is not allowed as protection against falls.

.3 Equipment, tools or protection that cannot be installed or used safely is deemed to inadequate for the work to be carried out.

.4 All mechanical equipment (e.g.: eqiupment to lift persons or material) must be inspected prior to delivery on site. Contractor must submit an inspection certificate signed by a competent mechanic prior to use. The Departmental Representative may at any time order work to be suspended immediately and require a second inspection by specialist of his choosing if he suspects equipment may be defective or there is risk of injury.

1.6 MEETINGS

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

.2 Contractor’s decisional representative must attend any meetings at which site safety and health issues are to be discussed.

.3 Contractor must set up a construction site committee if there are to be 25 workers or more at any time on the site and hold meetings as required under the Safety Code for the Construction Industry (S-2.1, r. 4). Submit copy of minutes to Departmental Representative no later than five (5) days after meeting.

1.7 REGULATORY REQUIREMENTS

.1 Comply with laws, regulations and standards applicable to execution of Work.

.2 Comply with specified standards and regulations to ensure safe operations at site containing hazardous or toxic materials.

.3 Always use most recent version of the standards referenced in the Safety Code for the Construction Industry (S-2.1, r.4), notwithstanding the date indicated in the Code.

1.8 COMPLIANCE REQUIREMENTS

.1 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry. and all requirements of these specifications.

.2 Prior to commencing Work and prior to receiving payment upon completion of Work, provide proof of compliance with all requirements of the Occupational Health and Safety Act.

.3 At all times during the term of the contract, provide to Departmental Representative, upon request, proof that Contractor and all its subcontractors have complied with requirements of the Act.

.4 In addition, the contractor is specifically considered the prime contractor within the meaning of the Act, with respect to health and safety on the site. As such, the Contractor's obligations, expressed summarily but not exhaustively, are as follows:

.1 Ensure that a prevention programme is drawn up.

.2 Transmit, where applicable, the prevention program to the persons or units designated by the Act respecting occupational health and safety and its regulations.

.3 Transmit the notice of opening and closing of the worksite to the CNESST within the prescribed time and manner.

.4 Ensure that the prevention program is applied.

.5 Ensure compliance with each employer's prevention program (written commitment).

.6 Receive the inspector's orders.

.5 Provide owner and manager with a copy of any document received and transmitted to or by the CNESST. The owner shall do the same with respect to the contractor.

.6 Contractor is responsible for any possible stoppage of work following an order from a CNESST inspector. Contractor will reimburse the owner for any fine imposed by the CNESST as a result of Contractor's failure to comply with the requirements of the Act.

.7 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.9 RESPONSIBILITY

.1 The Contractor must accept and assume all tasks and obligations under the Act Respecting Occupational Health and Safety (R.S.Q., chapter S-2.1) and the Safety Code for the Construction Code (S-2.1, r.4).

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

.3 Contractor must clearly identify construction site boundaries with physical means and comply with applicable regulations. Submit site boundary indicators to 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 Health and Safety Plan.

1.10 GENERAL REQUIREMENTS

.1 Prepare site-specific Health and Safety Plan prior to commencement of work based on prior assessment of risks and dangers in accordance with SAFETY ASSESSMENT and RISKS INHERENT TO WORK SITE sections. Implement program and ensure compliance until close-out is completed and measures to reduce workers' exposure to COVID-19 at construction sites described in Workplace Sanitary Standards Guide for the Construction Sector – COVID-19, available on www.cnesst.gouv.qc.ca.. At a minimum, the site-specific safety program must include:

Investigation report must contain the following:

.1 Company safety and health policy.

.2 Description of work stages and sequences.

.3 A description of the work, total costs, schedule and projected workforce curve.

.4 Flow chart of safety and health responsibility.

.5 The physical and material layout of the site.

.6 Risk assessment for the tasks to be carried out, including preventive measures and the procedures for applying them.

.7 Identification of the prevention measures related to the inherent risks specific to the work site indicated under RISKS INHERENT TO THE WORK SITE:

.8 Identification of the health and safety prevention measures for employees and public as indicated under REQUIREMENTS SPECIFIC TO HEALTH AND SAFETY OF OCCUPANTS AND PUBLIC.

.9 Training requirements.

.10 Procedures in case of accident/injury.

.11 Written commitment from all parties to comply with the prevention program.

.12 A site inspection schedule based on the preventive measures.

.13 Emergency response plan, which must contain the following:

.1 Site evacuation procedure.

.2 Identification of resources (police, firefighters, ambulances, etc.).

.3 Identification of construction site supervisors.

.4 Identification of respondents.

.5 Communications flowchart (including site supervisor and Departmental Representative).

.6 Training for persons in charge of the plan's application.

.7 Information deemed necessary based on characteristics of the work site.

.2 Departmental Representative will provide Contractor with site evacuation plan, if any, which must be coordinated with construction site procedure and returned to Departmental Representative.

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

.4 In addition to the prevention program, during the work, the Contractor must draw up and submit to the Departmental Representative a written procedure specific to work representing a high risk of accidents (e.g.: demolition, installation, lifting plan, cutting power, etc.) at the Departmental Representative's request.

.5 Plan and organize work to eliminate source of danger of falls and safety of all persons and reduce recourse to individual safety equipment to a minimum.

.6 Equipment, tools or protection that cannot be installed or used safely is deemed to inadequate for the work to be carried out.

.7 All mechanical equipment (e.g.: eqiupment to lift persons or material, mechanical diggers, concrete pumps, concrete saws) must be inspected prior to delivery on site. The Contractor must obtain and keep on site an inspection certificate signed by a mechanic and dated less than one week before delivery of the equipment on site and submit to Departmental Representative on request.

.8 Ensure inspections (daily, periodic, annual, etc.) required by current standards are carried out for equipment used to hoist persons or materials and provide copy of inspection certifications to Departmental Representative if requested.

.9 The Departmental Representative may at any time order work to be suspended immediately and require an inspection by specialist of his choosing if he suspects equipment may be defective or there is risk of injury.

.10 The Departmental Representative must be consulted for the location of gas tanks and reservoirs on site.

1.11 RISKS INHERENT TO WORK SITE

.1 In addition to the risks of each task to be executed, the personnel in charge of work on the site may be exposed to the following inherent risks.

.1 Location of work, if there are:

.1 Underground services (electricity, gas, vapour, water, etc.).

.2 Laboratories.

.3 Trees and landscaping to protect.

.4 Vehicles circulating in area immediately adjacent to site.

.2 The Contractor must conduct a risk assessment of the site to validate this information and see if other risks are present. Contractor must include all identified risks in prevention program..

1.12 UNFORSEEN HAZARDS

.1 When a source of danger not specified in the specification and not identified during the preliminary inspection of the site emerges as a result of or during execution of the work, the Contractor must immediately stop work, set up temporary measures to protect workers and the public and notify the Departmental Representative verbally and in writing. The Contractor must then make the necessary adjustments to the prevention program in order for work to resume safely.

1.13 HEALTH AND SAFETY CO-ORDINATOR

.1 Where hiring of a security guard is not required or when the security guard is hired by the Departmental Representative, the Contractor must assign a qualified person to supervise and oversee health and safety regardless of the size of the site or number of workers. The person must be present at all times on site and be able to take all necessary measures to ensure the health and safety of the persons and property on site and in the immediate surroundings if affected by the work. The name of the person must be submitted to Departmental Representative before work begins.

1.14 POSTING OF DOCUMENTS

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

.2 The following information and documents must be posted in a location readily accessible to all workers:

.1 Notice of site opening (Ouverture de Chantier Notice).
.2 Identification of principal Contractor.
.3 Company OSH policy.
.4 Site-specific safety program.
.5 Emergency plan.
.6 Minutes of site committee meetings.
.7 Names of site committee representatives.
.8 Names of those with first-aid training.
.9 Action reports and correction notices issued by the CSST.

1.15 INSPECTION AND CORRECTION OF NON-COMPLIANCE

.1 Inspect the work site and complete the site inspection sheet and submit to Departmental Representative in accordance with ACTION AND INFORMATIONAL SUBMITTALS.

.2 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.3 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.4 Work stoppage: Give the Contractor's representative full authority to order interruption and resuming of work as and when deemed necessary or desirable in the interests of safety and health. The Contractor must give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

.5 Departmental Representative May stop Work if non-compliance of health and safety regulations is not corrected. Without limiting the scope of the preceding sections, the Departmental Representative may at all times order work to be suspended if a risk to the health and safety of the personnel and public or environment is perceived.

1.16 PREVENTION OF VIOLENCE

.1 Health and safety management on PWGSC work sites includes measures aimed at protecting the psychological wellbeing of any person with access to the work site. Accordingly, in addition to physical violence, verbal abuse, intimidation or harassment is not tolerated. Any person demonstrating such behaviour will be notified and/or permanently expulsed from the site by the Departmental Representative.

1.17 BLASTING

.1 Blasting or other use of explosives is not permitted [without prior receipt of written instruction by Departmental Representative.

.2 Do blasting operations in accordance with Section 31 23 16.26 - Rock Removal.

.3 All operations involving explosives must be carried out under the immediate supervision of a qualified blaster.

.4 Purchase, transportation, storage and use of explosives must comply with provisions of applicable federal and provincial legislation:
Canada:

.1 Canada: Explosives Act (E-17), Explosives Regulations (C.R.C. CH. 599), Standard for Blast Furnaces, Transportation of Dangerous Goods Act and Regulations.

.2 Quebec: Explosives Act (E-22), Regulation respecting explosives (E-22, r.1), Safety Code for the Construction Industry (S-2.1, r.4), Regulation respecting the transportation of dangerous goods.

.5 Obtain all permits required under the above-mentioned laws and regulations and keep a copy readily available on site.

.6 Facilitate visits to work site and explosives depots as well as the inspection of vehicles used for their transportation to all government and police representatives who have jurisdiction in matters of explosives.

1.18 POWDER ACTUATED DEVICES

.1 Use of power hammers and other explosive-actuated devices must be authorized by Departmental Representative.

.2 Any person using a power hammer shall hold a training certificate and meet all requirements of Section 7 of the Construction Safety Code (S-2.1, r. 6). 4).

.3 Any other explosive-actuated device shall be used in accordance with the manufacturer's directions and applicable standards and regulations.

1.19 USE OF PUBLIC WAYS

.1 Contractor must obtain from authority having jurisdiction the necessary authorizations and licenses at own expense when required to use public roads for operational purposes and to ensure safety of works, occupants or general public (e.g., use of scaffolding, cranes and hoists, digging work, etc.).

.2 Contractor must install at own expense all signposting, barriers and other provisions required by applicable regulations to ensure safety of public and installations.

1.20 LOCK-OUT PROCEDURES

.1 Contractor must submit general lock-out procedure to Departmental Representative and implement for all work performed on electrically powered equipment.

.2 Supervisory staff and employees involved in work requiring lock-out must have lock-out training given by recognized organization; Contractor must submit training certificates to Departmental Representative.

.3 Prior to undertaking lock-out of equipment in an occupied site, Contractor must coordinate work with site representative if cutting power has an impact on site operations or occupants.

.4 Contractor must identify qualified person to be responsible for lock-out procedure and ensure that person prepares lock-out report for each piece of equipment to be locked-out. Lock-out report must be submitted to Departmental Representative at least 48 hours prior to beginning of Work; Departmental Representative must have report site representative if work is carried out in existing building. Lock-out report must include the following information:

.1 Description of work.

.2 Identification, description and location of circuit and equipment to lock-out.

.3 Identification of energy sources for equipment.

.4 Identification of power cutoff location.

.5 Sequence of lock-out and release of residual energy and lock-out sequence.

.6 List of necessary lock-out material.

.7 Zero-Energy inspection method.

.8 Name and signature of person who wrote the report.

.5 At Departmental Representative's request, the Contractor must include all information on the site representative's form.

.6 At lock-out time, the person responsible must date the form and ensure each worker involved in the work on the locked out circuit/equipment has added their name and signed.

1.21 ELECTRICAL WORK

.1 Contractor must ensure that all electrical work is carried out by employees qualified in accordance with provincial qualification and professional training regulations.

.2 Contractor must comply with requirements of CSA Z462 *Workplace Electrical Safety*.

.3 Electrical power must be turned off prior to working on an electrical appliance unless the appliance may be unplugged.

.4 Contractor must comply with all requirements of the Lock-out section.

.5 Contractor must notify Departmental Representative in writing of work that is impossible to do with the power off and receive authorization. Contractor must demonstrate to Departmental Representative that it is impossible to do work with the power turned off and provide all information to complete and obtain a live-line work permit (work method, evaluation of electrical arc, safety perimeter, safety equipment, etc.) prior to beginning work, except for exceptions provided for under CSA Z462 Workplace Electrical Safety.

.6 Live-line work permit must contain the following:

.1 Description of circuit, appliance and location.

.2 Justification for the live-line work.

.3 Description of safety practices.

.4 Conclusions of electrical shock hazard analysis.

.5 Identification of safety perimeter for electrical shock hazard.

.6 Conclusions of electrical arc hazard analysis.

.7 Identification of safety perimeter for electrical arc hazard.

.8 Description of individual safety protection required.

.9 Description of means to restrict access to non-qualified persons.

.10 Proof that an information meeting was held.

.11 signed approval of live-line work (by person in authority or Owner).

.7 If for operational purposes of the site occupants the site representative requires the Contractor to perform live-line work, the Contractor must the information required to obtain a live-line work permit (work method, evaluation of electrical arc, safety perimeter, safety equipment, etc.) and have it signed by site representative prior to beginning work.

1.22 EXPOSURE TO SILICA

.1 For all internal or external work generating silica dust, the Contractor must comply with the following requirements, in addition to complying with the Safety Code for Construction S-2.1, r.4. and the City of Montreal.

.1 In the majority of cases for this site it may be possible to capture the dust at source and retain in a high efficiency filter to prevent propagation in the environment.

.2 Clean surfaces and tools with water, never with compressed air.

.3 Sandblast and etch surfaces using an abrasive containing less than 1 % silica (also called amorphous silica).

1.23 ABRASIVE BLASTING

.1 Before the start of any work likely to produce asbestos dust, the Contractor must:

.1 Provide a written procedure that meets requirements of the Safety Code for Construction, S-2.1, r.4.

.2 Demonstrate that all equipment and the equipment necessary for compliance with the procedure and safe execution of the work is available.

.3 All sanding and blasting work must be carried out with an abrasive containing less than 1% silica.

1.24 RESPIRATORY PROTECTION:

.1 Contractor shall ensure that all workers who are required to wear a respirator in the course of their duties have been trained for this purpose as well as their respirator fit tests in accordance with the CSA standard. Z94.4 Selection, Care and Use of Respirators. Attestations of fit testing must be submitted to Departmental Representative upon request.

1.25 PREVENTION OF FALLS

.1 Plan and organize work to eliminate source of danger of falls and safety of all persons and reduce recourse to individual safety equipment to a minimum. When individual safety equipment is required, workers must use a safety harness in accordance with CAN - CSA- Z-259.10 - M90. Safety belt is not allowed as protection against falls.

.2 All persons using lifting platforms (extendable, articulated or rotating masts, etc.) must have relevent training.

.3 Safety harness is obligatory on all lifting platforms with extendable, articulated or rotating masts.

.4 Delineate a danger zone around each lifting lifting platform.

.5 All openings in floor or roof must have guard rail or be covered with cover attached to floor and able to withstand loads regardless of size of opening and height of fall it represents.

.6 All persons working less than two metres from an area with a risk of fall of three metres and more must use a safety harness in accordance with regulation requirements unless there is a guard rail or other equivalent means to ensure safety.

.7 In addition to regulation requirements, the Departmental Representative may require the installation of a guard rail or use of a safety harness in certain situations representing a risk of a fall under three metres.

1.26 SCAFFOLDING

.1 In addition to Construction Safety Code requirements, the Contractor must comply with the following when using scaffolding:

.1 Foundations

.1 Scaffolding must be installed on solid foundations to prevent slipping or tipping.

.2 Contractor must submit a load analysis and plans signed and sealed by an engineer to Departmental Representative to install scaffolding on a roof, overhangs, awning or mansard and obtain Departmental Representative’s authorization prior to beginning work.

.2 Assembly, bracing and anchors

.1 All scaffolding must be assembled, braced and anchored in accordance with manufacturer's instructions and provisions of the Construction Safety Code.

.2 Where scaffolding components must be removed (e.g., cross-ties), the Contractor must submit to the Departmental Representative prior to assembly a procedures signed and sealed by an engineer confirming that the scaffolding and assembly allow for work to be carried out safely in consideration of the loads.

.3 The Contractor must submit to the Departmental Representative prior to assembly an assembly plan signed and sealed by an engineer for scaffolding structures with spans exceeding three metres.

.3 Protection against falls during assembly

.1 At all times during assembly workers must be protected against falls higher than three metres.

.4 Floors

.1 Scaffolding platforms must be designed and installed in accordance with the provisions of the Construction Safety Code .

.2 Planks must be approved and and stamped in accordance with section 3.9.8. of the Construction Safety Code.

.3 Scaffolding with four or more sections (or six metres) must have full platform covering entire surface every three metres or fraction of three metres and floor elements must not be moved to create intermediate levels.

.5 Guard rails

.1 A guard rail must be installed at all levels.

.2 Bracing is not allowed as a substitute for guard rails.

.3 If floors are not full, guard rails must be installed adjacent to floor to ensure there is no space between floor and guard rail.

.4 Scaffolding with four section (or six metres) or more requiring full floors, guard rails must be installed at each level at the beginning of the work and remain in place until the end of the work.

.6 Access

.1 Contractor must ensure that access to scaffolding does not jeopardize the safety of workers.

.2 Scaffolding with planks require ladders to be installed clear of the planks.

.3 Notwithstanding the provisions of the Construction Safety Code, stairs must be installed on all scaffolding with six or more levels and six or more sections (or nine metres).

.7 Protection of public and occupants

.1 When scaffolding is installed in public areas, the Contractor must take measures to prevent access by the public to the scaffolding and, if applicable, work area or storage area in proximity to scaffolding.

.2 The Contractor must install covered passageways, nets and other measures to protect workers, the public and occupants from falling objects. Protection measures must be approved by Departmental Representative.

.8 Engineer plans

.1 In addition to requirements of the Construction Safety Code, the Departmental Representative reserves the right to require engineer plans for other types of scaffolding configurations.

.2 A plan signed and sealed by an engineer is required for scaffolding with tarps, screens and other wind protection devices.

.3 A compliance certificate signed by an engineer is required in all cases where an engineer plan is required prior to use. A copy of the documents must be available on site at all times.

1.27 ROOF WORK

.1 In addition to Construction Safety Code requirements, the Contractor must comply with the following when using scaffolding:

.1 Complete the form below and submit to Departmental Representative prior to start of excavation work.

.2 Submit the following documents to Departmental Representative:

.1 Plans and specifications, signed and sealed by an engineer, of shoring to be installed for the excavation work; or

.2 an engineer's opinion specifying slope of the walls of the trench or excavation.

CSST

Directive de creusage

N°_____de_____

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'engin de terrassement.

Nom de l'entreprise	
Nom du projet	N° du projet
Adresse du chantier	Date du début des travaux

Repérage

Chaînage ou axes : de _____ à _____ Plan annexé ☐ N° du plan : _____

Méthode de travail à utiliser

Tout en s'assurant que les parois ne présentent aucun danger de glissement de terrain,

- ☐ **creuser et étançonner** selon les plans et devis d'un ingénieur ;
- ☐ **creuser et étançonner** en utilisant une boîte de tranchée ;
- ☐ **creuser sans étançonner** pourvu que l'une des conditions suivantes soit respectée :
  - ☐ le roc est sain ;
  - ☐ aucun travailleur ne descend dans la tranchée ou l'excavation ;
  - ☐ les parois sont creusées conformément à l'avis d'un ingénieur.

Dimensions du creusement (Creuser selon le profil suivant.)

	Minimale	Maximale
H Profondeur		
Lf Largeur au fond		
Ls Largeur en surface		

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.

- ☐ Respecter le plan de l'ingénieur concernant les travaux à proximité d'une construction existante.
- ☐ Suivre le plan de localisation pour repérer les infrastructures souterraines.
- ☐ Installer le matériel de signalisation prévu par le plan de circulation (barrières, repères visuels, etc.).
- ☐ Affecter un ou des signaleurs au contrôle de la circulation.
- ☐ Respecter la méthode prévue pour le travail à proximité des lignes électriques.
- ☐ Mettre en place les dispositifs de protection des travailleurs, par exemple les glissières de sécurité en béton.

Nom	Fonction	
Signature	Date	N° de téléphone

Directive remise

☐ au responsable des travaux sur le terrain ☐ à l'opérateur de l'engin de terrassement

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1.28 LIFTIING WITH HOISTS OR CRANES

.1 Unless indicated otherwise, the Contractor must prepare a lifing plan and submit to Departmental Representative for all lifiting procedures using a hoist or crane within five (5) days of beginning of operations. The lifting plan must contain the information listed in this section

.2 The lifting plan must be signed and sealed by an engineer for the following lifting operations:

- .1 Llifting concrete panels.
- .2 Lifting mechanical/electrical equipment onto a roof or floors of a building.
- .3 Lifting loads over public areas.
- .4 Lifting large size or heavy loads.
- .5 All lifting operations as required by Departmental Representative.

.3 In addition to the requirements above, the Contractor must plan lifting operations to avoid loads passing over occupied areas on the site Where impossible to do otherwise, the lifting plan must be signed and sealed by an Engineer and guarantee the safety of occupants of the zone; the plan must be approved by the Departmental Representative. The Departmental Representative may if deemed necessary require work to be done evenings and and weekends.

.4 As soon as work starts, the Contractor must submit to Departmental Representative the list of lifting plans for the entire construction work period. The list must be kept up to date if changes are made during the work.

.5 In addition to the mechanical inspection certificate, all cranes and hoists have the annual inspection certificate on board and the crane log.

.6 Lifting zone must be barred off to prevent access by unauthorized persons.

.7 The Contractor must carefully inspect all lifting accessories and straps and dispose of damaged items.

.8 Compressed gas tanks must be lifted with a specially designed basket.

.9 MINIMUM REQUIREMENTS OF LIFTING PLAN

- .1 Sketch indicating crane location, surrounding installations, zone affected by lifting operations, traffic areas, safety perimeter, etc.
- .2 Weight of loads.
- .3 Size of loads.
- .4 List of lifting accessories and weight of each.
- .5 Total weight lifted.
- .6 Maximum height of obstacles.
- .7 Clearance of loads above roof (when lifting materials onto roof).
- .8 Use of guide wires.
- .9 Type of crane.
- .10 Capacity of crane.
- .11 Boom length.
- .12 Boom angle.
- .13 Radius of boom.
- .14 Deployment of stabilizers.

.15 Percentage of crane capacity used.

.16 Confirmation that lifting equipment has been inspected.

.17 Identification of crane operator with signatures and date

1.29 SUBORDINATION AGREEMENT

Project: _____ Address: _____

EXTERNAL CONTRACTOR

I hereby agreement to submit to the authority of (name of General Contractor) _____, who is the General Contractor for the project indicated above for the duration of our work on the construction site. Accordingly, I confrm having read the General Contractor's prevention plan and agree to:

- Inform my employees about the content of the General Contractor's prevention program and comply with its content at all times;
- Provide the prevention program specific to our activities for this project;
- Inform the General Contractor of my work on the construction site and obtain his consent prior to beginning work.
- Follow health and safety guidelines given by the General Contractor’s representative on site and as needed assist with training activities and health and safety meetings they organize.

Name of representative: _____

Name of company: _____

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

Approximate dates of work (start-finish): _____

Signature: _____ Date: _____

GENERAL CONTRACTOR

I hereby agree to allow the company (name of external contractor) _____ to perform work for the project indicated above and as General Contractor to take the necessary measures to protect the health and safety of the workers on site. In the event that the Contractor repeatedly refuses or fails to comply with my instructions I agree to inform the Departmental Representative and provide documented proof of my actions.

Name of representative: _____

Name of General Contractor's company: _____

Signature: _____ Date: _____

Give completed and signed copy to Departmental Representative.

PART 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 This section covers all of the activities involved in carrying out the project. As such, all of the sections in the specifications are linked to this section.

1.2 DESCRIPTION

.1 This section details the environmental requirements for the project. The Contractor must obey these requirements at all times during the work described in this specifications document.

.2 Other sections may also include environmental protection requirements. Schedule B (Environmental Monitoring Sheet) lists the mitigation measures that must be met along with the elements of these specifications. These specific requirements are therefore supplementary to the requirements described in this section. Should two elements contradict each other, the more restrictive element takes precedence.

1.3 REFERENCES

.1 Government of Canada:

.1 *Canadian Environmental Protection Act, 1999.*

.2 *Transportation of Dangerous Goods Act, 1992.*

.3 *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.*

.4 *Transportation of Dangerous Goods Regulations.*

.5 Documentation from the Canadian Council of Ministers of the Environment (CCME).

.6 Any other legislation, regulations, or guidelines relevant to the project.

.7 Greening Government Strategy.

.2 Government of Québec:

.1 *Guide de caractérisation des terrains*, MELCC, 2003, 130 pages.

.2 Sampling Guide for Environmental Analysis, Booklet 1 – General (Centre d'expertise en analyse environnementale du Québec – CEAEQ, 2008); Booklet 3 – Sampling of Groundwater (CEAEQ, 2012); Booklet 5 – Soil Sampling (CEAEQ, 2010); and Booklet 8 – Sampling of Hazardous Materials (CEAEQ, 2008).

.3 *Environment Quality Act* (CQLR, c. Q-2).

.4 *Regulation respecting the traceability of excavated contaminated soil.*

.5 *Regulation respecting the burial of contaminated soils* (CQLR, c. Q-2, r. 18).

.6 *Regulation respecting contaminated soil storage and contaminated soil transfer stations* (CQLR, c. Q-2, r. 46).

.7 *Petroleum Products Regulation* (*Petroleum Products Act*, c. P-30.01, ss. 5 and 96).

.8 *Regulation respecting the landfilling and incineration of residual materials* (CQLR, c. Q-2, r. 19).

.9 *Regulation respecting hazardous materials* (CQLR, c. Q-2, r. 32).

.10 *Transportation of Dangerous Substances Regulation* (CQLR, c. C-24.2, r. 43, *Highway Safety Code*).

.11 *Land Protection and Rehabilitation Regulation* (CQLR, c. Q-2, r. 37).

.12 *Regulation to amend the Land Protection and Rehabilitation Regulation*, effective August 8, 2019.

.13 *Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés* (*Guide d'intervention*) (MELCC, 2021).

.14 *Regulation respecting the reclamation of residual materials* (RRRM) (CQLR, c. Q-2, r. 49).

.15 *Regulation respecting the regulatory scheme applying to activities on the basis of their environmental impact* (CQLR, c. Q-2, r. 17.1).

.16 Applicable standards for the discharge of water into surface waters and/or sewers.

.17 Any other legislation, regulations, or guidelines relevant to the project.

.18 The Contractor is responsible for compliance with all federal, provincial, and municipal environmental protection legislation that applies to the work area (including any areas outside of the Place George V site where it is doing work associated with this rehabilitation).

.19 *Clean Air Regulation.*

.3 Bureau de normalisation du Québec:

.1 BNQ 2410-300, Products Used as Dust Control Agents for Non-Asphalted Roads and Other Similar Surfaces.

.4 Ministère des Transports du Québec:

.1 *Ouvrages routiers, Normes,* Tome II – Construction routière (includes all of the Ministère des Transports du Québec's standards).

1.4 DEFINITIONS

.1 Pollution and environmental damage: Presence of physical, chemical, or biological agents or elements that are harmful to the health and well-being of humans; that affect ecological balances that are important to humans; that affect species that are important to humans; or that degrade the aesthetic, cultural, or historical characteristics of the environment.

.2 Environmental protection: Prevention and/or control of pollution and disturbances to habitats and the environment during construction.

1.5 ENVIRONMENTAL PROTECTION PLAN

.1 The required documents and samples must be submitted in accordance with section 01 33 00 – Submittal Procedures.

.2 The Contractor must oversee the environmental management of the work and ensure its compliance with all applicable laws, regulations, and policies.

.3 At least 15 working days before construction begins or materials and equipment are delivered to the site, the Contractor must submit an environmental protection plan to the Departmental Representative for review and approval.

.1 The plan should provide a comprehensive overview of known or potential environmental issues to be addressed during construction.

.2 The actions described in the environmental protection plan must provide sufficient detail considering the restoration work to be done and the environmental problems that may arise.

.3 Work cannot begin until the plan has been accepted by the Departmental Representative.

.4 The environmental protection plan must include the following:

.1 The names of the people responsible for ensuring compliance with the plan;

.2 The names and qualifications of the people responsible for the cargo manifests for the soil, residual materials, etc. to be removed from the site;

.3 The names and qualifications of the people responsible for training site personnel;

.4 A description of the training program for the environmental protection personnel;

.5 An erosion and sediment control plan indicating the measures that will be implemented, including monitoring and reporting to verify compliance with federal, provincial, and municipal laws and regulations;

.6 Drawings showing the location of temporary excavations or roads, as well as any materials, structures, sanitary facilities, and surplus or soiled material deposits; drawings illustrating the methods that will be used to control runoff and keep soil and/or materials on the site;

.7 Traffic control plans, including measures to reduce the erosion of temporary roadbeds by construction vehicle traffic, especially during wet weather;

.1 These plans should include measures to prevent materials from being carried along public roads by vehicles or water runoff.

.2 The Contractor must ensure that vehicle movements associated with the site do not prevent vehicles from moving on adjacent properties.

.3 Local traffic will have to be safely maintained at all times.

.8 A plan of the work area, showing the activities planned in each part of the work area and identifying restricted and prohibited areas;

.1 This map must include ways to indicate the boundaries of usable areas, as well as protective measures for elements that are located inside authorized work areas but require protection.

.9 A spill response plan that includes the procedures to be implemented under section 1.16 of these specifications, as well as the instructions to be followed and reports to be made in the event of an unforeseen spill of a regulated substance;

.10 A disposal plan for non-hazardous residual materials that includes methods and locations for disposing of the residual material and excavation debris;

.11 An air pollution prevention plan that includes measures to contain dust, debris, materials, and waste within the site (see 1.10);

.12 A contamination prevention plan that identifies any potentially hazardous substances to be used on the site, the measures that will be taken to prevent these substances from becoming airborne or entering the soil, and details of the measures that will be taken to ensure that the storage and handling of these substances comply with federal, provincial, and municipal laws and regulations;

.13 A wastewater management plan that describes the methods and procedures for managing and disposing of wastewater directly from construction activities, such as the water used for concrete curing, washing/cleaning, drawdown, disinfection, and pipe flushing.

.5 All work must be managed in accordance with the Greening Government Strategy, which requires at least 90% (by weight) of all construction and demolition waste to be diverted from landfills, and this diversion to be tracked and reported.

.6 A contaminated soil management plan must be incorporated into the general environmental management plan, as described in section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

1.6 WATER AND EROSION MANAGEMENT

.1 Contractor's responsibilities

.1 The Contractor is responsible for managing the wastewater created during its work; this includes water from excavated soil (supernatants, water from washing the clamshell if applicable), transport, storage, the dewatering and treatment of excavated materials, or any other construction activities.

.2 The Contractor is responsible for executing, coordinating, monitoring, and completing the erosion and sediment control plan in accordance with this section and in compliance with applicable codes, laws, and regulations.

.3 The Contractor is responsible for all costs incurred for managing erosion control in accordance with the erosion and sediment control plan in this section.

.4 The Contractor and all subcontractors are subject to the erosion and sediment control plan.

.5 A sediment barrier is to be installed along the boundaries of the conservation areas. It must remain for the entire duration of the planned earthworks until the bare ground upwind has been revegetated.

.2 Documents to submit

.1 The Contractor must submit the following documents to the Departmental Representative for approval in the following order:

.1 Ten (10) working days before work begins on the site:

1. General environmental protection plan
2. Erosion and sediment control plan
3. List of control measures
4. Specific layout plan
5. Schedule

.2 Weekly, while work is ongoing, and upon request:

1. Inspection reports
2. Inspection photos

.2 The Contractor will also need to resubmit the aforementioned documents when site conditions change how the erosion and sediment control plan applies.

.3 At the Departmental Representative's request, the Contractor must be able to prove that their effluent meets the applicable standards or criteria.

.1 Results must be reported and available to the Departmental Representative at all times.

.3 Quality assurance

.1 At the project start-up meeting, the Contractor must identify the person under its authority who is responsible for preparing, executing, communicating, and coordinating the erosion and sediment control plan and following up on the documentation to be submitted.

.2 The Contractor and the person responsible for the control plan will need to meet with the Departmental Representative to review the following:

.1 The erosion and sediment control plan (general review)

.2 The Contractor's proposed schedule, control measures, and specific layout plan

.3 The content of the inspection reports

.4 The documentation to submit

.4 Erosion and sediment control plan

.1 The erosion and sediment control plan applies to all work done under the supervision of the Contractor and any other entity for which it is responsible.

.2 The Contractor must prepare an erosion and sediment control plan based on the following:

.1 List of control measures

.2 Specific layout plan

.3 Schedule

.4 Inspection report

.5 List of control measures

.1 The Contractor must prepare and complete a full list of the minimum erosion and sediment control measures to be incorporated into the project.

.2 If any of the minimum erosion and sediment control measures are not implemented, the Contractor will need to demonstrate that the measure in question does not apply to the project.

.3 Any measures added to the erosion and sediment control plan will also need to be added to the list of control measures. The Contractor will also need to include a reference number and detail the installation techniques, materials, and dimensions needed to properly apply the additional control measures.

.4 In addition, the Contractor must include the activity associated with the measure (e.g. excavation) and take the necessary steps to ensure the measures remain effective.

.6 Specific layout plan

.1 The Contractor must prepare a specific layout plan that accounts for each phase of the project and uses multiple plans to provide all information relevant to erosion and sediment control.

.2 The specific layout plan must include the name of the project, the date, the Contractor's name, and the following elements (if applicable):

.1 The direction of runoff and anticipated slopes during and after grading

.2 Where runoff will collect during work

.3 Which areas will be disturbed and left undisturbed during work

.4 Where excavation will be done

.5 Potential sources of runoff pollution during work

.6 The control measures to be implemented (with reference to the list of control measures)

.7 Where excavated soil will be stored

.8 Where materials will be stored off-site (if applicable)

.9 Where materials will be delivered and unloaded

.10 Where vehicles will be travelling

.11 Where tools and machinery will be cleaned

.7 The Contractor must keep the excavations dry.

.8 The Contractor must provide, operate, and maintain appropriate equipment with enough capacity or flow to keep excavations and other work areas free of water.

.9 Contaminated water, runoff, or groundwater that may have been in contact with potentially contaminated soils or materials cannot be discharged off-site or into the municipal sewer system.

.10 Runoff that has not been in contact with potentially contaminated soils or materials may be discharged into existing surface drainage systems.

.11 Precipitation must be prevented from infiltrating stored materials and soils or running out of the storage area. To that end, soils and stockpiled materials must be covered with an impermeable membrane during work stoppages and at the end of each workday, as directed by the Departmental Representative.

.12 Surface drainage must be monitored; this includes ensuring that water does not run off-site, but instead runs through approved pipes or properly constructed trenches and gutters, and that runoff from unstabilized areas is intercepted and directed to an appropriate structure.

.13 The temporary structures for controlling erosion and pollution that have been installed as part of this contract must be maintained.

.14 Water must be disposed of in a way that does not endanger human health and safety or compromise the integrity of the properties or any complete or incomplete structures.

.15 The Contractor must take all necessary precautions (e.g. by building ditches, gutters, etc.) to prevent runoff water from coming into contact with excavated materials at the temporary storage site. Potentially contaminated surface water must be transferred to separate storage tanks, if necessary.

.16 The Contractor must have suitable pumping equipment of sufficient capacity, as well as the associated tanks and machinery, available and in good working order to deal with emergencies, including power failures. Furthermore, it must employ workers who are able to operate the pumping equipment.

.17 All heavy vehicles (including concrete mixers) and excavation machinery must be cleaned by the Contractor before using public roads. To that end, a tire washing station, equipped with granular materials, must be provided. In addition, public roads must be cleaned regularly with a mechanical sweeper.

.18 Water from the drinking water system cannot be used for washing unless previously authorized by the Departmental Representative. Where possible, it should be drawn from the sedimentation basins. Furthermore, the Contractor is responsible for managing and disposing of water from the washing area in accordance with the provincial and municipal regulations in effect.

1.7 SITE CLEARING AND PLANT/TREE PROTECTION

.1 Plants and trees on the site and on adjacent properties must be protected.

.2 The removal of topsoil and vegetation in unexcavated areas must be kept to a minimum.

1.8 PREVENTION OF SOIL AND WATER POLLUTION

.1 The Contractor is responsible for pollution prevention measures while work is ongoing. It must:

.1 Take the necessary precautions to ensure that potentially hazardous substances do not become airborne or introduced into the soil, groundwater, or surface water;

.2 Ensure that the storage and handling of potentially hazardous substances comply with all applicable federal, provincial, and municipal laws and regulations;

.3 Take the necessary precautions to prevent chemical leaks or spills;

.4 Before work begins, identify an area for maintaining machinery and storing and handling hazardous materials;

.5 Place the drums or containers for hydrocarbons and other hazardous materials in a container or between impermeable berms that can hold 150% of the maximum amount that may be stored;

.6 Carefully monitor any handling (including transfilling) of fuel, oil, oil products, or contaminants in order to prevent accidental spills;

.7 Be prepared to contain, clean up, and dispose of spills or discharges that may occur on the surface of the land or the water. To that end, it must keep the equipment, materials, and supplies needed to clean up these spills or discharges on-site and readily available.

.2 All equipment and machinery must be free from leaks and be in excellent working condition. An inspection report certifying their condition must be submitted before they can be used on-site. Leaking equipment must be taken out of service immediately. The leak must be contained as quickly as possible and the equipment must be repaired to eliminate the leak as soon as possible. If this condition is not met, the Departmental Representative may require the Contractor to remove the equipment in question from the site.

.1 Machinery and truck engines must be kept in perfect working order. Equipment must be checked for contaminant leaks every day, and if a leak is found it must be repaired immediately.

.2 Mechanical maintenance must be performed on an impermeable surface.

.3 Motor vehicle traffic and parking must be restricted to authorized lanes and work areas.

.4 Structures and measures (geomembranes/concrete/asphalt; collection, confinement, and treatment systems, if necessary, for runoff and leachate) must be installed and implemented in the storage and handling areas for contaminated materials (debris, hazardous residual materials, contaminated water, etc.) in order to prevent contaminants from entering the soil, surface water, or underlying groundwater.

.5 Temporary road surfaces must be properly maintained to prevent soil (contaminated or not) from washing out onto adjacent roads.

.1 Temporary work areas must be reprofiled to create a stable surface ahead of revegetation.

.6 During construction, reworked surfaces must be quickly stabilized to prevent fine materials from eroding. An erosion control blanket should be placed over steep slopes for this purpose.

.7 The Contractor must maintain the temporary structures for controlling erosion and pollution that have been installed as part of this contract.

.8 Dry material must be dampened and waste covered to prevent the wind from blowing dust or debris. Dust must be cleared from temporary paths.

.9 The work area and surrounding areas must be regularly inspected for waste and significant dust; if waste or dust are found, they must be managed appropriately.

.10 The traffic lanes around the construction site must be cleaned as and when they are dirtied by subcontractors' activity.

1.9 DRAINAGE

.1 An erosion and sediment control plan must be developed. It must indicate the measures to be implemented, including monitoring and reporting to verify their compliance with federal, provincial, and municipal laws and regulations.

.2 A stormwater pollution prevention plan may replace the erosion and sediment control plan.

.3 The plan must include temporary drainage and pumping measures that allow the site and excavations to be kept dry.

.4 Water pumped into a watercourse, sewer system, or drainage system cannot contain suspended solids.

.5 Water containing suspended solids or harmful substances must be disposed of according to the requirements of local authorities.

1.10 PREVENTION OF ATMOSPHERIC POLLUTION

.1 Fires and the burning of waste on the construction site are prohibited.

.2 Emissions from equipment and machinery must be controlled in accordance with the requirements of local authorities. The engines of gasoline-powered vehicles and equipment must be turned off when not in use, if possible.

.3 Dry, uncontaminated material must be dampened and waste must be covered to prevent the wind from blowing dust or debris.

.4 Sealed or standard dump trucks (as required) must be covered with a tarpaulin to limit the dispersion of fine particles in the air.

.5 Vehicles must obey the standard speed limits.

.6 Machinery must travel along dedicated paths within the site and be prevented from leaving the zone where it is being operated.

.7 Speed and weight limits must be obeyed in order to protect public roads and minimize dust and noise.

.8 Water is the preferred dust suppressant, especially on coated surfaces. If another dust suppressant is used, it must comply with standard BNQ 2410-300.

.9 The roads and docks/ramps used must be cleaned as needed.

1.11 PREVENTION OF NOISE POLLUTION

.1 Work must be done between 7:00 AM and 5:00 PM.

.2 Stationary equipment (generators, compressors, etc.) must be placed as far away from noise-sensitive areas (residential areas) as possible.

.3 If jackhammers are to be used, they must be equipped with noise suppressors (silencer supplied by the manufacturer or acoustic enclosure).

.4 The rear panels of dump trucks must be prevented from clanking or slamming during dumping.

.5 Equipment must be equipped with a white noise alarm 5 dBA louder than ambient noise and/or a strobe light.

1.12 MANAGEMENT AND REDUCTION OF HAZARDOUS AND NON-HAZARDOUS RESIDUAL MATERIALS

.1 All materials to be removed from the site become the property of the Contractor.

.2 It is prohibited to bury waste, scrap, and materials on the site.

.3 Every day, the residual materials generated must be collected, sorted, and stored into one of three categories: recoverable residual materials; residual materials or residual granular materials to be eliminated under the *Regulation respecting the landfilling and incineration of residual materials*; or hazardous residual materials within the meaning of the *Regulation respecting hazardous materials* in effect.

.4 Measures must be implemented to reduce residual materials and encourage the reuse, recycling, and repurposing of materials based on the 5 R's.

.5 All residual materials, debris, and scraps that have come into contact with contaminated soil or other contaminants (such as stones polluted by heavy oil product spills) must be cleaned in an impermeable area. If applicable, the water used for cleaning must also be collected and managed according to applicable regulations and the work authorizations issued.

.6 Residual materials, debris, and scrap must be stored in covered airtight containers or on an impermeable surface, covered in an impermeable tarpaulin until they can be eliminated, according to the Departmental Representative's instructions.

.7 The Departmental Representative must be provided with copies of the transport sheets/manifests and weight tickets for the elimination of residual and reclaimed/recycled materials.

1.13 DISPOSAL OF SOILS AND RESIDUAL MATERIALS

.1 Disposal of contaminated soils

.1 The Contractor must pile any potentially contaminated excavated material on impermeable geomembranes before disposal, making sure that different types of materials mix as little as possible. It must then await the Departmental Representative's instructions as to the material's final destination. The Departmental Representative may take up to five (5) working days to issue instructions to the Contractor. During this period, the Owner will take a soil sample for analysis at an approved laboratory.

.2 The Contractor must account for the pre-disposal analysis when developing its schedule.

.3 Contaminated soils must be disposed of at a licensed site. The Contractor is responsible for finding a site and making arrangements for the disposal of materials.

.4 Materials should be disposed of at the appropriate site for their level of contamination.

.5 The quantities payable in metric tons to the Contractor will be established using the material receipts from each contaminated material disposal site.

.2 Disposal of residual materials

.1 All residual materials, as defined in the *Regulation respecting the landfilling and incineration of residual materials* of the *Environment Quality Act*, must be disposed of in accordance with said regulation.

.3 Disposal of dry materials

.1 The definition of “dry materials” is that of the *Regulation respecting the landfilling and incineration of residual materials* of the *Environment Quality Act*.

.2 The disposal of dry materials must be agreed upon with the MELCC’s representative and comply with the directives on the interpretation of the aforementioned regulation.

.4 Disposal of excess soil

.1 All storage and disposal sites for excavated material (excess soil, stumps, trees, shrubs, but not waste) to be used for the execution of this contract must be approved in advance by the MELCC’s representative by the first site meeting at the latest. These materials cannot be disposed of without this approval.

.2 The planned disposal sites must comply with municipal regulations. All disposal sites for excess soil must be graded and revegetated to the satisfaction of the MELCC’s representative.

1.14 PROTECTION OF INFRASTRUCTURE

.1 The Contractor must locate all public and private above- and underground utilities before beginning any excavation work. Refer to item 2.3 of section 01 35 13.43 – Special Project Procedures for Contaminated Sites.

.2 If the Contractor plans to use land outside of the work area, it must provide the Departmental Representative with a copy of the agreement it signed with the Landowner. All applicable measures in the specifications, as well as all applicable regulations, must be carefully followed.

.1 Upon completion of the work, a copy of the Landowner’s release must be provided to the Departmental Representative.

.3 Once the Contractor completes its work and removes its infrastructure from the sites used, it must restore the sites in question.

.1 If the environmental condition is found to have deteriorated due to the Contractor’s activities (if contamination levels have increased for a given substance), the Contractor must rehabilitate the site(s) in question, at its own expense and in compliance with the regulations in effect and the agreements made with the Landowner.

.4 Before work begins, the Contractor, in conjunction with the Departmental Representative, must take photographs and a video of Place George V, Grande-Allée East, Wilfrid-Laurier Avenue, and George V West and East Streets. Once work ends, the Contractor must return the public roads to a state that is at least equal to their initial state as soon as possible. The photographs and video will serve as a reference for the original condition of the streets.

1.15 PRESERVATION OF HISTORICAL/ARCHAEOLOGICAL CHARACTER

.1 Specific conditions

.1 The Voltigeurs de Québec Drill Hall National Historic Site of Canada has been recognized by the Canadian government as a site with the highest heritage value. For this reason, all excavation on soil that has been deemed to potentially contain remains must be monitored by an archaeologist, who will be assigned by the Departmental Representative.

As such, this section applies to all excavation needed to build infrastructures.

.2 Archaeological monitoring

.1 An archaeological survey was performed on Place George V ahead of the Contractor's work. The archaeologist or their representative will be present at all times during excavation. For areas deemed to require sporadic monitoring, the archaeologist and their representative will be available on call to handle discoveries reported by the Contractor. In the event of an accidental discovery, the archaeologist and their representative will go to the site to evaluate and record the cultural resources within 36 hours of being notified by the Departmental Representative.

.3 Access and collaboration

.1 The Contractor must cooperate and comply with all of the Departmental Representative's instructions during excavation to prevent any archaeological information on the site from being lost. The Contractor must cooperate with the archaeologist and facilitate their access to the site.

.2 The Contractor must allow the archaeological team to examine, survey, and record the archaeological remains.

.4 Archaeological discoveries

.1 For areas that do not require continuous monitoring, the Contractor must notify the Departmental Representative of any archaeological findings (remains of buildings or structures, objects, and fragments of objects) discovered on the site during excavation work and await written instruction before continuing work at the site of the find.

.2 Remains, antiquities, and other items of historical, archaeological, or scientific interest (remains, objects, or fragments) found on the work site or in the areas to be excavated or demolished will remain the property of Canada. The Contractor will be required to protect them and seek instructions from the Departmental Representative.

.5 Work stoppages

.1 The Contractor must include in its contract, at its own expense, one five (5) minute stoppage per hour of excavation of existing soils. These stoppages, if not used, will be accumulated and can be reused later as needed. A record of all unused time will be kept by the Departmental Representative in agreement with the Contractor and the archaeologist.

.2 For stoppages of more than 30 minutes, the Departmental Representative will assess the implications of the stoppage and inform the Contractor of those implications. The Contractor may need to move machinery to allow the archaeologists to work. If the machinery cannot be moved, the Contractor will be repaid from the time bank. If no banked time is available, it will be repaid based on the agreements made during the first site meeting.

.6 Manual archaeological excavations

.1 Given the possibility of archaeological finds, the Contractor is advised that manual excavation, as well as additional work needed to protect the discoveries, may be required. The Contractor will be compensated based on the labour and rate schedule submitted by it and approved by the Departmental Representative.

.7 Protection of remains and structures

.1 The Contractor must take all reasonable precautions during excavations and all other work to protect any remains uncovered and allow them to be examined by archaeologists. The Departmental Representative will not tolerate any deviation from this requirement. If the Contractor negligently damages any of the remains, it will be held responsible and the impact will be determined by Canada.

.2 If the Departmental Representative authorizes the demolition of elements on the site, the Contractor must take the necessary precautions to protect adjacent structures that are not to be demolished. The elements in question must then be demolished gradually and carefully once the archaeological survey has been completed. If any structures are damaged during the course of the work, the Departmental Representative must be notified immediately.

1.16 PROCEDURES FOR ACCIDENTAL HYDROCARBON, HAZARDOUS MATERIAL, OR OTHER CONTAMINANT SPILLS

.1 In the event of a spill, the Contractor must initiate the following response and cleanup procedure:

.1 Make sure people are safe, stop the source of the spill, and immediately recover the spill.

.2 Immediately notify the Departmental Representative of the spill. Depending on the location, it must also notify:

.1 Environment Canada's emergency service (1-866-283-2333)

.2 Québec's Urgence-Environnement (1-866-694-5454)

.3 Emergency numbers must be clearly posted at all times in the site office (trailer).

.2 The Contractor must keep one emergency response kit on hand within 30 m of operations at each site. It must also have personnel who are trained to use the kit if an environmental emergency occurs.

.3 The Contractor's personnel must be trained on the necessary procedures and equipment.

.4 As soon as it is identified, any soil contaminated by petroleum hydrocarbon leaks or spills must be excavated, stored in leakproof containers, and disposed of at an MELCC-approved disposal site (http://www.environnement.gouv.qc.ca/sol/lieux/centres.pdf) in accordance with the management plans for hazardous materials and contaminated soils.

.1 Decontamination must return the soil to the criterion level identified during the pre-project characterization.

.5 Water contaminated by accidental spills must be contained for characterization or taken care of directly by a specialized company, in accordance with MELCC regulations and directives.

.6 Emergency response kit

.1 Once work begins, the Contractor must ensure that it has at least one emergency response kit on-site. This kit must contain products suitable for the site's specific characteristics and include, at a minimum:

.1 1 x barrel or 1 x airtight box to store the kit equipment

.2 10 x 430 cm^3 polypropylene absorbent mats

.3 200 x absorbent polypropylene sheets

.4 10 x absorbent polypropylene pads

.5 10 x net-wrapped socks that can attach to each other

.6 2 x 1 m^2 neoprene manhole covers

.7 5 x 10-litre bags of peat fibre, treated to absorb hydrocarbons

.8 10 x polyethylene bags, 6 mil thick and 205 litres in capacity, for storing contaminated absorbents

.9 A pool skimmer if there is a risk of spillage in the water

.7 Declaration and procedure

.1 The Contractor must immediately notify the Departmental Representative of any contaminant spills, regardless of size. Following an accidental spill, the Contractor must immediately take the following actions at its own expense:

.1 Secure the premises

.2 Control the leak

.3 Determine the extent of the spill

.4 Start the alert procedure

.5 Contain the contaminant

.6 Recover the contaminant

.7 Excavate contaminated soils, if necessary

.8 Manage the contaminated soils according to the "contaminated soils" clause

.9 Manage contaminated waste according to the "hazardous materials" clause

.10 Before backfilling the excavation, take soil samples to ensure that all contaminated material has been removed and submit the results of the analysis to the Departmental Representative

.11 Prepare a spill report and submit it to the Departmental Representative within 24 hours

.8 If the Contractor does not have the necessary expertise to effectively respond to a contaminant spill, it must mandate a specialist to do so at its own expense.

.9 If the Departmental Representative determines that the measures implemented by the Contractor are insufficient or inappropriate, they may take the matter out of the Contractor's hands as indicated in the Default of the Contractor section of the general administrative clauses.

1.17 ENVIRONMENTAL PROTECTION MEASURES – TRAFFIC AND EQUIPMENT

.1 Choice and maintenance of equipment

.1 To avoid creating ruts, the Contractor must choose suitable equipment for the ground type. If this guideline cannot be met for technical reasons, the Contractor must prepare a soil remediation plan for the work area and submit it to the Departmental Representative.

.2 The Contractor must maintain its equipment in perfect working order and be able to demonstrate this at the Departmental Representative's request. It must inspect its equipment daily to ensure that there are no leaking contaminants. If a leak is detected, the necessary repairs must be made immediately.

.3 Fuel, oil, and other contaminants must be handled (e.g. refuelling, transferring) more than 60 m from any body of water or other sensitive areas identified in the contract or designated by the Departmental Representative. A retention tank must be placed under the equipment during transfers.

.4 Stationary equipment that contains oil must be equipped with a leakproof recovery system if it is located within 60 m of water or other sensitive area. For the refuelling of small equipment, the Contractor must use steel fuel tanks (20 litres) equipped with a non-return valve.

.5 The Contractor must perform all maintenance on its equipment in a location where contaminants can be contained in the event of a spill. This location must have the appropriate response equipment on-site.

.6 The Contractor must supply its equipment with the necessary absorbents to respond effectively to accidental contaminant spills.

.7 If there is a risk of water contamination, the Contractor must store contaminants and materials containing hydrocarbons or other contaminants in leakproof containers.

.8 These containers must be stored together in a location that is organized and maintained in a way that allows emergency responders to access it at all times.

1.18 NOTICE OF NON-COMPLIANCE

.1 The Departmental Representative will issue a written notice of non-compliance to the Contractor whenever they observe an incident of non-compliance with a provincial, federal, or municipal law, regulation, or permit or any part of the Contractor's environmental protection plan.

.2 Upon receipt of a notice of non-compliance, the Contractor must propose corrective measures to the Departmental Representative and implement them with their approval.

.1 The Contractor must receive approval from the Departmental Representative before implementing any of the proposed measures.

.3 The Departmental Representative will issue a stop work order until satisfactory corrective action is taken.

.4 No additional time and no adjustment will be granted for the work stoppage.

PART 2 PRODUCT

2.1 NOT APPLICABLE

.1 Not applicable.

PART 3 EXECUTION

3.1 IMPLEMENTATION OF MITIGATION MEASURES

.1 The Departmental Representative will be required to certify the implementation of mitigation measures and prepare a daily environmental monitoring report.

.2 The Departmental Representative will also conduct full-time environmental monitoring of the project.

3.2 NOTICE OF NON-COMPLIANCE

.1 Cases of environmental non-compliance must be corrected as soon as the Contractor has detected them or the Departmental Representative has informed it verbally or in writing.

.2 The Departmental Representative will issue a written notice of non-compliance to the Contractor whenever they observe an incident of non-compliance with a provincial, federal, or municipal law, regulation, or permit or any part of the Contractor's environmental protection plan.

.3 Upon receipt of a notice of non-compliance, the Contractor must propose corrective measures to the Departmental Representative and implement them with their approval.

.1 The Contractor must receive approval from the Departmental Representative before implementing any of the proposed measures.

.4 The Departmental Representative will issue a stop work order until satisfactory corrective action is taken.

.5 No additional time and no adjustment will be granted for the work stoppage.

3.3 CLEANING

.1 The site and adjacent areas must be kept clean as required by local, provincial, and federal safety and fire prevention laws, ordinances, codes, and regulations.

.2 Cleaning must be coordinated with disposal operations in order to prevent dust, dirt, debris, waste, or garbage from accumulating.

.1 Any potentially contaminated facilities, equipment, and materials must be decontaminated before leaving the site.

.3 Once work ends, the materials constituting the temporary work area must be removed and the site must be restored.

END OF SECTION

PARTIE 1 GENERAL

1.1 CODES, STANDARDS, AND OTHER REFERENCE DOCUMENTS

.1 The work must be performed according the requirements of the National building code 2015, and other relevant provincial or local codes. In the event of a discrepancy between the requirements of the various documents, the more stringent shall prevail.

.2 The work must meet or exceed the requirements of the following documents:

.1 Contract documents

.2 Prescribed standards, codes, and other reference materials

1.2 DISCOVERY OF HAZARDOUS MATERIALS

.1 If hazardous materials are discovered during excavation or other work, the work must be stopped immediately and the Departmental Representative must be notified.

1.3 SMOKE-FREE ENVIRONMENT

.1 Smoking restrictions as well as municipal by-laws must be obeyed.

PARTIE 2 PRODUCTS

2.1 NOT APPLICABLE

.1 Not applicable

PARTIE 3 EXECUTION

3.1 NOT APPLICABLE

.1 Not applicable

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Not Used.

1.2 REFERENCES

.1 Not Used.

1.3 EXAMINATION

.1 Allow 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 Departmental Representative instructions, or law of 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 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 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

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 appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can 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 result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by 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 opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.8 REPORTS

.1 Submit 2 prints and one electronic copy of inspection and test reports to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

1.9 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by 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 as specified in specific Section.

.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, Departmental Representative will assist in preparing schedule fixing dates for preparation.

.6 Remove mock-up at conclusion of Work or when acceptable to 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 requested and required of specification Sections.

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 11 01 - General Information.

.2 Section 01 33 00 - Submittal Procedures.

.3 Section 01 35 43 - Environmental Protection.

.4 Section 01 56 00 - Temporary Barriers and Enclosures.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-A23.1/A23.2-F04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA O121-FM1998 (C2003), Douglas Fir Plywood.

.3 CAN/CSA-S269.2-16.

.2 Ministère des Transports du Québec.

.1 Cahier de normalisation Tomes Signalisation routière, most recent edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 INSTALLATION AND REMOVAL

.1 Refer to construction site enclosure plan.

.2 Prior to beginning Work, prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area, location of construction sign and details of fence installation.

.3 Specify site accesses on Rue Wilfrid-Laurier.

.4 Identify areas which have to be gravelled to prevent tracking of mud.

.5 Indicate use of supplemental or other staging area.

.6 Provide construction facilities in order to execute work expeditiously.

.7 Remove from site all such work after use.

.8 Restore site to preconstruction state, remove crushed stone infrastructure, spread topsoil and seed as indicated on plan.

1.5 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

.2 Restore site to preconstruction state, remove crushed stone infrastructure, spread topsoil and seed as indicated on plan.

1.6 HOISTING

.1 Provide, operate and maintain hoists [cranes] required for moving of workers, materials and equipment.

.2 Hoists, cranes and lifts to be operated by qualified operator.

1.7 SITE STORAGE/LOADING

.1 Provide outdoor storage plan for materials including granular, stones, gabions, conduits and other and have approved by Departmental Representative.

.2 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.3 Do not load or permit to load any part of Work with weight or force that will endanger Work.

.4 Storage of materials and machinery is prohibited in proximity to Ville de Quebec's water main. Mark on the ground and ensure compliance of loads in proximity to Ville de Quebec's water main throughout work period with CL-625 of CSA S6 : 19 standard. The Contractor must submit calculations to the departmental representative and demonstrate, beyond any doubt, that the machinery loads are compliant. Calculations must respect chapter 7 of CSA S6:19 standard. Mitigation measures should be put in place, if necessary.

1.8 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of Work.

.2 Provide and maintain adequate access to project site.

.3 Provide access signs in accordance with Ministère des Transports du Québec requirements.

.4 Clean runways and taxi areas where used by Contractor's equipment.

1.9 SECURITY

.1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

1.10 OFFICES

.1 Provide office to accommodate site meetings and coordination, and surveillance personnel.

.1 Contractor must comply with all relevant ordinances and regulations regarding site office to provide its workers with a place to eat.

.2 Provide marked and fully stocked first-aid case in readily available location. Contents of kit must comply with the Minimum Standards of First Aid and First Aid Regulations.

.3 Contractor must complete the trailer connection form and allow two weeks for the trailers to be connected.

.4 Departmental Representative will provide, free of charge, the electrical power supply for connection of the site office.

.5 Location of the site office during the work will be discussed at the start of the work.

.6 Departmental Representative must determine supply points and quantity limits. Written authorization from Departmental Representative is required before any

connection is made. Connect to existing power supply in accordance with Canadian Electrical Code and provide meters and switching.

.7 Contractor must supply and install all equipment (pole also if required) required for site office connection to pole with medium voltage (25 kV) electrical system.

.8 Where site electricity mast has a meter socket and there is no meter installed, install an approved cover to cover opening.

.9 Install a complete grounding system for the site office electrical panel.

.10 Once trailer is in place, confirm in writing that installation of the trailer at the site is compliant.

.11 Temporary services provided by Departmental Representative will be subject to needs of Departmental Representative and may be discontinued without notice at any time by Departmental Representative. Departmental Representative is not liable for any damage or delay caused by the interruption of such services.

.2 Departmental Representative's site office:

.1 Locker must be identified for exclusive use of Departmental Representative.

.2 Insulate building and provide heating system to maintain 22 degrees C inside temperature at -20 degrees C outside temperature.

.3 Furnish office with a drawing table with two lockable drawers and a stool, a desk with lockable drawers, three chairs, two clothes lockers, a chemical or flush toilet, a refrigerator, a microwave and a sink with hot and cold running water.

.4 Site office must be functional before work begins, i.e. water, electricity, heating and telephone must be installed. Guard rails must remain in place until the end of the project.

1.11 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.12 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.13 CONSTRUCTION SIGNAGE

.1 Provide and erect project sign, within three weeks of signing Contract, in a location designated by Departmental Representative.

.2 Locate project identification sign as follows:

.1 Erect framework, and attach signboard to framing.

.2 The frame consists of three posts and the supporting framework, grade 1 or 2 SPF timber, bleached on all four sides, size 140 x 140mm.

.3 The plywood panel is made of sandblasted B.C.F., size 2438 x 1219 x 19 mm, suitable for outdoor use.

.4 The minimum mounting height of the sign is 1,200mm.

.5 The sign may be fixed in the ground or self-supporting.

.6 Apply the vinyl film provided by Departmental Representative using tools and instructions provided with the film upon delivery.

.7 Once the sign is in place, coat supports with black exterior primer.

.8 Upon completion of the work, dismantle sign and dispose as directed by Departmental Representative.

.3 Ensure maintenance of sign.

.4 No other signs or advertisements, other than warning signs, are permitted on site.

1.14 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs.

.2 Protect travelling public from damage to person and property.

.3 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

.4 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

.5 Construct access and haul roads necessary.

.6 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.

.7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

.8 Dust control: adequate to ensure safe operation at all times.

.9 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.

.10 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.

.11 Provide snow removal during period of Work.

.12 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.15 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material not in construction facilities.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways. These means must be in accordance with the site-specific erosion and sediment control plan.

.2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 11 01 – General Information.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB).

.1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 CAN/CGSB 1.18900, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)

.1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

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 and datasheet Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings indicating location of the fence and access if different from the plan..

.4 Samples:

.1 Submit 1.0 m x 1.0 m sample to Departmental Representative for approval prior to printing.

1.4 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

.3 Dismantle fences to allow access to the site and put them back in place at the end of the work.

.4 Remove all signage, lampposts and furniture obstructing access to the site. Store in safe place and protect until it is put back in place at the end of the work.

1.5 SITE ENCLOSURE

.1 Provide and maintain a secure, rigid and continuous fence around the construction site as specified in the Contract Documents.

.2 Erect temporary fencing around the construction site consisting of modular elements; construction fence panels of galvanized steel mesh. Modular panels: 2,428 mm high, 16 gauge galvanized steel tubular sections and 6 gauge galvanized steel mesh welded to tubular sections. Erect fence on level surface, supported by concrete block footings.

.3 Maintain fence in good condition and of uniform colour.

.4 Provide two lockable truck entrance gates and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Keep lockable entrance doors clear to allow traffic flow. Parking near construction site is prohibited. Provide a copy of keys to Departmental Representative.

.5 Set construction fences back from vehicles parked in vicinity of the site to allow access from all sides and to prevent damage.

.6 Take necessary measures to ensure security of site enclosure, including preventing unauthorized access and protecting public from hazards.

.7 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

.8 Adequately fence off excavation not backfilled at end of working day to satisfaction of Departmental Representative.

.9 Provide, install and maintain dust screens.

.1 Attach green dust screen to site fence over entire height of fence along Place George-V Est and George-V Ouest as well as on Avenue Wilfrid-Laurier.

.2 Banner installed on fence along Rue Grande Allée to include graphics. Graphics provided by Departmental Representative by electronic means.

.10 Before November 18, 2022, in preparation for winter,relocate section of construction fence located along Rue Grande Allée to keep sidewalk clear.

1.6 LIGHT CONSTRUCTION SLIDE

.1 The concrete pavement part on Grande Allée must be converted into a secure pedestrian sidewalk. Provide for the installation of a light slide AB500 safety barrier, minigard, temporary, in galvanized steel, modular, without fence, fixed to the ground in a straight line using male and female anchors, as specified by the manufacturer, having sections 416 mm high, 1500 mm long, 500 mm wide, visible, mechanically fixed to the concrete pavers at every 1600 mm center-to-center, to separate the safe pedestrian crossing from the traffic lane.

.2 Before November 18, 2022, in preparation for winter, the light barrier must be removed and the part of the pavement on Grande Allée Street must be cleared and free of obstacles to allow vehicular traffic.

.3 After demobilization, drilled pavers must be repaired, filled with concrete sealer suitable for the material.

1.7 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work. Site layout plan shows access roads to the site.

.2 Provide additional granular material in turning areas to protect structures such as the concrete base of lamp posts and allow multi-axle vehicles to turn on compacted granular surface.

.3 Add flagging tape to tree trunks and branches in narrow passages where the risk of impact with heavy vehicles is high. Add traffic cones on the ground to direct vehicles where trees and branches encroach over the access road.

.4 Limit speed on access roads to 25 km/h with appropriate signs.

1.8 PUBLIC TRAFFIC FLOW

.1 Refer to Section 01 11 01 – General Information.

.2 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

.3 Submit request for permit for temporary occupation to Ville de Quebec. Include all necessary documents such as, but not limited to, the schedule and plan specifying worksite installations and signage. Specify temporary or partial closure of Grande Allée Ouest, George V Ouest, George V Est and Wilfrid-Laurier streets to allow vehicle access to work site.

1.9 FIRE ROUTES

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

1.10 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.

PART 2 PRODUCTS

2.1 OPAQUE BANNER.

.1 Printed opaque banner.

.1 Limit length to 2,438.4 mm to ensure stability and sturdiness. Technical specifications:

.1 MESH fabric printed with supplied graphics.

.2 Printable ± 60% perforation type. Allows for air flow.

.3 Size: 2,438.4 mm (96 in.) high x fence sections.

.4 Mat finish.

.5 Eyelets and double stitching.

.6 For outdoor use.

.7 Hanging system: eyelets 12 in CC around entire edge Select fasteners to ensure stability and sturdiness of fencing banners.

.8 Submit 1.0 m x 1.0 m sample to Departmental Representative for approval.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Not Used.

1.2 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.3 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify [Departmental Representative] [DCC Representative] [Consultant] of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber and panels on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

1.7 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.8 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.9 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.10 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.2 Perform in a manner to neither damage nor put at risk any portion of Work.

1.11 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum. Space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.12 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.13 PROTECTION OF WORK IN PROGRESS

.1 Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

1.14 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, occupants, and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

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 Not Used.

1.2 REFERENCES

.1 Owner's identification of existing survey control points and property limits.

1.3 SURVEY REFERENCE POINTS

.1 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.2 Make no changes or relocations without prior written notice to Departmental Representative.

.3 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.4 Require surveyor to replace control points in accordance with original survey control.

.5 AutoCAD drawings of the project will be available to the contractor for electronic staking logs.

1.4 SURVEY REQUIREMENTS

.1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and topsoil placement and landscaping features.

.4 Stake slopes and berms.

.5 Establish pipe invert elevations.

.6 Stake batter boards for foundations.

.7 Establish foundation column locations and stair elevations.

.8 Establish lines and levels for mechanical and electrical work.

.9 Stake out each project component, using pins, and validate locations on drawings. Report any discrepancy or inconsistency. Validate position with Departmental Representative. In addition, provide Departmental Representative with GPS locations for validation. No installations are permitted without approval of Departmental Representative following the above work.

.10 Allow 48 hours after staking for analysis by Departmental Representative and send GPS coordinates for approval. In addition, submit final staking to Departmental Representative for approval before work. Submit final staking to Departmental Representative for approval before starting work.

1.5 EXISTING SERVICES

.1 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.

.2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cutoff points as directed by Departmental Representative.

1.6 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.7 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

1.8 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit name and address of Surveyor to Departmental Representative.

.2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.9 SUBSURFACE CONDITIONS

.1 Promptly notify Departmental Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

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 Not Used.

1.2 REFERENCES

.1 Not Used.

1.3 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative]. Do not burn waste materials on site.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling.

.6 Dispose of waste materials and debris at designated dumping areas off site.

.7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

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

.10 Clean and sweep as needed, and daily if necessary, to keep clean the public roads and paths used for the construction site, including Grande Allée, George V East, George V West and Wilfrid-Laurier, including pavements and parallel parking lots.

1.4 FINAL CLEANUP

.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 Removal:

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and stone.

.8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.9 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.10 Remove dirt and other disfiguration from exterior surfaces.

.11 Sweep and wash clean paved areas.

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 11 01 – General Informations.

.2 Section 01 35 43 — Environmental Protection.

.3 Section 01 74 11 — Cleaning.

.4 Section 02 41 13 – Selective Site Demolition.

1.2 REFERENCES

.1 Not Used.

1.3 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with 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 90% total Project Waste from landfill sites. Prior to project completion provide Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.

.3 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.

.4 Recycle, salvage and reuse non-hazardous waste materials generated during construction. Calculations based on weight(tonnage/$m^{2)}$.

1.4 DEFINITIONS

.1 Approved/Authorized recycling facility. Approved/Authorized recycling facility: waste recycler approved by 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 Cost/Revenue analysis workplan (CRAW): based on information from Waste Reduction Workplan, and intended as financial tracking tool for determining economic status of waste management practices (Schedule E).

.5 Inert Fill: inert waste: exclusively asphalt and concrete.

.6 Waste Source Separation Program (WSSP). implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.

.7 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.8 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.9 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.

.10 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.

.11 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.12 Separate Condition: refers to waste sorted into individual types.

.13 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.

.14 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.

.15 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.

.16 Reference Standards

.1 Public Works and Government Services Canada (PWGSC).

.1 2002 National Construction, Renovation and Demolition Non-Hazardous Solid Waste Management Protocol.

.2 CRD Waste Management Market Research Report (available from PWGSC's Environmental Services).

1.5 CRD WASTE MANAGEMENT PLAN

.1 Contractor is responsible for developing and implementing a waste management plan during construction.

.2 Management Plan ten (10) days prior to the commencement of work and including at a minimum:

.1 Project name and address.

.2 Planned diversion objectives and strategies for the project.

.3 Initial diagnosis and estimate of the volumes/weights of CRD waste (tonnage/m2) diverted from landfill. Initial diagnosis should allow contractor to demonstrate how 90% CRD diversion target will be achieved.

.4 Name of the sorting centre in the case of off-site sorting.

.5 Name of the hauler(s).

.6 List of diversion channels and/or recovery sites and anticipated use of the recycled materials.

.3 During construction, provide Departmental Representative with all waste scale tickets from hauler and (by weight) from sorting centre.

.4 Upon completion of the work, provide Departmental Representative with a CRD waste management report including a waste management calculator, in Microsoft Excel format, including the final total percentages (by material) that have been disposed of and diverted. Sample CRD waste management report in Microsoft Excel format is provided in the Appendix as an example. CRD waste management report must include the tonnage of CRD waste diverted (per m2), categorized by waste type including supporting documentation (weigh tickets) and clearly demonstrate whether or not the CRD waste diversion target was met. In the event that the diversion target is not met, the report must also include justification as to why the target was not met.

1.6 WASTE SOURCE SEPARATION PROGRAM (WSSP)

.1 As part of Waste Reduction Workplan, prepare WSSP prior to project start-up.

.2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.

.3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.5 Locate containers to facilitate deposit of materials without hindering daily operations.

.6 Provide training for sub-contractors and workers in handling and separation of materials for reuse and/or recycling.

.7 Locate separated materials in area which minimizes material damage.

.8 Clearly and securely label containers to identify types/conditions of materials accepted and assist sub-contractors in separating materials accordingly.

.9 Monitor on-site waste management activities by conducting periodic site inspections to verify: state of signage, contamination levels, bin locations and condition, personnel participation, use of waste tracking forms and collection of waybills, receipts and invoices.

.10 On-site sale of salvaged materials is not permitted unless authorized in writing by Departmental Representative and provided that site safety regulations and security requirements are adhered to.

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 existing facility. Implement security measures approved by Departmental Representative.

1.8 WASTE PROCESSING SITES

.1 Provide Departmental Representative with a list of waste treatment sites to which Contractor intends to transport the waste. Provide list of treatment and disposal sites established by Contractor to Departmental Representative.

.2 All waste or demolition products become the property of the Contractor. Transport and dispose of waste material off site at the Contractor's expense at a site authorized by Departmental Representative.

1.9 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by 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 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.

1.10 DISPOSAL OF WASTE

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil, 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 tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials on-site as Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

1.11 SCHEDULING

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

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 GENERAL

.1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEAN-UP

.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 Separate waste for reuse.

.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 Departmental Representative, and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

.2 On-site sale of materials is not permitted.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 74 11 — CLEAN-UP

1.2 ACCEPTANCE OF WORK PROCEDURES:

.1 Contractor's Inspection:

.1 Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.2 Notify Departmental Representative in writing of satisfactory completion of inspection and submit verification that corrections have been made.

.3 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 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, adjusted and fully operational.

1.3 FINAL CLEANUP

.1 Proceed in accordance with Section 01 74 11 — Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Separate waste for reuse.

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 — Not used.

1.2 ADMINISTRATIVE

.1 Pre-warranty Meeting:

- .1 Convene meeting (2) weeks prior to beginning of work with Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:
  - .1 Verify project requirements.
  - .2 Review warranty requirements, manufacturer's installation 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit 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 scanned copies of operating and maintenance manuals.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.4 FORMAT

.1 Organize data as scanned instructional manual.

.2 Correlate data into related consistent groupings.

.3 Arrange content by systems, process flow under Section numbers and sequence of Table of Contents.

.4 Provide scaled CAD files in DWG format with descriptive and maintenance data described herein

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents: provide title of project;

- .1 Date of submission; names.
- .2 Addresses, and telephone numbers of Departmental Representative 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.

1.6 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 Keep record documents and samples available for inspection by Departmental Representative.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of drawings.

.2 Use 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 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 References 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 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

1.8 FINAL SURVEY

.1 Submit final site survey certificate certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.9 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 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.3 Include manufacturer's printed operation and maintenance instructions.

.4 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.5 Additional requirements: as specified in individual specification sections.

1.10 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

.1 Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual specification sections.

1.11 MAINTENANCE MATERIALS

.1 Extra Materials:

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue items.

.1 Submit list to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

.2 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 list to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

1.12 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 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.13 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: 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 10 days after completion of applicable item of work.

.4 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 9 months 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 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs and vapour barrier systems.

.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 9-month post-construction warranty inspections.

.10 Respond in timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification to follow oral instructions.

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 ADMINISTRATIVE PROCEDURES

.1 Two (2) weeks before the final inspection of the work, demonstrate the operation and maintenance of the installed equipment, materials, and systems to the Project Owner.

.2 The Project Owner must provide a list of the staff members to be trained and ensure that they attend the training sessions.

.3 Preparatory work

.1 Ensure that the conditions under which the training sessions and the equipment, material, and system demonstrations are conducted meet the requirements.

.2 Ensure that the designated people are present.

.3 Ensure that the equipment, materials, and systems have been inspected and started up in accordance with engineering requirements.

.4 Ensure that testing, adjustment, and balancing have been performed in accordance with section 01 91 13 – General Commissioning Requirements, and that the equipment, materials, and systems are fully operational.

.4 Demonstration and training

.1 Demonstrate, at the agreed times and at each element's location, how to start up, operate, control, adjust, troubleshoot, service, and maintain each material, system, and piece of equipment.

.2 Teach staff members all the operation and maintenance phases for the equipment, materials, and systems, using the operation and maintenance manuals provided.

.3 Conduct a detailed review of the contents of these manuals to explain all aspects of operation and maintenance.

.4 Gather any additional data for training, if required, and include it in the Operation and Maintenance Manuals.

.5 Training duration: Plan the appropriate amount of training for each material, system, and piece of equipment according to the customer's requests, and coordinate the training on-site.

1.2 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

.2 Two (2) weeks before the specified dates, submit a schedule indicating the planned date and time for the material, system, and equipment demonstrations to the Consultant for their approval.

.3 In the week after the demonstrations, submit documentation confirming that the demonstrations have been given and that the appropriate training has been provided in a satisfactory manner.

.4 Specify the date and time of each demonstration and the names of the attendees.

.5 Provide complete copies of the Operation and Maintenance Manuals that will be used to demonstrate the operation of equipment, materials, and systems and for related training sessions.

1.3 QUALITY ASSURANCE

.1 If a section specifies that an authorized representative of the manufacturer must demonstrate the operation of the installed devices, equipment, and systems:

.1 Ensure the Project Owner's staff receives proper training;

.2 Provide written documentation confirming that the demonstration and related training have been given.

PARTIE 2 PRODUCTS

2.1 NOT APPLICABLE

.1 Not applicable

PARTIE 3 EXECUTION

3.1 NOT APPLICABLE

.1 Not applicable

END OF SECTION

Part 1 GENERAL

1.1 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.

.4 AFD managed projects the term Departmental Representative in Cx specifications to be interpreted as AFD Service Provider.

1.2 COMMISSIONING OVERVIEW

.1 Cx to be a line item of Contractor's cost breakdown.

.2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.3 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.

.4 Departmental Representativewill 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.

1.3 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 Representativeto 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.

1.4 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 Ensure installation of related components, equipment, sub-systems, systems is complete.

.2 Fully understand Cx requirements and procedures.

.3 Have Cx documentation shelf-ready.

.4 Understand completely design criteria and intent and special features.

.5 Submit complete start-up documentation to Departmental Representative

.6 Have Cx schedules up-to-date.

.7 Ensure systems have been cleaned thoroughly.

.8 Complete TAB procedures on systems, submit TAB reports to Departmental Representativefor review and approval.

.9 Ensure "As-Built" system schematics are available.

.4 Inform Departmental Representativein writing of discrepancies and deficiencies on finished works.

1.5 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Departmental Representativebefore start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

.1 Submit no later than 4weeks 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 Representativefor 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

1.7 COMMISSIONING DOCUMENTATION

.1 Departmental Representativeto review and approve Cx documentation.

.2 Provide completed and approved Cx documentation to Departmental Representative

1.8 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.19 - Construction Progress Schedule - 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.

1.9 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings: Section 01 32 16.16 - Construction Progress Schedule - Critical Path Method (CPM) 01 32 16.19 - Construction Progress Schedule - 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 16.16 - Construction Progress Schedule - Critical Path Method (CPM) 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart. Departmental Representativeto 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.

1.10 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.

1.11 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days notice prior to commencement.

.2 Departmental Representativeto 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.

1.12 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 Representativeto 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.

1.13 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 RepresentativeIf 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.

1.14 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 Representativeto repeat start-up at any time.

1.15 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 Representativefor 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.

1.16 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.

1.17 START OF COMMISSIONING

.1 Notify Departmental Representativeat least 21days prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.18 INSTRUMENTS / EQUIPMENT

.1 Submit to Departmental Representativefor 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.

1.19 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

.1 Under actualoperating 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.

1.20 WITNESSING COMMISSIONING

.1 Departmental Representativeto witness activities and verify results.

1.21 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.

1.22 EXTRAPOLATION OF RESULTS

.1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.23 EXTENT OF VERIFICATION

.1 Elsewhere:

.1 Provide manpower and instrumentation to verify up to 30 % of reported results, unless specified otherwise in other sections.

.2 Number and location to be at discretion of Departmental Representative Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.

.3 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.

.4 Perform additional commissioning until results are acceptable to Departmental Representative

1.24 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.

1.25 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.

1.26 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

1.27 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

1.28 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.

1.29 TRAINING

.1 In accordance with Section 01 79 00.13 - Demonstration and Training for Building Commissioning.

1.30 OCCUPANCY

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

1.31 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 +/- 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 +/- 2 % of recorded values.

1.32 OWNER'S PERFORMANCE TESTING

.1 Performance testing of equipment or system by [Departmental Representative] [DCC Representative] [Consultant] 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 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

1.2 APPROVALS

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

1.3 GENERAL INFORMATION

.1 Provide Departmental Representativethe 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 architectural, structural, fire protection, mechanical 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 under conditions of heightened security and emergencies as indicated in Section 2.0 of BMM.

.4 System, equipment and components Maintenance Management System (MMS) identification - Section 2.1 of BMM.

.5 Information on operation and maintenance of architectural systems and equipment installed and commissioned - Section 2.0 of BMM.

.6 Information on operation and maintenance of fire protection and life safety systems and equipment installed and commissioned - Section 2.0 of BMM.

.7 Information on operation and maintenance of mechanical systems and equipment installed and commissioned - Section 2.0 of BMM.

.8 Operating and maintenance manual - Section 3.2 of BMM.

.9 Final commissioning plan as actually implemented.

.10 Completed commissioning checklists.

.11 Commissioning test procedures employed.

.12 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Departmental Representative

.13 Commissioning reports.

1.4 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

.1 For detailed requirements refer to Section 01 78 00 - Closeout Submittals.

.2 Departmental Representativeto 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 materials.

.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.

1.5 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, lose of water or pressure, chemical spills and refrigerant release.

.2 Failure of elevators and escalators.

.3 HVAC emergencies and fuel supply failures.

.4 Intrusion and security breach.

.5 Emergency provisions for natural disasters, bomb threats and other disruptive situations.

.6 Dedicated emergency generators for high security projects, medical facilities and computer systems.

.7 Emergency control procedures for fire, power and major equipment failure.

.8 Emergency contacts and numbers.

.9 Manual to be readily available and comprehensible to non- technical readers.

1.6 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

.1 Provide Departmental Representativesupporting 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 Architectural and structural:

.1 Inspection certificates, construction permits.

.2 Roof anchor log books.

.3 PV reports.

.3 Fire prevention, suppression and protection:

.1 Test reports.

.2 Smoke test reports.

.3 PV reports.

.4 Mechanical:

.1 Installation permits, inspection certificates.

.2 Piping pressure test certificates.

.3 Ducting leakage test reports.

.4 TAB and PV reports.

.5 Charts of valves and steam traps.

.6 Copies of posted instructions.

.5 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 Representativewith preparation of BMM.

1.7 LANGUAGE

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

1.8 IDENTIFICATION OF FACILITY

1.9 When submitting information to Departmental Representative for incorporation into BMM, use following system for identification of documentation: 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'sapproval 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

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 11 01 – General Informations on the Works..

.2 Section 01 34 43 — Environmental Procedures.

.3 Section 01 33 00 - Action and Informational Submittals.

.4 Section 04 03 06 – Cleaning Historic Masonry.

.5 Section 04 03 43.19 - Period Stone Dismantling.

.6 Section 04 03 43.13 - Masonry - Restoration and Repair

.7 Section 09 63 41 - Stone Paving.

.8 Section 31 00 99 - Earthworks - Minor Works.

1.2 ADMINISTRATIVE

.1 Site Meetings:

.1 Convene pre-demolition meeting one week prior to beginning work of this Section.

.1 Project requirements.

.2 Installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's instructions and warranty requirements.

.2 Arrange for site visit with Departmental Representative prior to start of Work to examine existing site conditions adjacent to demolition Work.

.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 Departmental Representative writing.

.3 Survey of existing work:

.1 Contractor must, with Departmental Representative, identify materials to be removed, dismantled, salvaged, transported, relocated and reassembled within the limits of the site.

.2 Contractor must take note of the condition of the four monuments to be recovered, stored, transported off-site during the duration of the work, brought back to the site and reassembled according to indications of the Centre de conservation du Québec (CCQ).

1.3 DELIVERY, STORAGE AND HANDLING

.1 Storage and Protection:

.1 Protect existing work and work that will remain. Repair or replace damaged work immediately at own expense to approval of Departmental Representative.

.2 Remove and wrap items to be salvaged or reused, and transport and store in area specified by Departmental Representative.

.3 Store in a designated off-site location and protect materials to ensure maximum preservation.

.2 Transportation, storage and protection of monument components.

.1 Refer to Section 04 03 43.19 - Period Stone Dismantling.

.2 Each of the component parts of the monuments must be adequately protected.

1.4 SITE CONDITIONS

.1 Environmental requirements.

.1 Ensure that selective demolition works do not produce any harmful effects and do not generate excessive levels of air or noise pollution.

.2 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.

.1 Ensure proper disposal procedures are maintained throughout project.

.3 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.

.4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Consultant’s instructions.

.5 Protect trees, plants and foliage on site and adjacent properties where indicated.

.6 This item also includes the stockpiling of materials for environmental characterization, and the removal and disposal off site of non-contaminated materials in excess, and any incidental expense.

.2 Existing Conditions

.1 Prior to start of Work remove contaminated or hazardous materials as directed by Departmental Representative from site and dispose of at designated disposal facilities in safe manner and in accordance with TDGA and other applicable requirements.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 PREPARATION

.1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 The contractor shall refer to the plan and coordinate with the Department's representative on site the work to be demolished, salvaged, removed and reused.

3.2 DISMANTLING OF MONUMENTS

.1 Refer to Section 04 03 43.19 - Period Stone Dismantling.

.2 The presence of a conservator, a technician from the Centre de Conservation du Québec is planned in order to coordinate with the general contractor the dismantling operations and transportation of the monuments, including the commemorative bronzes.

3.3 MATERIALS

.1 Refer to Section 04 03 43.19 - Period Stone Dismantling.

.2 Equipment provided by general contractor:

.1 A crane for handling the bronzes and stones.

.2 Trailer for the removal and transport of the bronzes.

.3 Custom-made stands, if required.

.4 Clean wooden pallets and beams for masonry and bronzes.

.5 Telescopic lift for handling stones.

.3 Maximum weight heaviest stones is estimated at:

.1 Heaviest stones:

.1 Voltigeurs monument (base): 5 tonnes.

.2 Royal 22nd Regiment (base of bas-relief): 4 tonnes.

3.4 REMOVAL

.1 Remove, carefully dismantle prescribed works as indicated.

.2 It is forbidden to disturb the works designated to remain in place.

.3 Salvage:

.1 Dismantle elements containing materials to be salvaged and set aside salvaged materials.

.2 Recover all granite stones from monuments not recovered by the QCC and other granite stone to be removed and demolished: curbs, steps, slabs, to be crushed and added to stabilized stone screening to be prepared. Additional stone screenings will be required to complete the works. Crushed stone mixture shall be of the size specified in Section 31 00 99 - Earthworks - Minor Works.

.3 Collect black coloured stone along Grande Allée sidewalk. Store it on wooden pallets to be recovered and transported to a Ville de Québec warehouse within a 10-km radius of the work site, as per Departmental Representative's instructions.

.4 Recover panel at northwest corner, belonging to the Battlefields Commission (NBC). Store on wooden pallets to be recovered and transported to an NBC warehouse within a 3-km radius of the work site, as per Departmental Representative's instructions.

.4 Disposal

.1 Dispose of materials not designated for salvage or reuse/reemployment on the site.

.2 If demolition disposal is to be carried out on site, restore areas used for demolition to the satisfaction of Departmental Representative.

.3 Dispose of all materials not designated for salvage or reuse including concrete bases, boxes, cabinets, connections and conduits. Dispose of demolition materials and transport them off-site.

3.5 DISMANTLING MONUMENTS

.1 Refer to Section 04 03 43.19 - Period Stone Dismantling.

.2 In order to carry out the dismantling, monuments are accessible from Place George V. Allow circulation of equipment on Place George V or surrounding streets by general contractor in order to transport masonry to the established storage place. No prior ground preparation is required by the general contractor for this stage.

.3 Transport and store bronze monument components at QCC for duration of the work. Storage area must be in the vicinity of the QCC, in a perimeter secured by construction barriers. Costs associated with storage of the bronzes at expense of QCC.

3.6 STORAGE OF MONUMENT COMPONENTS AT CONSTRUCTION SITE

.1 Refer to Section 04 03 43.19 - Period Stone Dismantling.

.2 Storage of stones on work site to be determined in collaboration with Departmental Representative. This storage area must:

.1 Be located within the perimeter of the Place George V work site, or nearby.

.2 Not interfere with work.

.3 Allow access and circulation of restorers and masons around pallets during restoration phase of the masonry elements. Circulation corridor of 1 m in width is required between each pallet to allow the work of the restorers and masons. Total area required for each monument will be specified by the QCC. This stage will follow the dismantling and take place in parallel with the work on Place George V.

.4 Storage area must be fenced off with protective netting.

3.7 STORAGE OF OTHER MATERIALS

.1 Label stockpiles, indicating material type and quantity.

.2 Designate appropriate security resources / measures to prevent vandalism, damage and theft.

.3 Locate stockpiled materials convenient for use in new construction. Eliminate double handling wherever possible.

.4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.8 REMOVAL OF MATERIALS OFF SITE

.1 Remove stockpiled material as directed by Departmental Representative when it interferes with operations of project construction.

.2 Temporary off-site storage site for stone components of monuments will be designated by Departmental Representative. Handling and transportation costs, to and from storage sites, at Contractor's expense. Contractor to provide for transportation costs to a storage site within 30 km of work site.

.3 Temporary off-site storage site for stone components of monuments will be designated by Departmental Representative. Handling and transportation costs, to and from storage sites, at Contractor's expense.

3.9 CLEANING STONES

.1 Section 04 03 01.13 – Period Masonry Cleaning.

3.10 REPAIRING STONES

.1 Section 04 03 43.13 - Period Masonry Mortaring.

3.11 REMEDIAL WORK

.1 Restore surfaces and structures outside the demolition areas to the condition they were in before work began.

3.12 PROTECTION

.1 Repair damage to adjacent materials, equipment or property through selective demolition of land development works.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 15 00 – Concrete Accessories.

.2 Section 03 20 00 – Concrete Reinforcing.

.3 Section 03 30 00 – Cast-in-Place Concrete.

.4 Section 03 35 00 – Concrete Finishing.

.5 Section 03 39 00 – Concrete Curing.

.6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 REFERENCES

.1 American Concrete Institute (ACI).

.1 ACI 303R-12, Guide to Cast-in-Place Architectural Concrete Practice.

.2 ACI 347-04, Guide to Formwork for Concrete.

.3 ACI 347.2R-17, Guide for Shoring/Reshoring of Concrete Multistory Building.

.4 ACI 347.3R-13, Guide to Formed Concrete Surfaces.

.2 Canadian Standard Association (CSA)/CSA International.

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.2 CSA O86-14, Engineering Design in Wood.

.3 CSA O121-17, Douglas Fir Plywood.

.4 CSA O151-17, Canadian Softwood Plywood.

.5 CSA O153-13, Poplar Plywood.

.6 CSA O325-16, Construction Sheathing.

.7 CSA O437 Series-93(R2006), Standards on OSB and Waferboard.

.8 CSA S269.1-16, Falsework for Construction Purposes.

.9 CAN/CSA S269.2-16, Access Scaffolding for Construction Purposes.

.3 Government of Quebec.

.1 Safety Code for the Construction Industry R.R.Q., c. S-2.1, r.4.

.4 International Concrete Repair Institute (ICRI).

.1 Guideline No. 320.1R-1996, Guide for Selecting Application Methods for the Repair of Concrete Surfaces.

.2 Guideline No. 320.2R-2009, Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces.

.5 Underwriters Laboratories of Canada (ULC).

.1 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.6 Régie du bâtiment du Québec :

.1 Code de construction du Québec - chapitre I, Bâtiment et Code national du bâtiment du Canada 2010 (modifié).

1.3 CONTRACTOR'S LIABILITIES

.1 The Contractor scope of work includes concrete forming, falseworks, their design and installation. No examination or comments from the Departmental Representative or anyone else shall relieve the Contractor of assuming solely all risks and liability regarding these parts of work.

.1 Calculations, layout and construction of formworks are the sole responsibility of the Contractor.

.2 The Contractor shall provide insulation to be placed in foundation walls. The insulation shall be placed by the Contractor in formworks, in collaboration with the Contractor in reinforcement.

1.4 FORMWORKS AND FALSEWORK DESIGN

.1 Formwork and falsework design shall be performed by an engineer member of the OIQ employed by the Contractor or mandated to do so.

.2 Formwork and falsework design shall be done in accordance with laws and regulations in place, including but not limited to the Safety Code for the Construction Industry.

.3 Special precautions shall be taken during design to limit loads applied on existing structures to values inferior to the maximum allowable loads on these structures.

.4 Describe the construction sequence incorporated into the design of structures. Show or describe the position of construction joints provided and, if applicable, the principle of formworks and falseworks reuse.

.5 Calculations shall be made in accordance with recommendations and loads indicated in ACI 347 and ACI 347.2 guides. Wind loads shall conform to the requirements of the Code de la Construction du Québec.

.6 Designer of formwork and falsework shall consider indications on drawings.

1.5 ACTIONS AND INFORMATIONNAL SUBMITTALS

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

.2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.

.3 Submit descriptions of all formwork materials in direct contact with wet concrete.

.4 Submit for approval a drawing including location of all sleeves embedded in concrete.

.5 Submit formworks and falseworks shop drawings.

.1 The drawings shall bear the seal and signature of a professional engineer, certified by the Ordre des ingénieurs du Québec (OIQ).

.6 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and formwork drawings.

.7 Indicate formwork design data including permissible rate of concrete placement, and temperature of concrete, in forms.

.8 When falseworks or structural element are connected or lean on an existing structure used as support, shop drawings shall indicate maximum forces transmitted in each direction.

.9 Before concreting, submit a letter signed by a professional engineer certified by the Ordre des ingénieurs du Québec (OIQ), stating that the construction of falseworks was done in accordance with the plans submitted. The engineer attesting the conformity of temporary shoring must visit the site of work prior to the production of the letter and attach the report of his visit to the letter. If the Contractor does not use temporary shoring, the Departmental Representative may request to be provided with a letter signed by a professional engineer certified by the OIQ stating that temporary shoring is not required.

1.6 QUALITY CONTROL

.1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.4	Shoring / Reshoring Procedure.	*Refer to terms and conditions of section 01 33 00*	Transmission letter. Inscription to the technical specification's registry.
1.5.55 and 1.5.6	Formworks and falseworks shop drawings.	*At least fourteen (14) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents.*	Transmission letter. Inscription to the technical specification's registry.
1.5.10	Certificate of compliance of falseworks.	*Refer to terms and conditions of section 01 33 00*	Certificate of compliance signed by an engineer and visit report.
1.5.3	Descriptions of formwork materials in contact with wet concrete.	*Refer to terms and conditions of section 01 33 00*	Transmission letter. Inscription to the technical specification's registry.
1.5.4	Drawing including location of all sleeves embedded in concrete.	*Refer to terms and conditions of section 01 33 00*	Location drawing. Inscription to the technical specification's registry.
3.2.2	Certificate of compliance for anchors	*Refer to terms and conditions of section 01 33 00*	Breakpoint Certificate of compliance signed by an engineer

1.7 WASTE MANAGEMENT AND DISPOSAL:

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

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the Departmental Representative.

.4 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the Departmental Representative.

.5 Divert unused form release material from landfill to an official hazardous material collection site as approved by the Departmental Representative.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials in accordance with CSA O86, CSA O121, CSA O153 and/or CSA O437 Series.

.2 Rigid insulation board: in accordance with CAN/ULC S701, type II, thermal rating RSI 0.82 for 25 mm thickness, RSI 1.18 for 38 mm and RSI 1.50 for 50 mm.

.2 Formwork materials for exposed surface (architectural concrete):

.1 The use of « Duraform » type formwork is not allowed for these surfaces.

.2 Use brand-new formwork materials. Use brand-new plywood, 19 mm thick, sanded and coated with high quality formwork release agent. For lining only, use three-ply 6 mm thick plywood.

.3 For concrete with an exposed surface, use brand-new plywood, high density in accordance with CSA O121.

.3 Form release agent: use a non-toxic, biodegradable and low VOC product.

.1 Approved products: Formshield Pure by Euclid, MasterFinish RL 100 (formerly Cast-Off) by BASF and King Form Release by KING.

.4 Falsework materials: to CSA-S269.1, table 1. Identify materials through quality indices and present data from tests or any certificate of compliance.

.5 Form ties:

.1 For concrete without special architectural features, use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

.2 For concrete with an apparent surface, use snap ties complete with plastic cones and light grey concrete plugs. Cone diameter shall be less than 38 mm. Insure concrete cover of 25 mm or more.

.3 Unless otherwise indicated, use watertight snap ties with a neoprene washer in the centre of the tie, able to resist 12 meters high water pressure for foundation walls and retaining walls. In general, use watertight snap ties for all concrete work considered watertight.

.4 Sealing mortar for form ties holes: Cementitious, two-component, fast-setting mortar, grey colored and containing a corrosion inhibitor.

.6 Refer to section 03 15 00 for concrete accessories.

PART 3 EXECUTION

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings. Allow for a 100 mm tolerance on the elevation of the bottom of excavation at no supplementary charge.

.2 Prior to concreting, clean formwork and treat surfaces with a form stripping agent in accordance with CSA A23.1.

.3 Obtain Departmental Representative approval for use of earth forms, or for framing openings not indicated on drawings.

.4 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.5 Fabricate and erect falsework in accordance with CSA S269.1.

.6 Do not place shores and mud sills on frozen ground. Bottom of excavation shall be protected against frost at all time. Concrete shall never be poured over a frozen surface.

.7 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.8 Fabricate and erect formwork in accordance with CSA S269.1 to produce finished concrete conforming to shape, dimensions, locations and levels indicated. Insure proper temporary bracing to maintain the shape of formwork from pouring to hardening of concrete.

.9 Geometric configuration and localisation shall be within tolerances required by CSA A23.1, article 6.4.

.10 Align form joints and make them watertight. Keep form joints to minimum. Adequate reinforcements must be placed at the back of the joints between plywood sheets to ensure obtaining a continuous flat surface able to withstand all stages of concreting without deforming or moving.

.11 Unless otherwise indicated, use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints.

.12 For all sharp angles of exposed concrete, provide 25 mm chamfers, even where no indications are given on drawings.

.13 When formwork's height is significant, windows shall be incorporated into the forms to facilitate concreting. Windows shall be placed to limit free fall of concrete and segregation of ingredients during concrete pouring.

.1 Minimally, for vertical elements more than three (3) meters high, access window shall be spaced 2.4 meters apart horizontally and vertically.

.2 When pumping concrete, lowering a trunk down into the casing from the top to limit the drop height is likely to create segregation of concrete during the interruption of pumping or when opening the valve before the descent of the trunk. This method cannot be considered as to guarantee proper placing of concrete – the addition of access window in the formwork should be used.

.14 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated. Refer to section 03 15 00 for requirements regarding expansion or dilatation joint.

.15 Special care shall be taken in fabrication and erection of formwork for architectural concrete, as indicated on drawings and specifications.

.1 It might not be possible to align joints using panels of standard dimensions or maximum spacing between snap ties.

.16 At least twenty-four (24) hours prior to closing forms, advise the Departmental Representative as to allow inspection of reinforcement.

3.2 ANCHORS, SLEEVES AND EMBEDDED ELEMENTS

.1 Provide and install into formwork all embedded elements (anchors, sleeves, ducts, machinery anchor bolts, etc.) in accordance with CSA A23.1 article 6.7. Refer to section 03 15 00 – Concrete Accessories for additional requirements.

.2 Build in anchors, sleeves, and other inserts required to accommodate work specified in other sections.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.2 Prior to concreting, ensure that all dimensions required in drawings and specifications and tolerances imposed for the implementation are met.

.3 Provide a certificate of compliance signed by an engineer attesting that installation of anchor rods complies to the anchoring plan and that concrete foundations reached the strength required to support the erection of steel structure, in accordance with article 3.24.12 of the Safety Code for the construction industry.

.3 Tolerances shall be in accordance with standard CSA A23.1 article 6.7.3.

.4 Sleeves and openings with a side larger than 100 mm shall be examined by the Departmental Representative if not indicated on drawings.

.5 No sleeve, pipe or duct shall be installed and no openings shall be made into a joist, a beam, a slab, slab capitol or a column unless directed otherwise by the Departmental Representative.

.6 When authorized by the Departmental Representative, incorporate openings, place sleeves, ties, hangers, ducts or pipes and any other embedded elements as indicated in drawings.

.7 Unless otherwise indicated, the following guidelines shall be met when installing sleeves, ducts or pipes:

.1 Ducts shall be placed between top and bottom rebars;

.2 Ducts shall be spaced apart 300 mm or farther. Maximum dimension of ducts shall be less than a third of the thickness of the concrete element or fifty (50) millimetres, whichever is less. Location of ducts shall be approved by the Departmental Representative;

.3 Centre-to-centre dimension between sleeves or pipes shall be superior to three (3) times the diameter of the larger element;

.4 The exterior diameter of the embedded element shall not be larger than the third of the thickness of the wall, beam or slab into which it is embedded;

.5 Do not remove or move rebars in order to place embedded elements. If placement of embedded elements is impossible where prescribed, any modification need to be approved by the Departmental Representative;

.6 Nothing shall be embedded into a slab on ground exposed to the effect of bad weather.

.8 Notify the Departmental Representative and wait for his instructions if the preceding requirements cannot be met.

.9 Coordinate delivery and placement into formworks of embedded elements with subcontractors.

.10 Aluminium material embedded into concrete shall be covered with a proper coating to prevent aluminium corrosion.

3.3 FORMWORK REMOVAL AND RESHORING

.1 Leave formwork in place for the following minimum periods of time after placing concrete:

.1 One (1) day for footings, abutment and thrust blocks;

.2 Three (3) days for walls less than three (3) meters high and beam sides;

.3 Five (5) days for walls three (3) to six (6) meters high;

.4 Seven (7) days for column;

.5 Twenty-eight (28) days for beams, slabs, decks and any other framing elements, or seven (7) days if formworks are replaced immediately by adequate reshoring. Reshores shall remain set in place for twenty-one (21) days. Falsework drawings in accordance with CSA S269.1 shall indicate the method, materials and locations used for reshores. Each drawing shall bear the seal and signature of an engineer certified by the OIQ.

.6 Refer to section 03 39 00 – Concrete Curing for the minimum time prior to formwork removal, notwithstanding the indication of the preceding articles. Coordinate the time required before formwork removal with concrete curing.

.2 Notwithstanding preceding articles, formwork removal is authorised only when the Departmental Representative allows it. The authorization shall be given only if proper methods of curing are ensured, including protection against cold- or hot-weather, rain or any other adverse conditions. Moreover, time prior formwork removal may be increased depending on the process used for concreting, curing conditions and weather conditions.

.3 The Contractor remains the sole responsible for any damage to concrete following early formwork removal, even if he has been authorized to proceed.

.4 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.5 Space reshoring in each principal direction at not more than 3 000 mm apart.

3.4 FORMWORK FOR ARCHITECTURAL CONCRETE

.1 Architectural concrete shall be in accordance with article 7.9.2.6 of CSA A23.1 which shall be considered a minimum requirement to be read in conjunction with the following specifications.

.2 Quality of finish for structural concrete architecturally exposed shall be in accordance with ACI 347.3R Guide to Formed Concrete Surfaces, with surface category as defined in the following table:

Element	**Concrete surface category (CSC)**
All concrete exposed where no surface category is explicitly defined.	CSC 1

.3 Requirements of table 3.1a of ACI 347.3R apply integrally to architecturally exposed concrete.

.1 For surface category CSC 1 and CSC 2, mock-ups are not required. For concrete in this category, first work performed shall be inspected and the first work judged acceptable shall be considered as reference work for evaluating subsequent work.

.4 Before beginning forming, examine structural and architectural drawings to identify concrete elements that will be exposed (architectural concrete). Refer to architectural drawings for special requirements. Any concrete element exposed shall be considered as a CSC 1 element unless another category is explicitly defined on specifications or drawings.

.5 Duraform type formwork shall not be used for architectural concrete.

.6 Joints and snap ties shall be arranged in symmetrical patterns.

.7 Procedure to repair defects:

.1 Procedure to repair defects shall be chosen as to obtain a general impression matching the concrete surface category (CSC) required. Extra care shall be taken in the execution of corrective work. Refer to article 7.3 of ACI 347.3R in preparing repair procedures.

.2 The Contractor is responsible to submit repair procedures.

.3 Any repair required on CSC 3 or CSC 4 surface category shall at first be performed on existing mock-ups.

.4 Refer to Guideline No. 320.2R Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces by ICRI when selecting repair materials.

.5 Refer to Guideline No. 320.1R *Guide for Selecting Application Methods for the Repair of Concrete Surfaces* by ICRI when selecting application method for repair materials.

3.5 PATCHING OF FORM TIE HOLES

.1 Refer to article 7.9.3 from CSA A23.1 standard for patching of form tie holes.

.2 All conical cavities left after removal of the plastic cones on the ends of snap ties shall be filled with grout. Proceed according to the instructions of the grout manufacturer. Moisten the surface beforehand. Ensure a smooth finish with the grout blending into the surrounding concrete surfaces. Allow to cure.

.3 For exposed surfaces (architectural concrete), products used to fill the holes shall have the same texture and color as the concrete. Provide the technical datasheet of the product for approval by the Departmental Representative.

3.6 FIELD QUALITY CONTROL

.1 Surveys shall be conducted prior to concreting to measure the level of the top of the formwork. At minimum, five (5) survey points shall be taken for every span. Provide this survey to the Departmental Representative and wait for his approval before placing concrete.

.2 Survey points shall be used as guide to control slab thickness during concreting.

.3 During inspection of concrete reinforcement, formworks and falseworks shall be inspected as well. Formwork quality and its cleanliness shall be inspected, as well as solidity of falseworks.

.4 Following concreting, before removing formworks or shoring, conduct a new survey of the top of the slab consisting of an equal number of survey points as the formwork's survey.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 11 00 – Concrete Forming.

.2 Section 03 20 00 – Concrete Reinforcing.

.3 Section 03 30 00 – Cast-in-Place Concrete.

.4 Section 03 35 00 – Concrete Finishing.

.5 Section 03 39 00 – Concrete Curing.

.6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 REFERENCES

.1 American Concrete Institute (ACI).

.1 ACI RAP Bulletin 1, Structural Crack Repair by Epoxy Injection, 2003.

.2 American Society for Testing and Materials International (ASTM).

.1 ASTM C 39/C 39M-18, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

.2 ASTM C 42/C 42M-18a, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

.3 ASTM C 496/C 496M-17, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.

.4 ASTM C 881/C 881M-15, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

.5 ASTM C 920-18, Standard Specification for Elastomeric Joint Sealants;

.6 ASTM C 1107/C 1107M-17, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

.7 ASTM D 624-00(2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.8 ASTM D 638-14, Standard Test Method for Tensile Properties of Plastics.

.9 ASTM D 1751-18, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.10 ASTM D 1752-18, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.11 ASTM D 2628-91(2016), Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

.12 ASTM E 1745-17, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

.13 ASTM E 1993/E 1993M-98(2013), Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

.3 Canadian Standard Association (CSA)/CSA International.

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.2 CSA 40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.4 Canadian General Standards Board (CGSB).

.1 CAN/CGSB 19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.

.2 CAN/CGSB 51.34-M86(R1988) and CAN/CGSB 51.34-M86 AMEND, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.3 ATTACHMENTS

.1 When attachments or anchors are required for concrete work to support vertically or laterally architectural elements, precast concrete panels, mechanical or electrical equipment, or other, manufacturer of said elements is the sole responsible for the design and calculations of attachments. The design engineer (representative of the PSPC) shall not be held liable for any part of this work.

.2 Steel plates, angles, steel rods, bolts, studs, anchoring elements or any hardware parts in direct contact with, embedded or partially embedded into concrete shall be considered attachments.

1.4 ACTIONS AND INFORMATIONNAL SUBMITTALS

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

.2 Submit shop drawings for all steel elements embedded in concrete. When forces are induced into the concrete by embedded steel elements, provide forces and direction of forces applied to concrete works where they are embedded.

.1 The drawings shall bear the seal and signature of a professional engineer, certified by the Ordre des ingénieurs du Québec (OIQ).

.3 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.

1.5 QUALITY CONTROL

.1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.4.2	Shop drawings for embedded steel elements.	Refer to terms and conditions of section 01 33 00	Transmission letter. Inscription into the shop-drawing registry.
1.4	Technical descriptions of cast-in-place concrete products and concrete components.	Refer to terms of conditions of the section 01 33 00	Transmission letter. Inscription into the shop-technical descriptions of the products.
3.1.3	Certificate of compliance for anchors.	Refer to terms of conditions of the section 01 33 00	Breakpoint Certificate of compliance signed by an engineer.

1.6 WASTE MANAGEMENT AND DISPOSAL:

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

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the Departmental Representative.

.4 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the Departmental Representative.

.5 Divert unused hazardous material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Sealing joints compound.

.1 Sealing joints compound shall figure on the registered products listing from the qualification and certification program of the CGSB. When a product has been certified with a primer, this primer shall be used in conjunction with the sealing compound.

.2 Sealing compound for dilation and control joints: polyurethane-based, chemically cured, self-levelling two- or three-component elastometric sealant, in accordance with CAN/CGSB 19.24 and ASTM C 920 (type M, grade P or NS, class 25, use T) standards.

.3 Sealing compound for concrete slab joints: one-component, moisture-cured, polyurethane-based, non-sag elastometric sealant in accordance with CAN/CGSB 19.24 and ASTM C 920, (type S, grade P or NS, class 25, use T) standards.

.4 Sealing compound for vertical joints: two- or three-component, chemically cured, polyurethane-based, elastometric sealant in accordance with CAN/CGSB 19.24 and ASTM C 920, (type M, grade NS, class 25 or 50) standards.

.2 Premoulded joint fillers:

.1 Bituminous fiber board: to ASTM D 1571, bituminous impregnated fiber board, premoulded and resilient. Dimensions shall be as indicated on drawings.

.1 Substitute product: Deck-o-foam from W.R. Meadows.

.2 Sponge rubber: to ASTM D 1752, type I, flexible or firm.

.3 Standard cork: to ASTM D 1752, type II.

.4 Self-expanding cork: to ASTM D 1752, type III.

.3 Water repellent.

.1 Deep penetrating, 100% silane formulation that produces a hydrophobic treatment on concrete and masonry.

.4 Backer rod: closed-cell polyethylene foam, dimensions as required per drawings.

.5 Steel for embedded steel elements: to CSA G40.21 grade 350W or superior.

.6 Shrinkage compensating grout: premixed compound to ASTM C 1107/C 1107M type C, 50 MPa minimum compressive resistance after twenty-eight (28) days.

PART 3 EXECUTION

3.1 ANCHOR BOLTS

.1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.

.2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative. Spacing between anchor bolts shall be within a 1.5 mm tolerance.

.3 Provide a certificate of compliance signed by an engineer attesting that installation of anchor rods complies to the anchoring plan and that concrete foundations reached the strength required to support the erection of steel structure, in accordance with article 3.24.12 of the Safety Code for the construction industry.

3.2 JOINT FILLERS (BACKING FOAM/BACKER ROD)

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.

.2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Locate and form isolation, construction and expansion joints as indicated.

.4 Use 12 mm thick joint fillers to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

3.3 JOINTS SEALING

.1 Clean and dry joint surfaces. Cleaning shall be accomplished by mechanical means. All joint surfaces must be clean, sound, dry and frost-free. Joint walls must be free of oils, tar, asphalt, bitumen, grease, paints, coatings, sealers, curing compound residues, and any other foreign matter that might prevent adhesion.

.2 Bond breaker tape, backing foam or backer rod must be used in bottom of joint to prevent bond. Leave free space of sufficient height to place a thickness of sealant in accordance with manufacturer’s recommendations.

.3 Before applying sealant, apply primary per manufacturer’s recommendation. Clean surrounding areas after application.

3.4 EMBEDDED STEEL

.1 Fabrication of embedded steel elements in accordance with CSA S16.

.2 Ensure galvanic separation (galvanization, neoprene or other) between any steel and aluminium element.

3.5 APPLICATION – SEALER FOR CONCRETE SURFACES (WATER REPELLENT)

.1 Apply a water repellent on all concrete surfaces that may be or are in contact with water, including concrete exposed to weather conditions.

.2 Concrete shall be cured for twenty-eight (28) days prior to waterproofing surfaces.

.3 Surfaces shall be clean and dry before applying water repellent. Between twenty-four (24) and seventy-two (72) hours prior to application, surfaces shall be cleaned using a high-pressure (5 000 lb.) water jet to eliminate any residue (coating, laitance, oil, dirt or other) on concrete.

.4 Air, material and surface temperatures shall be 5 °C or higher during application. Do not apply sealer when temperature is expected to drop under 0 °C within twelve (12) hours.

.5 Cover or protect with drop cloth nearby shrubbery, landscaping, pavement or other.

.6 Apply sealer at a maximum rate of 4.3 m^2/l. Submit method of application and method of control to the Departmental Representative. Follow manufacturer's recommendations, especially when rate of application need be reduced in presence of porous concrete.

.7 Sealed surface shall be protected against rain and any splashing at least six (6) hours following treatment.

3.6 EXECUTION – CHEMICAL ANCHORING SYSTEM

.1 Drill hole normal to the surface, 4 mm larger than anchor rods, or more, as indicated by anchoring system manufacturer.

.2 Borehole shall be free of dust, debris, ice, oil, grease and other contaminants. Use a hammer drill set in rotation-hammer mode for drilling. Use round steel brush and oil-free compressed-air blower for cleaning, per manufacturer's recommendation.

.3 Prepare and apply epoxy as indicated in manufacturer technical datasheet.

.4 Partially fill hole with epoxy before placing anchor rod. Inject epoxy to fill out the hole.

.5 Unless otherwise indicated, anchor depth shall be fifteen (15) times the diameter of the rod.

3.7 EXECUTION – CORROSION INHIBITOR

.1 Clean rebars using dry or wet sand blast. Remove all concrete, dirt, oil, grease, rust and any other contaminants from surfaces. Use a steel brush to remove all traces of rust.

.2 Clean concrete by waterblasting or lightly sandblasting to obtain a clean and sound surface free of dirt, dust, oil, grease, efflorescence or any contaminants.

.3 Allow substrate to dry for twenty-four (24) to seventy-two (72) hours depending on weather conditions before applying inhibitor. Substrate shall be as dry as practical prior to application.

.4 Using a brush, roller or low-pressure hand-spray equipment, apply the corrosion inhibitor to saturation. Follow manufacturer's recommendation for number of coats and waiting time between applications.

.5 When applying a follow-up sealer, coating, repair mortar, or concrete or polymer overlay over a surface treated with a corrosion inhibitor, allow at least twenty-four (24) hours or more per manufacturer's recommendation after application. Clean surface by mean of pressure washing or blastcleaning to remove any residue left by the application of corrosion inhibitor.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 11 00 – Concrete Forming.

.2 Section 03 15 00 – Concrete Accessories.

.3 Section 03 30 00 – Cast-in-Place Concrete.

.4 Section 03 35 00 – Concrete Finishing.

.5 Section 03 39 00 – Concrete Curing.

.6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 REFERENCES

.1 American Concrete Institute (ACI).

.1 ACI 318-14, Building Code Requirements for Structural Concrete with Commentary.

.2 ACI 421.1R-08, Guide to Shear Reinforcement for Slabs.

.3 ACI 421.2R-10, Guide to Seismic Design of Punching Shear Reinforcement in Flat Plates.

.4 SP 66-04, ACI Detailing Manual 2004.

.1 ACI 315-99, Details and Detailing of Concrete Reinforcement.

.2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.2 American Society for Testing and Materials International (ASTM).

.1 ASTM A 143/A 143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.2 ASTM A 641/A 641M-09a(2014), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

.3 ASTM A 706/A 706M-16, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

.4 ASTM A 722/A 722M-18, Standard Specification for Uncoated High-Strength Steel Bars for Prestressing Concrete.

.5 ASTM A 767/A 767M-16, Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

.6 ASTM A 780/A 780M-09(2015), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.7 ASTM A 1035/A 1035M-11, Standard Specification for Deformed and Plain, Low-carbon, Chromium, Steel Bars for Concrete Reinforcement.

.8 ASTM A 1044/A 1044M-16, Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete.

.9 ASTM A 1060/A 1060M-15, Standard Specification for Zinc-Coated (Galvanized) Steel Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.10 ASTM A 1064/A 1064M-18a, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.3 Canadian Standard Association (CSA)/CSA International.

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;

.2 CSA A23.3-14, Design of Concrete Structures;

.3 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement;

.4 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CSA S413-14, Parking Structures.

.6 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC).

.1 RSIC-2018, Reinforcing Steel Manual of Standard Practice.

.5 Canadian General Standards Board (CGSB).

.1 CAN/CGSB 1.181-99, Ready-Mixed, Organic, Zinc-Rich Coating.

1.3 ACTIONS AND INFORMATIONNAL SUBMITTALS

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

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315 standard.

.3 Submit shop drawings. Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Lists of reinforcing elements.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by the Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.

.4 Submit, in conjunction with shop drawings, lists of steel reinforcing elements corresponding to shop drawings.

.5 Verify on field all dimensions and levels not defined on drawings or that may depend on field conditions.

.6 The Departmental Representative may take up to ten (10) working days to verify and return shop drawings.

.7 Corrections and comments made on shop drawings during the revision process do not limit the Contractor responsibility to respect requirements of drawings and specifications. Review of shop drawings is done only to ensure the general conformity in regard to design and contract requirements. Contractor shall confirm and correlate all dimensions and characteristics, choose method of fabrication and construction and execute work safely.

.8 If revision required on shop drawings are too numerous or too important, the Departmental Representative will return drawings without annotations, awaiting a new submittal. If drawings are submitted more than two times, the Contractor shall pay, by mean of a permanent deduction, the cost of review.

.9 Work shall not begin before shop drawings have been reviewed by the Departmental Representative.

.10 The Contractor assumes full responsibility for the exactness of his drawings. He may not claim any extra charge for delays resulting from the discovery, be it on the field or before, of mistakes on his drawings, even if they were examined by the Departmental Representative.

1.4 REBAR DETAILLING

.1 In general, use details in accordance with RSIC *Reinforcing Steel Manual of Standard Practice*.

.2 Unless otherwise indicated, development lengths and cover shall be in accordance with articles 7 and 12 of CAN/CSA A23.3 standard.

.3 Detail lap lengths and bar development lengths as type B tension lap splices unless otherwise indicated. Refer to *RSIC Reinforcing Steel Manual of Standard Practice*, table 17B, for lap lengths.

.4 Dimensions of ties, spiral reinforcing, hangers and stirrups shall be determined in accordance with minimum concrete cover from article 6.6.6 of CSA A23.1 standard.

.5 Unless otherwise indicated, hooks required, including stirrups and ties, shall be standard hooks as defined in article 6.6.2.2 of CSA A23.1 standard.

1.5 QUALITY CONTROL

.1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.3.3	Concrete reinforcing shop drawings	*Refer to terms and conditions of section 01 33 00*	Transmission letter. Inscription to the technical specification registry.
3.4.2	Certificate of compliance for underslab fill	*Refer to terms and conditions of section 01 33 00*	Certificate of compliance for underslab fill
3.4.3	Certificate of compliance for formworks	*Refer to terms and conditions of section 01 33 00*	Certificate of compliance for formworks
3.4.13	Notice to the Departmental Representative for concrete reinforcing inspection	*Refer to terms and conditions of section 01 33 00*	Breakpoint. Inspection report.

1.6 WASTE MANAGEMENT AND DISPOSAL:

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

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the Departmental Representative.

.4 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the Departmental Representative.

.5 Divert unused hazardous material from landfill to an official hazardous material collections site.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by the Departmental Representative.

.2 Reinforcing steel: unless otherwise indicated, billet bars, to CSA G30.18 grade 400W, or ASTM A 706/A 706M, grade 60.

.3 Galvanized steel bars: to ASTM A 767/A 767M, class I or II.

.4 Galvanized carbon steel wire: to ASTM A 641/A 641M.

.5 Galvanizing of non-prestressed reinforcement: to ASTM A767/A 767M class I or II, minimum zinc coating 610 g/m².

.1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.

.2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.

.3 Temperature of solution equals to or greater than 32 degrees and galvanized steels immersed for minimum of twenty (20) seconds.

.4 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.

.1 In this case, no restriction applies to temperature of solution.

.5 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.

.1 Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.6 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

.7 Zinc-rich coating:

.1 Use zinc-rich coating to CAN/CGSB 1.181 and ASTM A 780/A 780M containing at least 92% of metallic zinc in dried coat, brush applied.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA A23.1, ACI 315 standards and RSIC Reinforcing Steel Manual of Standard Practice.

.2 Fabrication tolerances shall be in accordance with RSIC manual chapter 6 or the following paragraphs, as determined by the more stringent requirement. Bars fabricated without conforming to those tolerances will be rejected.

.3 Tolerance for cutting rebar.

.1 10M and 15M rebar:

.1 Less than 4.0 meters long: ± 12 mm;

.2 4.0 meters or more: ± 25 mm.

.2 20M to 35M rebar: ± 25 mm.

.4 Tolerance for bent rebars.

.1 10M to 35M rebar:

.1 Overall length: ± 25 mm;

.2 Overall height: ± 12 mm;

.3 Hook diameter: ± 12 mm.

.2 Ties and stirrups:

.1 Overall width and length: ± 12 mm.

.5 Obtain the Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.

.6 Ship bundles of bar reinforcement clearly identified in accordance with bar bending details and lists.

.7 Galvanized bars shall be bent after galvanizing.

.1 After the bar is bent, minor peeling of coating is considered acceptable. A value of surface peeling up to the bar nominal section area is considered acceptable. For surface peeling higher than the nominal section area, bar will be rejected and need to be replaced.

.8 All reinforcing steel shall be bent to be parallel to the edge of concrete works, as indicated on drawings. Bending shall be done in shop, as indicated on shop drawings.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide the Departmental Representative with certified copy of mill test report of reinforcing steel, minimum two (2) weeks prior to beginning reinforcing work. Test reports shall indicate physical and chemical properties of steel.

.2 Upon request, submit in writing to the Departmental Representative, proposed source of reinforcement material to be supplied.

.3 Identify bundles of bar reinforcement and wire mesh, in accordance with shop drawings, bar bending details and lists before shipping.

.4 All rebars shall be identified during fabrication. Identification shall include diameter, grade and fabricator. Rebar not properly identified will not be allowed on site.

2.4 STORAGE

.1 Store materials off ground over wood studs or indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area to prevent rusting.

.2 Protect reinforcing steel if stored over a long period.

.3 Replace defective or damaged materials with new.

PART 3 EXECUTION

3.1 PREPARATION

.1 Galvanizing to include chromate treatment.

.1 Duration of treatment: 1 hour per 25 mm of bar diameter.

.2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A 143/A 143M.

3.2 FIELD BENDING

.1 Do not field bend or field weld reinforcement except for a written approval by the Departmental Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars which develop cracks or splits.

.4 Unless otherwise indicated, field weld reinforcement is prohibited. When authorized, weld specially identified rebars.

3.3 CONNECTION TO EXISTING WORK

.1 When connecting to existing work, prior to preparing shop drawings, verify dimensions and condition of existing work, report discrepancies and potential problem areas to the Departmental Representative for direction before commencing fabrication. Dimensions of steel elements shall be modified to adapt for the existing conditions and modifications shall be submitted to the Departmental Representative for approval.

.2 For reinforcement anchored to an existing reinforced concrete or masonry element, use the following procedure, under the sole responsibility of the Contractor:

.1 Detect existing reinforcement bars prior to drilling to locate anchors;

.2 Use manual percussion drilling to drill anchor loads and protect existing reinforcement.

.3 For reinforcement anchored to an existing unreinforced masonry element, use diamond drilling to drill anchors as to protect the existing work. The Contractor may use a different mean of drilling only if he is able to demonstrate that no damage will occur to the existing work due to drilling. If the Contractor uses an alternative mean of drilling, any damage occurring to the existing work following drilling shall be automatically considered his responsibility.

.4 Where new concrete is placed in contact with existing concrete or masonry works, follow the directions below, unless otherwise indicated:

.1 Drill holes with a minimum depth of 150 mm up to a maximum of two thirds of the depth of the existing work;

.2 Place holes at the centre of the existing element, at 300 mm centre-to-centre maximum;

.3 Place 20M reinforcing bars used as dowels in holes and pack solidly with adhesive and hold dowels in positions until the adhesive as set.

.4 Use chemical adhesive.

3.4 PLACING REINFORCEMENT

.1 Clean reinforcing steel before placement. Steel shall be free from mud, oil, or other coatings that adversely affect bond strength. Bar surface shall be in accordance to CSA A23.1 article 6.1.6.

.2 Prior to placing concrete reinforcement for slabs on grade, Contractor shall demonstrate to the Departmental Representative the compliance of underslab fill.

.3 Prior to placing concrete reinforcement in general, Contractor shall demonstrate to the Departmental Representative the compliance of formworks (see section 03 11 00).

.4 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1. Refer to article 6.6.7 of this standard for placement and number of supports.

.5 Attach reinforcing steel solidly to supports to prevent any movement during concreting.

.6 Support bars are not included on drawings. Use 15M reinforcing bar spaced at 1 000 mm on center to support top reinforcing steel.

.7 When concrete will never be exposed to weather conditions, use chairs and hangers with nylon- or plastic-covered extremities.

.8 When concrete will be exposed to weather conditions or sandblasted, use chairs and hangers with nylon- -covered extremities or fabricated with stainless steel.

.9 For slab-on-grade and footings, reinforcing steel is placed on chairs, supports and/or cement brick, spaced on center 1 000 mm maximum.

.10 Rocks, piece of rocks, woods or pipes shall not be used to support reinforcing steel.

.11 Lifting the reinforcing steel with a hook at the time of concreting is prohibited.

.12 Install dowels and anchors for walls and columns with template before concreting. Spacing of anchors shall be within 1.5 mm of dimensions indicated on drawings.

.13 At least forty-eight (48) hours prior to placing concrete, obtain the Departmental Representative approval of reinforcing material and placement.

.14 Ensure cover to reinforcement is maintained during concrete pour.

.15 During concreting, a worker shall be assigned to replacing reinforcing steel that may have been displaced during the operation.

.16 Drill holes into concrete, place adhesive and anchor steel into existing concrete per manufacturer’s recommendations.

.17 Protect reinforcement coating during concreting.

3.5 CONCRETE COVER

.1 Unless otherwise indicated, cover thickness for reinforcement in concrete, shall be:

Exposure condition	**Exposure class**		
	Not exposed	**Exposed to freezing thawing**	**Exposed to chlorides**
Cast against and permanently exposed to earth, including footings and piles	75	75	75
Beams, girders and columns	30	40	60

Exposure condition	Exposure class		
	Not exposed	**Exposed to freezing thawing**	**Exposed to chlorides**
Slabs, walls and joists	25	40	60
Ratio of cover to nominal bar diameter	1.0	1.5	2.0
Ratio of cover to nominal maximum aggregate size	1.0	1.5	2.0

« Not exposed » concrete refers only to concrete that will be continually dry within the conditioned space (i.e., members entirely within the vapour barrier of the building envelope).

3.6 FIELD TOUCH-UP

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

.1 For galvanized steel, use zinc-rich coating to article 2.1.7.

3.7 WIELDING

.1 Unless written approval, do not weld reinforcement.

.2 When welded splice are specified and location has been approved by the Departmental Representative, weld reinforcement in accordance with CSA W186 and article 6.6.10 of CSA A23.1 standard. Weldable (W) grade reinforcement shall be used.

.3 Welding shall be done by Contractor certified by the Canadian Welding Bureau.

3.8 INSULATION IN WALLS

.1 The Contractor shall take into account that insulation will be placed within foundation wall formworks when placing concrete reinforcing.

.2 Placement of insulation within formworks shall be done by the formwork Contractor, in collaboration with the reinforcement Contractor.

END OF SECTION

PART 1 GENERALS

1.1 RELATED REQUIREMENTS

.1 Section 03 11 00 – Concrete Forming.

.2 Section 03 15 00 – Concrete Accessories.

.3 Section 03 20 00 – Concrete Reinforcing.

.4 Section 03 35 00 – Concrete Finishing.

.5 Section 03 39 00 – Concrete Curing.

.6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 REFERENCES

.1 American Concrete Institute (ACI).

.1 ACI 302.1R-15, Guide for Concrete Floor Slab Construction.

.2 ACI 305R-10, Hot Weather Concreting.

.3 ACI 306R-16, Recommended Practice for Cold Weather Concreting.

.4 ACI 309R-05, Guide for Consolidation of Concrete.

.2 American Society for Testing and Materials International (ASTM).

.1 ASTM A 820/A 820M-11, Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.

.2 ASTM C 31/C 31M-19, Standard Practice for Making and Curing Concrete Test Specimens in the Field.

.3 ASTM C 33/C 33M-18, Standard Specification for Concrete Aggregates.

.4 ASTM C 39/C 39M-18, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

.5 ASTM C 42/C 42M-18a, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

.6 ASTM C 88-18, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.

.7 ASTM C 109/C 109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

.8 ASTM C 143/C 143M-15a, Standard Test Method for Slump of Hydraulic-Cement Concrete.

.9 ASTM C 260/C 260M-10a (2016), Standard Specification for Air-Entraining Admixtures for Concrete.

.10 ASTM C 330/C 330M-17a, Standard Specification for Lightweight Aggregates for Structural Concrete.

.11 ASTM C 457/C 457M-16, Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete

.12 ASTM C 494/C 494M-17, Standard Specification for Chemical Admixtures for Concrete.

.13 ASTM C 535-16, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.14 ASTM C 618-19, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

.15 ASTM C 873/C 873M-15, Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds.

.16 ASTM C 989/C 989M-13, Standard Specification for Slag Cement for Use in Concrete and Mortars.

.17 ASTM C 1017/C 1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.18 ASTM C 1116/C 1116M-10a(2015), Standard Specification for Fiber-Reinforced Concrete.

.19 ASTM C 1157/C 1157M-17, Standard Performance Specification for Hydraulic Cement.

.20 ASTM C 1202-19, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.

.21 ASTM C 1240-12, Standard Specification for Silica Fume Used in Cementitious Mixtures.

.22 ASTM C 1609/C 1609M-12M, Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading).

.23 ASTM C 1611/C 1611M-18, Standard Test Method for Slump Flow of Self-Consolidating Concrete.

.3 Canadian Standard Association (CSA)/CSA International.

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A23.3-14, Design of Concrete Structures.

.3 CSA A283-06(R2011), Qualification Code for Concrete Testing Laboratories.

.4 CSA A3000-18, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.1 CSA A3001-18, Cementitious materials for use in concrete.

.4 Bureau de normalisation du Québec (BNQ).

.1 NQ 2560-600 (2003), Granulats - Matériaux recyclés fabriqués à partir de résidus de béton, d'enrobés bitumineux et de briques - Classification et caractéristiques.

.2 NQ 2621-900 (2005), Bétons de masse volumique normale et constituants.

.3 BNQ 2621-905 (2012), Béton prêt à l’emploi - Programme de certification.

.5 Ministère des Transports du Québec (MTQ).

.1 Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation, édition 2019 (CCDG 2019).

.2 Norme 3301, Bétons de masse volumique normale.

.6 International Concrete Repair Institute (ICRI).

.1 Guideline No. 310.1R-2008, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion.

.2 Guideline No. 320.1R-1996, Guide for Selecting Application Methods for the Repair of Concrete Surfaces.

.3 Guideline No. 320.2R-2009, Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces.

1.3 DESIGN CRITERIA

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

1.4 ACTIONS AND INFORMATIONNAL SUBMITTALS

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

.2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.

.3 Minimum four (4) weeks prior to starting concrete work, submit to the Departmental Representative test reports and certificate from testing laboratory certifying that the following materials meet the requirements of this section:

.1 Portland cement,

.2 Blended hydraulic cement,

.3 Supplementary cementing material,

.4 Admixtures,

.5 Aggregates,

.6 Water.

.4 Provide the Departmental Representative, at minimum fourteen (14) days prior to starting concrete work, with valid and recognized certificate from plant delivering concrete. Certificate shall indicate that plant, materials and methods used in fabricating concrete are in accordance with CSA A23.1 standard.

.1 Concrete provider shall be certified by the BNQ in accordance with requirements of BNQ 2621-905 qualification pamphlet.

.2 If plant does not have a valid certificate, submit test data and certificate from independent testing laboratory certifying that concrete mix materials meet the requirements of this section.

.5 Minimum fourteen (14) days prior to starting concrete work, provide proposed quality control procedures for review by the Departmental Representative on following items:

.1 Falsework erection.

.2 Hot weather concrete.

.3 Cold weather concrete.

.4 Curing.

.5 Finishes.

.6 Formwork removal.

.7 Joints.

.6 Minimum fourteen (14) days prior to starting concrete work, provide the Departmental Representative with concrete mix formulas including admixtures for this project. Concrete formulas shall be submitted to testing laboratory for approval prior to beginning work.

.1 Include analysis results certifying that aggregates used are non-reactive. Provider shall demonstrate that aggregates contain non-significant quantities of pyrrhotite or other harmful minerals.

.7 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet the specified resistance.

.8 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

1.5 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with section 01 45 00 - Quality Control.

.2 Pre-installation Meetings: in accordance with section 01 32 16.07 - Work scheduling - Bar (GANTT) Chart.

.1 Ensure key personnel, site supervisor, the PSPC representative, speciality contractor - finishing, forming, concrete producer and testing laboratories attend.

.2 Verify project requirements.

.3 Realize the following activities and submit required documents:

Art.	Prescriptions	Period (Frequency)	Registry
1.4.3 and 2.2	Technical descriptions of products and components of cast-in place concrete.	*Refer to terms and conditions of section 01 33 00*	Transmission letter. Inscription into the technical specification registry.
1.4.6	Concrete mix formulas.	*Refer to terms and conditions of section 01 33 00*	Transmission letter. Inscription into the technical specification registry.
1.4.5 and 3.4.1	Procedure for hot-weather concreting,	*Refer to terms and conditions of section 01 33 00*	Procedure for hot-weather concreting
1.4.5 and 3.6.1	Procedure for cold-weather concreting	*Refer to terms and conditions of section 01 33 00*	Procedure for cold-weather concreting
3.1.2, section 03 20 00	Notice to the Departmental Representative for concrete reinforcing inspection.	*Refer to terms and conditions of section 01 33 00*	Breakpoint Inspection report
3.1.12	Concrete pour registry	*Refer to terms and conditions of section 01 33 00*	Concrete pour registry. Delivery slip.
3.12	Concrete and concrete ingredients tests.	*Refer to terms and conditions of section 01 33 00*	Test reports.
3.3.1.1	Inspection of concrete reinforcement.	*Refer to terms and conditions of section 01 33 00*	Inspection report

1.6 DELIVERY, STORAGE AND HANDLING

.1 Concrete hauling time: deliver to site of work and discharged within one hundred and twenty (120) minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from the Departmental Representative and concrete producer as described in CSA A23.1.

.2 Deliver concrete using means to prevent separation of concrete mix component or any alteration to consistency.

.3 Waste management and disposal:

.1 Separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Management and disposal of construction / demolition waste.

.2 Divert unused concrete and concrete materials to local quarry after receipt of written approval from the Departmental Representative.

.3 Provide on-site adequate space for the safe washing of concrete trucks.

.4 Divert unused admixtures from landfill to an official hazardous material collections site.

.5 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.6 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Portland Cement: to CSA A3001 or ASTM C 1157, type GU, unless otherwise indicated.

.2 Blended hydraulic cement: to CSA A3001 or ASTM C 1157, type GUb-SF, unless otherwise indicated.

.3 Supplementary cementing materials: to CSA A3001.

.1 Fly ash and natural pozzolan: to ASTM C 618.

.2 Ground granulated blast-furnace slag: to ASTM C 989/C 989M.

.3 Silica fume: to ASTM C 1240.

.4 Water: to CSA A23.1, article 4.2.2.

.5 Non-reactive to alkalis aggregates: to CSA A23.1, article 4.2.3 and ASTM C 33/C 33M, normal weight coarse aggregate.

.1 The particles must be clean, durable, without dust or deleterious materials, containing less than 25% of flat particles and less than 45% elongated particles, as determined by testing according to CSA A23.2-13A.

.2 Loss by abrasion (to ASTM C 535, CSA A23.2-16A) shall be less than 50%. Loss shall be less than 12% after five (5) cycles of testing soundness by use of sodium sulfate or magnesium sulfate (ASTM C 88, CSA A23.2-9A).

.3 Aggregates should not be made of fine-grained limestone and crystalline limestone.

.4 The use of potentially reactive aggregates will be permitted only if compensatory measures as defined in CSA A23.2-27A are used. The use of a mixture containing potentially reactive aggregates is subject to the written approval of the Departmental Representative, under favorable opinion of the laboratory responsible for the quality control of materials.

.6 Fine aggregates (sand): to CSA A23.1, article 4.2.3 and ASTM C 33/C 33M, normal weight.

.7 Lightweight aggregates: to ASTM C 330/C 330M.

.8 Recycled aggregates: to NQ 2560-600.

.9 Admixtures:

.1 Air entraining admixture: to ASTM C 260.

.2 Chemical admixture: to ASTM C 494/C 494M or ASTM C 1017/C 1017M when added to flowing concrete. The Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

2.2 MIXES

.1 Provide concrete to meet content and performance requirements defined by the Departmental Representative in accordance with CSA A23.1 on following articles. Refer to table 1 and table 2 of CSA A23.1 for requirements related to class of exposure.

.2 Ensure that concrete supplier meet component and performance requirements identified hereafter and control compliance as indicated in article FIELD QUALITY CONTROL or PART 3.

.3 The concrete mix used for concrete in the construction of concrete works, concrete slab on soil, footings, cleanliness bases, foundation walls, structural slab, concrete for supports, sidewalks, exterior slabs, monuments concrete base/slab, steps, pavement, curbs, gutters, protection posts and fence pilasters, concrete base for lamppost and flagpole must be compliant. to the following requirements:

.1 Cement: Portland cement type GUb-SF (10-SF);

.2 Nominal size of coarse aggregate: 20 mm;

.3 Slump at discharge: 80 ± 30 mm, except for molded curbs where slump shall be 30 ± 20 mm;

.4 Air content: 5 to 8 %;

.5 Class of exposure: C-2 – for reinforced elements use C-1 class;

.6 Minimum compressive strength: 35 MPa at twenty-eight (28) days.

.4 Concrete mix used for **lean concrete** shall meet the following requirements:

.1 Cement: Portland cement type GU (10);

.2 Nominal size of coarse aggregate: 20 mm;

.3 Slump at discharge: 80 ± 30 mm;

.4 Air content: 5 to 8 %;

.5 Class of exposure: N;

.6 Minimum compressive strength: 15 MPa at twenty-eight (28) days.

.5 Concrete mix used for **duct banks and the concrete support of streetlights** shall meet the following requirements:

.1 Cement: Portland cement type GU (10);

.2 Nominal size of coarse aggregate: 10 mm;

.3 Slump at discharge: 150 ± 30 mm;

.4 Air content: 5 to 8 %;

.5 Water to cementitious material ratio: 0.6 max;

.6 Nominal cement content: 250 kg/m^3;

.7 Minimum compressive strength: 20 MPa at twenty-eight (28) days.

.6 Pilasters included within foundation walls shall be built with the same concrete as the foundation walls. Stand-alone pilasters or independent columns within ground shall be built using the same concrete mix as columns.

.7 Concrete supplier and Contractor shall ensure that all concrete meet the following requirements:

.1 Unless otherwise indicated, aggregates shall be of normal weight.

.2 For all parts of work, concrete mix shall be homogeneous and when cured, have the strength, resistance to deterioration, durability, appearance and other properties required by this specification.

.3 Mix design shall ensure durability, strength, workability and other properties required for concrete.

.4 Mix shall ensure that concrete flows everywhere into formworks, wrap up reinforcing bars completely but without allowing segregation of materials or excessive bleeding

.5 Concrete shall be free from surface blemishes, loss of mortar or color variations.

.8 For floors with a trowel finish, Concrete Provider and Contractor shall ensure that concrete mix is appropriate to obtain the level of quality desired for the slab finish.

.1 Use a concrete mix having a minimum compressive strength of 25 MPa and a maximum water-to-cementitious ratio of 0.55, as specified for class N-CF concrete.

.2 For slab poured directly on a vapour retarding membrane, use a maximum water-to-cementitious ratio of 0.45 or less. If using a mix with a ratio higher than 0.45, the Contractor shall allow for a longer drying period for the slab to obtain the relative humidity appropriate to place floor covering.

.3 To ensure proper placement and finishing, consider using superplasticizer. Initial concrete slump should be near 60 mm and final slump should reach near 130 mm following addition of superplasticizer.

.9 For slabs on ground screeded by machine, 40 mm blended coarse aggregates may be used.

.10 When concrete thickness is less than 200 mm, maximum size of coarse aggregate shall be 14 mm.

.11 Nominal size of coarse aggregate indicated for mixes should be considered a maximum rather than an absolute. The Contractor may, at his discretion, use smaller aggregates to facilitate concrete placement or for any other consideration, if it results in concrete with equal properties.

2.3 SPECIAL REQUIREMENTS

.1 Use of admixtures.

.1 Provide samples of admixtures on the Departmental Representative's request.

.2 Follow manufacturer's recommendations for admixtures use.

.3 Ensure compatibility of admixtures, between them and with all components of concrete mix.

.4 Use of admixture shall never affect adversely concrete durability including resistance under freeze-thaw cycles.

.2 Internal vibrators shall be used for consolidating concrete.

.3 Do not modify concrete mix formulas without the Departmental Representative approval. If source of supply for concrete materials is modified, new concrete mix formulas need be approved by the Departmental Representative.

.4 No water shall be added into concrete mix during transport or after arrival on jobsite

2.4 METHODS OF TEST FOR CONCRETE

.1 Reference values indicated in this section shall be obtained from tests in accordance with standards indicated in the following table:

Tests	Standard
Air content	ASTM C 457/C 457M, CSA A23.2-4C
Compressive strength of 50 mm cube specimens	ASTM C 109/C 109M
Compressive strength of concrete cylinders	ASTM C 873/C 873M, CSA A23.2-9C
Degradation of coarse aggregates	ASTM C 535, CSA A23.2-16A
Degradation of fine aggregates	ASTM C 88, CSA A23.2-9A
Flat and elongated particles in coarse aggregate	CSA A23.2-13A
Ion chloride permeability	ASTM C 1202
Obtaining and curing concrete test specimens	CSA A23.2-3C
Obtaining and testing drilled cores of concrete (compressive resistance)	ASTM C 42/C 42M, ASTM C 39/C 39M, CSA A23.2-14A
Obtaining concrete test specimens	ASTM C 31/C 31M, CSA A23.2-1C
Slump	ASTM C 143/C 143M, CSA A23.2-5C
Slump-flow (self-consolidating concrete)	ASTM C 1611/C 1611M, CSA A23.2-5C

PART 3 EXECUTION

3.1 PREPARATION

.1 Place formworks in accordance with section 03 11 00 – Concrete Forming. Place embedded elements and concrete reinforcing in accordance with sections 03 15 00 – Concrete Accessories and 03 20 00 - Concrete Reinforcing.

.2 Obtain the Departmental Representative's approval before placing concrete.

.1 Provide forty-eight (48) hours minimum notice prior to placing of concrete.

.3 During concreting operations:

.1 Development of cold joints is not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.3 Placing of concrete shall be done in accordance with article 7.4 of CSA A23.1 standard.

.4 Pumping of concrete is permitted only after approval of equipment and mix, conditional to execution in accordance with testing laboratory recommendations.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing concrete, formworks shall be cleaned and free of water.

.7 Prior to placing of concrete, obtain the Departmental Representative's approval of proposed method for protection of concrete during placing and curing.

.8 Approval is given before concreting, conditional to:

.1 Previous approval of formworks and concrete reinforcing after inspection by the Departmental Representative.

.2 Favorable climatic conditions, namely an external temperature between 5 and 25°C and the absence of rain or snow, unless the Departmental Representative has approved arrangements (shelter, heating, etc.) previously.

.9 Protect previous work from staining.

.10 Take special precautions where concrete will be exposed to prevent any damage.

.11 Clean and remove stains prior to application for concrete finishes.

.12 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken. Submit concrete works registry at the end of each phase of work.

.13 Where new concrete is placed in contact with existing concrete or masonry works, follow the directions below, unless otherwise indicated:

.1 Drill holes with a minimum depth of 150 mm up to a maximum of two thirds of the depth of the existing work;

.2 Place holes at the centre of the existing element, at 300 mm centre-to-centre maximum;

.3 Place 20M reinforcing bars used as dowels in holes and pack solidly with adhesive and hold dowels in positions until the adhesive as set.

.4 Unless otherwise indicated, use chemical adhesive in accordance with section 03 20 00.

.14 Do not load new concrete until authorized by the Departmental Representative.

3.2 PRODUCTION OF CONCRETE

.1 Provide ready-mixed concrete, fabricated in concrete plant, delivered and offloaded to site in accordance with section 5.2 of CSA A23.1 standard. Alternatively, provide concrete fabricated on site in accordance to the same section. When concrete is fabricated on site, submit methods and equipment for approval by the Departmental Representative.

.2 Producer of ready-mixed concrete is the sole responsible for formulation of concrete. Producer shall take all steps required to ensure production of high quality, uniform concrete.

.3 Request from concrete provider delivery slip for each delivery of concrete and hand over one copy to the Departmental Representative. Delivery slip shall include: name and address of the batch plant, truck number, name of Contractor, designation of the job (name and location), class or designation of the concrete, amount of concrete delivered and cumulative amount, time of loading, of beginning of unloading and of end of unloading, maximum size of coarse aggregate, slump and air content required, admixtures used, amount and type of cement and water quantity.

.4 **Adding water after initial batching at concrete plant is prohibited,** notwithstanding any indications given in article 5.2.5.3.2 of CSA A23.1 standard. Use water-reducing admixture to ASTM C 494, type F or G, to correct concrete's slump.

.5 Plan fabrication of concrete and spread deliveries to site to ensure that pouring is continuous.

.6 Never again batch concrete or mortar after beginning of hardening.

.7 Concrete temperature at discharge shall be within limits of table 14 of CSA A23.1, tested to article 5.2.5.4 of the same standard. Use protective measures whenever necessary.

3.3 INSTALLATION / APPLICATION

.1 Prior to concreting, the Contractor shall demonstrate to the satisfaction of the Departmental Representative the conformity of the following work. Ensure that the Departmental Representative has released the following breakpoints before starting any subsequent activity

.1 Concrete reinforcement work (see section 03 20 00);

.2 Anchors, sleeves and embedded elements work (see section 03 11 00 article 3.2);

.3 Joint fillers work (see section 03 15 00 article 3.2).

.2 Prior to concreting, ensure that the following procedures and / or methods have been submitted and approved by the Departmental Representative:

.1 Methods for cold-weather concreting (see article 3.6.1);

.2 Methods for hot-weather concreting (see article 3.4.1).

.3 Execute cast-in-place concrete work in accordance with CSA A23.1.

.4 Saturate with water hardened concrete surfaces where new concrete will be placed.

.5 Bond fresh concrete to rock or hardened concrete in accordance with CSA A23.1 article 7.8.5.

.6 Concrete shall look good, be free from honeycomb, cold joints, burrs or other defects.

.7 Wherever concrete will be exposed, take special precautions in placing concrete and in using good quality brand-new formworks.

.8 Ensure no shocks or impacts occur on formworks and on freshly poured concrete.

.9 Deposit concrete in horizontal layers, 500 mm thick maximum, as near as possible to its final position.

.10 The Contractor is the sole responsible for choosing free-drop height of concrete as to obtain a high-quality work. In general, free-drop shall not exceed 1.5 m to prevent segregation. Use chutes, slides and/or trunks whenever necessary.

.11 For placing concrete for any concrete element, specifically columns, shear walls and any element with significant reinforcing quantity, use superplasticizer admixture to facilitate placing.

.12 Internal vibrators shall be used for consolidating concrete. Vibrators shall be applied at such spacing intervals as to compact all concrete properly. Do not vibrate excessively as to prevent segregation. Do not use vibration to force concrete horizontally in place. Follow requirements of CSA A23.1 article 7.4.4.2 and ACI 309R for consolidating concrete.

.13 Do not place concrete in water unless special authorization is given. Follow the Departmental Representative and testing laboratory instructions strictly. If a special authorization is given for placing concrete in water, use an anti-washout admixture.

.14 Under adverse weather or if equipment failure occurs, take measures to prevent deterioration of freshly poured concrete. When discontinuing work, prepare construction joints and protect fresh concrete with membranes.

.15 If Contractor does not use shores, the Departmental Representative may request that the Contractor demonstrates, by mean of a letter signed by an engineer member of the Ordre des ingénieurs du Québec (OIQ), that shores are not required for that part of works.

.16 When placing concrete for slabs, follow the requirements of ACI 302.1R standard.

.17 Place grout under machinery bases and pedestals, per manufacturer's recommendations, to obtain a bearing surface of 100% of the area covered by grout.

3.4 HOT-WEATHER CONCRETING

.1 Hot-weather concreting shall be done in accordance to CSA A23.1, article 7.1.1 and ACI 305R. Submit, for approval by the Departmental Representative, hot-weather concreting procedure prior to beginning works.

.2 The Contractor shall protect in-place concrete against the effects of heat and dry weather. During very hot periods, the Contractor must protect formworks, reinforcement and concreting equipment against the direct rays of the sun or cool them by spraying water.

.3 When outside temperature is 25°C or more, or when the Departmental Representative judges that the temperature may rise to 25°C or more during concreting, use special precautions to maintain concrete temperature as low as practicable, and never higher than 30°C when minimum dimension of concrete element is smaller than 1 m, 25°C when this dimension is between 1 and 2 m and 20°C for elements larger than 2 m.

.4 Costs for hot-weather concreting are included in concrete pricing.

3.5 PROTECTION AGAINST DRYING

.1 During placement of concrete, Contractor shall estimate the rate of superficial moisture evaporation using figure D.1 of CSA A23.1 standard. When the rate is higher than 0.50 kg/(m^2*h), the Contractor shall use the supplementary measures defined by article 7.1.1 of CSA A23.1, such as:

.1 Wet support before placing concrete.

.2 Lower concrete temperature.

.3 Cover concrete surface prior to and between different steps when finishing concrete.

.4 Vaporize water (use fogging) continuously after concrete placement, taking care that ponding does not occur.

.5 Start curing immediately after final finishing; or

.6 Place and finish concrete by night or early in the morning.

.2 In addition to measures defined in article 3.5.1, the Contractor may use an evaporation retardant to article 2.1.14 as a supplementary measure. The evaporation retardant shall be used immediately after concrete placement, following the manufacturer's recommendations. Depending on climatic conditions, many successive applications may be required.

.3 The Departmental Representative or the representative from the testing laboratory may require the use of the supplementary measures listed above if the Contractor is not able to demonstrate that the rate of superficial moisture evaporation is lower than 0.50 kg/(m^2*h).

3.6 COLD-WEATHER CONCRETING

.1 Cold-weather concreting shall be done in accordance with CSA A23.1, article 7.1.2 and ACI 306R. Submit, for approval by the Departmental Representative, cold-weather concreting procedure prior to beginning works.

.2 Before placing concrete under cold-weather conditions, all equipment needed to protect concrete shall be available on site of works.

.3 Obtain approval from the Departmental Representative before pouring concrete when exterior temperature is below 5°C.

.4 When outside temperature is 5°C or below, or when the Departmental Representative judges that temperature may fall below 5°C during concreting, ensure that concrete temperature remains above 16°C, and never higher than 32°C. Heat water and aggregates if necessary, before mixing.

.5 When concreting is not done under heated enclosures, the Departmental Representative may stop concreting if temperature drops to -10°C or below or if winds or snow affects adversely concreting.

.6 Before concreting, inner walls, reinforcing bars and bottom of formworks shall be cleaned free of snow or ice. Heat formwork and reinforcing bars if necessary. No concrete shall be poured where surfaces or reinforcing bars temperature is below 5°C.

.7 After concreting, maintain surface temperature of concrete at 21°C for a minimum of three (3) days or 10°C for a minimum of seven (7) days. Concrete temperature shall remain over freezing point for a minimum of seven (7) days and concrete shall not be exposed under freeze-thaw cycles for a minimum of fourteen (14) days.

.8 Use of calcium chloride, other de-icing salts or chemical products as substitute to proper curing and protection methods is prohibited.

.9 After protection, concrete temperature shall be lowered progressively, up to a maximum of 6°C per day, until concrete reaches the outside temperature.

.10 If heated enclosures are used, the Contractor shall, if necessary, moisten air to maintain concrete and formwork moist. Stationary heaters can be used as long as concrete surfaces will not be exposed to heating gazes resulting from combustion.

.11 Costs for cold-weather concreting are included in concrete pricing.

3.7 CONSTRUCTION JOINTS

.1 Refer to CSA A23.1, article 7.2 for construction joints.

.2 When concrete works are of a volume or complexity such that placing cannot be done in one operation, the Contractor shall, with approval of the Departmental Representative, add construction joints even where there is no indication on drawings. Costs for materials and handiwork required to execute construction joints shall be assumed by the Contractor.

.3 The Contractor shall submit a drawing with location and details for construction joints to the Departmental Representative, who may take up to two (2) weeks before approving it.

.4 Irregular construction joints are prohibited.

.5 Concrete reinforcement shall be continuous through the construction joints.

.6 Construction joints indicated on drawings are mandatory and shall not be moved.

.7 Before placing new concrete, Contractor shall prepare joint in accordance with the following requirements:

.1 Tighten formworks at joint.

.2 Clean thoroughly hardened concrete to obtain a surface free of foreign matter, laitance, damaged concrete, etc.

.3 Saturate surface with water.

.4 Cover hardened concrete with a mortar of same composition than mortar used for concrete and add a bonding agent following the manufacturer’s recommendations.

3.8 CONCRETING OVER EXISTING CONCRETE WORKS

.1 Pour concrete shown on drawings in accordance with CSA A23.1, article 7.4.

.2 Clean thoroughly concrete used as substrate to obtain a surface free of foreign matter, dusts, damaged concrete, etc.

.3 When needed, clean existing reinforcing bar by grinding or any other means except sandblasting or water blasting. When loss of steel exceeds 25% of reinforcing bar section, replace existing reinforcing bars and add dowels if needed.

.4 Obtain the Departmental Representative approval for exposed surfaces before placing formworks.

.5 Prepare surface in accordance with CSA A23.1 article 7.8.3.2, method c) or d). All laitance, dirt, dust, debris, grease or any other foreign matter that may adversely affect bond between existing and new concrete shall be removed. Surface shall be rough and clean before placing new concrete.

.6 Existing concrete surfaces shall be saturated surface dry (SSD) before placing new concrete. Moisten existing concrete surface for a minimum of four (4) hours before concreting and allow one (1) hour to drain water from surface before placing new concrete.

3.9 CONCRETE CURING AND FINISHING

.1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

.2 Using chisel, break concrete projections left by the open joints of the formwork.

.3 Finishing in accordance with section 03 35 00 – Concrete Finishing.

.4 Curing in accordance with section 03 39 00 – Concrete Curing.

.5 Do not load new concrete before concrete has reached the required strength.

3.10 CONSTRUCTION TOLERANCES

.1 Follow requirements of CSA A23.1, article 6.4, for construction tolerances for cast-in-place concrete.

.2 In case of non-compliance, the Departmental Representative may require the demolition of the non-compliant element and the construction of a new one, following tolerances to article 6.4, without any additional cost. Alternatively, a permanent deduction may be applied to the global price of the contract as a compensation for the lower quality of the work. The Departmental Representative will be the sole judge of the appropriate withholding amount, which may amount up to the equivalent cost of the demolition and reconstruction of the element.

3.11 FIELD QUALITY CONTROL

.1 Conduct tests as follows and in accordance with section 01 45 00 - Quality Control. Submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory, certified according to CSA A283, designated by the Departmental Representative for review in accordance with CSA A23.1.

.3 The Contractor shall cooperate fully to facilitate testing by allowing access to work site and equipment, providing manpower and materials needed to prepare cylinders, and providing a proper secure space for storing samples.

.1 Inform testing laboratory at least twenty-four (24) hours before pouring concrete, no matter the volume of concrete to be poured.

.2 Set aside on site a place protected against weather conditions where concrete cylinders will be stored, at a temperature of at least 10°C and at most 25°C before being delivered to laboratory.

.4 One group of test shall be carried out to evaluate compressive strength for every 50 m^3 of concrete, but not less than one group of test for each class of concrete poured in a given day.

.5 Tests shall be carried out in accordance with the indication of article 2.4 of this specification. A group of test shall include, as a minimum, three (3) cylinders, one slump test and one air content test. Test air content for each concrete truck when concrete will be exposed to freeze-and-thaw cycles or exposed to de-icing salts.

.6 For concrete with fibres, the first group of test for each concrete mix shall include flexural testing of two (2) 150 x 150 x 500 mm beams to ASTM C 1609/C 1609M.

.7 Slump tests shall be carried out in sufficient number to ensure uniform consistency of concrete.

.8 Testing laboratory shall take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.9 The Owner will pay for the costs of tests indicated above.

.10 Non-Destructive Methods for Testing Concrete shall be conducted in accordance with CSA A23.2.

.11 Inspection and testing by the Departmental Representative or testing laboratory cannot replace nor complete the Contractor's quality control. No inspection can liberate the Contractor from his obligations in this respect.

.12 If tests demonstrate that concrete resistance is inferior to specification or to requirements of CSA standards, the Departmental Representative may require obtaining drilled cores from the concrete work for testing. If said tests demonstrate that concrete resistance follows requirements, cost of tests will be assumed by the Owner. If not, costs shall be paid by the Contractor. The Departmental Representative may require that drilled cores be obtained and tested when, based on his opinion, concrete pouring or curing was not done in accordance with the specifications of this section.

3.12 INTERPRETATION OF COMPRESSIVE STRENGTH TEST RESULTS

.1 Interpretation of compressive strength test results will be done in accordance with article 4.4.6.6.1 of CSA A23.1 standard. Concrete meets the requirements of this specification for compressive strength if:

.1 The average value of a group of three (3) consecutive tests equals or exceeds the specified strength.

.2 Compressive strength equals at least the specified resistance minus 3.5 MPa for all individual tests.

.2 When test results do not meet the above requirements, the Departmental Representative may require, without any additional costs from the Contractor, that:

.1 Mix proportions are changed for the remainder of work.

.2 Additional curing is done on the portion of the work represented by test specimens.

.3 Cores be drilled from the portion of structure in question, in accordance with ASTM C 42/C 42M, ASTM C 39/C 39M and CSA A23.2-14C, interpreted to article 4.4.6.6.2 of CSA A23.1.

.4 The portion of structure is submitted to load tests, in accordance with CSA A23.3, article 20.

3.13 NON-COMPLIANT WORK

.1 Structural defect.

.1 Work or part of work has a structural defect when concrete strength, as interpreted by article 3.12 of this specification, does not meet the specified resistance.

.2 Moreover, work or part of work presents a structural defect if one of the following conditions occur:

.1 Concrete mix formula was not approved prior to pouring,

.2 The Departmental Representative and/or testing laboratory was not informed before concreting,

.3 Concrete pouring was not done following the requirements of this specification.

.3 Notwithstanding the results of any tests done during concrete pouring, work or part of work presenting a structural defect has interpreted by article 3.143.13.1.2 is considered as if not meeting the specified strength requirement per article 3.133.12.1.

.4 When specific requirements are given for mixes formula, such as chloride ion permeability or spalling due to salt, to ensure or improve durability of concrete, failure to meet these requirements is considered a structural defect.

.2 Esthetic defect.

.1 Work or part of work has an esthetic defect when concrete is soiled, contaminated by debris, contains honeycombs, surface voids or bug holes, protrusion, smudges, change in colors or any other similar defect.

.2 Notwithstanding the article above, presence of surface voids, bug holes and/or honeycombs in concrete with a class of exposure C-1 or C-XL is considered presenting a structural defect as in article 3.143.13.1.

.3 The following definitions shall be used when determining esthetic deficiencies:

.1 Surface voids or bug holes: Small regular or irregular cavities, usually not exceeding 15 mm in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and compaction.

.2 Honeycombs: Concrete or part of concrete that, due to lack of the proper quantity of fine aggregates or vibrations, contains abundant interconnected large voids or cavities; honeycombs may result from improper consolidation. Any regular or irregular voids exceeding 15 mm in diameter are considered honeycombs.

.3 Protrusion: any part of concrete work protruding 10 mm or more from concrete work.

.4 Smudges: any spillage of concrete from formwork.

.5 Changes in color: any change in color that affects adversely the overall look of the concrete work.

.3 Cracking in new concrete work:

.1 Presence of cracks with openings of 0.5 mm or more in new concrete work is considered a defect. Presence of a network of cracks with openings of 0.3 mm or more is considered a defect. One or more cracks of a total length exceeding 1.5 m on an area of 0.25 m^2 constitute a network of cracks.

3.14 CORRECTIVE WORK

.1 Structural defect.

.1 If, after taking the measures identified in section 3.133.12.2 of this specification, the Departmental Representative still believes that concrete of part of or of all of the works does not meet the strength requirements, he may require strengthening or replacement (demolition and reconstruction) of part of or of the whole work as appropriate. All costs shall be assumed by the Contractor.

.2 Esthetic defect.

.1 Make sure the Departmental Representative has inspected defects before beginning surface repairs.

.2 Any damaged concrete soiled or containing debris shall be repaired in accordance with the Departmental Representative directives.

.3 Honeycombs made visible after removal of formworks will be scraped to solid concrete, to a minimum depth of 10 mm. Repairs shall be circumscribed by saw cuts of a regular shape without angles of 60 degrees or less. Zone of repairs shall extend at least 50 mm into sound concrete near honeycombs.

.4 When necessary, concrete faces will be cut to obtain sharp regular edges using saw. Surfaces will be cleaned, and cavities coated with an epoxy bonding agent then filled with an epoxy modified grout, held in place by formworks if necessary.

.5 Protrusions, burrs, smudges, etc. due to formworks shall be grinded.

.6 If concrete faces finish is not satisfactory, if the extent of repair needed is too extensive or if concrete presents significant changes of colors, the Departmental Representative may require the application of a coating product (cement-based paint, epoxy-based grout, or any other product deemed appropriate) on all exposed faces, without any costs to the Owner.

.7 Corrective work shall conform to article 3.4 of section 03 11 00 – Formwork.

.3 Cracks in new concrete.

.1 Cracks with openings of 0.5 mm or more will be injected as described in section 03 15 00 – Concrete Accessories.

.2 Where a network of cracks is present, the Departmental Representative may require one of the following actions:

.1 Application of a coating product (cement-based paint, epoxy-based grout, or any other product deemed appropriate).

.2 Partial demolition and reconstruction with an appropriate product.

.4 Procedure for repairing deficiencies.

.1 The Contractor is responsible to submit methods for repairing deficiencies. He needs to obtain the Departmental Representative approval of said method before proceeding with reparations.

.2 Refer to Guideline No. 310.1R *Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion* by ICRI when preparing methods for repairing deficiencies. Refer to chapters 5 to 7 when determining geometry and extent of surfaces to demolish prior to repairing.

.3 Refer to Guideline No. 320.2R Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces by ICRI when selecting repair materials.

.4 Refer to Guideline No. 320.1R *Guide for Selecting Application Methods for the Repair of Concrete Surfaces* by ICRI when selecting application method for repair materials.

.5 Inform the Departmental Representative after finishing demolition prior to reparation, at least forty-eight (48) hours before applying repair materials, to allow for inspection.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 11 00 – Concrete Forming.

.2 Section 03 15 00 – Concrete Accessories.

.3 Section 03 20 00 – Concrete Reinforcing.

.4 Section 03 30 00 – Cast-in-Place Concrete.

.5 Section 03 39 00 – Concrete Curing.

.6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections

1.2 REFERENCES

.1 American Concrete Institute (ACI).

.1 ACI 302.1R-15, Guide for Concrete Floor Slab Construction.

.2 American National Standards Institute (ANSI).

.1 ANSI/NFSI B101.1-2009 Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.

.2 ANSI/NFSI B101.3-2012 Test Method for Measuring Wet DCOF of Common Hard-Surface Floor Materials.

.3 American Society for Testing and Materials International (ASTM).

.1 ASTM C 920-18, Standard Specification for Elastomeric Joint Sealants.

.2 ASTM E 430-11, Standard Test Methods for Measurement of Gloss of High-Gloss Surfaces by Abridged Goniophotometry.

.3 ASTM E 965-15, Standard Test Method for Measuring Pavement Macrotexture Depth Using a Volumetric Technique.

.4 ASTM E 1155M-14, Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers [Metric].

.5 ASTM F 710-17, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

.6 ASTM F 1869-16a, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

.4 Canadian Standard Association (CSA)/CSA International.

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.5 Concrete Floors Contractors Association of Canada (CFCA).

.1 Specification Bulletin, Polished Concrete – Gloss & Aggregate Exposure, April 12, 2011.

.6 International Concrete Repair Institute (ICRI).

.1 Guideline No 310.2R-2013 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.3 PERFORMANCES

.1 Products and workmanship quality: in accordance with section 01 61 00 – Common Product Requirements.

.2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.4 TECHNICAL DATASHEETS

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

.2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets. WHMIS datasheets for products used on concrete shall include volatile organic compound (VOC) content. Datasheets shall be in accordance with Health Canada and Human Resources and Skills Development Canada requirements.

.3 Submit instructions relating to products application.

1.5 QUALITY CONTROL

.1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.3.2	Declaration of compatibility of products	*Refer to terms and conditions of section 01 33 00*	Transmission letter. Inscription to the technical specification registry.
1.4	Technical datasheets for concrete finishing products	*Refer to terms and conditions of section 01 33 00*	Transmission letter. Inscription to the technical specification registry.
1.7.5 and 3.6	Evaluation of moisture content of substrate	*Refer to terms and conditions of section 01 33 00*	Breakpoint. Tests report.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Ensure that empty recipients are sealed and stored properly before elimination.

.4 Divert unused hazardous material from landfill to an official hazardous material collections site as approved by the Departmental Representative, in accordance with all applicable legislation.

.5 Dispose of waste generated by work (scarification, stripping of floor, etc.) in an environmentally sound manner.

1.7 ENVIRONMENTAL REQUIREMENTS

.1 Temporary lighting:

.1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 square meters of floor being treated.

.2 Electrical power:

.1 Provide sufficient electrical power to operate equipment normally used during construction.

.3 Work area:

.1 Make work area watertight protected against rain and detrimental weather conditions.

.4 Temperature:

.1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.5 Moisture:

.1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer. Moisture content shall be controlled by laboratory test and a written report presented prior to product application.

PART 2 PRODUCTS

2.1 N/A

PART 3 EXECUTION

3.1 FINISHING OF FORMED SURFACES

.1 Clean and finish formed surfaces in accordance with article 7.9.2 of CSA A23.1 standard. Use smooth form finish in accordance with article 7.9.2.6 for exposed surfaces. Rough form finish in accordance with article 7.9.2.5 is deemed acceptable for all other surfaces.

.2 For all corners of exposed concrete, chamfer corners to 25 mm, even if no indications are given on drawings.

.3 Refer to section 03 11 00 – Concrete Forming for patching of form tie holes.

3.2 PREPARATION OF SLABS

.1 Examine slab surfaces and environmental and workmanship conditions to ensure that all manufacturer’s requirements are met for the application of finishing products. Verify slab levels in regard to shop drawings and manufacturer’s requirements.

3.3 SLAB FLATNESS TOLERANCES

.1 Tolerances for slab and floor finish shall be in accordance to table 21 of CSA A23.1 standard. Method to ASTM E 1155M shall be used to determine slab flatness by determining F numbers. The Contractor shall mandate, at their own expense, a specialized laboratory to perform in situ measurements and provide F numbers for each concrete slab (slab on grade and structural slabs) in compliance with the above-mentioned standards. Results shall be sent to the PSPC representative maximum 48 hours after in situ measurements.

.2 Refer to articles 7.6.1.1 and 7.6.1.4 of CSA A23.1 and the following table to determine slab flatness and methods of finishing. When a slab does not belong specifically to a category listed on the following table or no other specifics indications are given elsewhere, use tolerances associated with class B.

Class	Examples	Recommended Method	Global F number	
			F_F	F_L
A	“Conventional” slab	Manual screeding, trowelling using steel trowels	20	15

*Refer to table 21 of CSA A23.1 standard. The above table was developed using the information contained in table 21.

3.4 SLAB FINISH

.1 Concrete slab finish shall be done in accordance with CSA A23.1 article 7.6 and ACI 308R requirements. Requirements hereby presented shall be read in conjunction with those standards.

.2 Do not sprinkle dry cement or dry cement and sand mix on concrete surfaces.

.3 Control excess bleeding water using methods in accordance with CSA A23.1. Avoid any damage to concrete surfaces.

.4 Initial Finishing.

.1 After the placing, spreading and vibrating of concrete, screed surfaces using properly designed screed or straight-edge.

.2 Using bull float, darby or mechanical equipment as appropriate, work concrete to remove high spots and ridges and to fill voids and hollows. Coarse aggregate shall be slightly embedded into concrete. Surface level shall be as indicated on drawings.

.3 Complete initial finishing before any bleeding or free water appears on the surface of concrete.

.5 Final Finishing – General.

.1 Final finishing includes edging, grooving, floating and trowelling. Commence final finishing as soon as bleed water has disappeared, and concrete has hardened enough to prevent working of excess mortar to the surface.

.2 Unless otherwise indicated, surfaces shall be monolithic, trowelled using steel trowel to obtain a smooth, non-slip, without streaks, trowel marks or ripples.

.3 Finishing quality shall meet all quality requirements for the installation of flooring.

.6 Final Finishing – Stairs and landings.

.1 Finishing quality shall be sufficient to allow proper installation of nonslip coating. Surfaces shall be monolithic, trowelled using steel trowel to obtain a smooth, abrasive, without streaks, trowel marks or ripples.

.2 When specified on architectural drawings, embed one carborundum band in per step over the full width of the stair.

.3 Special care shall be taken to obtain uniform horizontal step nosing.

.7 Finishing – Sidewalks.

.1 Finish surface at levels and slopes determined on drawings. Unless otherwise indicated, transversal slope shall be 1V:40H toward pavement.

.2 Level surface using screed bearing on forms.

.3 Use wood trowels for first trowel pass.

.4 Before concrete hardening, but after a proper delay, sweep the surface using a rough broom or brush, to create a surface without irregularities, holes or any other defect. Surface shall be nonslip.

.5 Prepare cross joints with the appropriate tool for this purpose. Round sidewalk and joints edges with an iron rim of 10 mm radius.

.8 Final Finishing – Ramps.

.1 If needed, surface finish shall allow installation of waterproof membrane. Surface shall be smooth, without streaks, trowel marks or ripples. Finish shall be monolithic, trowelled using wood trowels, and nonslip grooves shall be added to a ramp without membrane.

.9 Ensure that tolerances indicated in section 3.3 are met.

.10 Other works.

.1 Using carborundum, grind straight edges of concrete to obtain a 3 mm radius.

3.5 CONTROL JOINTS

.1 Before twenty-four (24) hours have passed following concreting, cut control joints in accordance with CSA A23.1 standard,

.2 For slabs and toppings, use specialized cutting tools to cut control joints – hand operated concrete saw is not allowed. Vertical joints shall be cut immediately after formwork removal.

.3 When concrete has hardened and surface is dry, follow requirements of section 03 15 00 – Concrete Accessories for joints caulking.

.4 Unless otherwise indicated, refer to drawings for control joint’s location. Where there is no indications, use the general requirements as follow:

.1 Saw cut width shall be 6 mm.

.2 Saw cut depth shall be 40 mm. Where reinforcing steel is present, depth shall be modified as to prevent any damage to reinforcing steel.

.3 Maximum spacing between joints on slabs and concrete toppings shall be 4.5 m in each direction, as indicated in article 7.2.2 of CSA A23.1 standard.

3.6 SLAB WITH FLOOR COVERING

.1 The General Contractor, concrete provider and concrete finisher are jointly and severally liable for slab preparation to receive floor covering, including conformity with the following criteria:

.1 Concrete curing shall be completed.

.2 Maintain ambient temperature of not less than 10 degrees C from at least 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.3 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer. Where no indications are given, the moisture-vapor emission rate must be inferior to 3 lb by 1000 ft^2 (1.465 kg by 100 m^2) per 24 hours as determined by tests performed in accordance with ASTM F 1869.

.4 PH of slab shall be between 5 and 9.

.5 Moisture content and pH shall be controlled by independent laboratory testing and a written report presented prior to product application. The General Contractor is responsible to ensure proper testing and shall assume all costs related to testing.

.2 Prepare slab to receive resilient flooring in accordance with ASTM F 710.

.3 Verify whether joint sealing compound or cementitious floor screed (or similar product) should be used to fill control joint prior to applying floor covering.

3.1 FIELD QUALITY CONTROL

.4 Site tests: conduct tests as follows and in accordance with section 01 45 00 - Quality Control. Submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.5 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory, certified to CSA A283, in accordance with CSA A23.1.

.6 The Contractor shall demonstrate the conformity of the concrete slabs to the flatness criteria of article 3.3 by tests performed by the laboratory for all concrete slabs on the project.

.7 Prior to placing floor covering, or prior to polishing, the Contractor shall provide a written report by the Laboratory responsible for field quality control demonstrating that the slab meets criteria for pH and moisture-vapor emission rate.

3.7 SLAB LEVELLING

.1 Where slab flatness does not meet requirements, apply a cementitious floor screed.

.2 Prepare surfaces by sandblasting, by manual scarification or manual chipping using a "Needle Gun" to provide a surface profile CSP-4 as specified in guideline 310.2R *Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair* of ICRI.

.3 Apply cementitious floor screed per manufacturer’s recommendations.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 11 00 – Concrete Forming.

.2 Section 03 15 00 – Concrete Accessories.

.3 Section 03 20 00 – Concrete Reinforcing.

.4 Section 03 30 00 – Cast-in-Place Concrete.

.5 Section 03 35 00 – Concrete Finishing.

.6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

1.2 REFERENCES

.1 American Association of State Highway and Transportation Officials (AASHTO).

.1 AASHTO M 182-05(2017), Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.

.2 American Concrete Institute (ACI).

.1 ACI 308R-16, Guide to Curing Concrete.

.3 American Society for Testing and Materials International (ASTM).

.1 ASTM C 171-16, Standard Specification for Sheet Materials for Curing Concrete.

.2 ASTM C 309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C 1315-11, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

.4 Canadian Standard Association (CSA)/CSA International.

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.5 Canadian General Standards Board (CGSB).

.1 CAN/CGSB 19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.

1.3 ACTIONS AND INFORMATIONNAL SUBMITTALS

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

.2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.

.3 At least fourteen (14) days prior to curing concrete, submit to the Departmental Representative methods for curing concrete and to control quality of concrete curing.

1.4 QUALITY CONTROL

.1 Quality control: in accordance with section 01 45 00 – Quality Control.

.2 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.3.3	Method for curing concrete	*Refer to terms and conditions of section 01 33 00*	Transmission letter. Inscription to the technical specification registry.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Ensure that empty recipients are sealed and stored properly before elimination.

.4 Divert unused hazardous material from landfill to an official hazardous material collections site as approved by the Departmental Representative, in accordance with all applicable legislation.

.5 Dispose of waste generated by work in an environmentally sound manner.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Water: to CSA A23.1, article 4.2.2.

.2 Membranes, sheet materials: to ASTM C 171.

.3 Jute or burlap cloth: to ASTM C 171 and AASHTO M 182.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

.1 Follow requirements of section 03 30 00 – Cast-in Place Concrete for concreting.

.2 Concrete curing in accordance with CSA A23.1, article 7.7 and ACI 308R. Refer to those standards when choosing curing methods.

.3 Use of curing compound is prohibited.

.4 Whenever possible, curing methods shall be chosen such that concrete is moistened by direct contact with water.

.1 Use methods reviewed to the Departmental Representative satisfaction and as defined in CSA A23.1 standard to eliminate bleeding water. Ensure no damage is done to concrete surfaces.

.5 During curing, ensure that concrete remains unloaded and is protected against chocks, vibrations, weather conditions or any other element that might affect quality of works.

3.2 WET CURING

.1 Water used for curing concrete shall be clean and without matters that may leave marks on concrete.

.2 Exposed faces of concrete shall be moistened for at least seven (7) days and protected against weather conditions and other works. Concrete temperature shall remain at or above ten (10) degrees Celsius.

.3 When concrete has to be protected against cold weather, maintain protection at least twelve (12) hours after the end of wet curing.

.4 When temperature is twenty-five (25) degrees Celsius or more, or twenty (20) degrees Celsius for mass concrete, use water jet, wet sand or jute for initial curing of concrete.

.1 Moisten formworks before concreting and until formworks are removed.

.5 If required by ambient conditions, exposed concrete surfaces must be covered with tarpaulins or protected by other means acceptable to the Departmental Representative.

.6 Use two layers of constantly wet jute or burlap clothes for curing walls or other vertical elements.

.7 Non-formed concrete surfaces shall remain wet for a minimum of seven (7) days.

.8 Formed concrete surface (beams, columns, walls, etc.) shall be cured for at least seven (7) days, as follows:

.1 Before formwork removal: three (3) days, but not less than the duration in section 03 11 00 – Concrete Forming.

.2 Wet curing following formwork removal: four (4) days.

3.3 MEMBRANE CURING

.1 Effect of sun, wind, cold or rain can adversely affect concrete curing. Exposed faces of concrete shall be covered partially or completely by tarpaulin or protected by any other means approved by the Departmental Representative.

.2 Rather than using a method in accordance with article 3.2 of this section, the Contractor may use blankets specially designed for curing concrete. Depending on weather conditions, use sheet materials designed for hot weather. Method for using sheet materials shall be as follow:

.1 Begin placing immediately after concrete has hardened enough to prevent damages.

.2 Spray water over a first strip where sheet materials will be installed. Surface shall be covered by 3 to 6 mm of water.

.3 Unroll sheet materials over wet concrete. Add water when needed.

.4 Use squeegee to smooth out wrinkles and air bubbles.

.5 Spray water over next strip and repeat preceding operations. Lap strips over 75 mm minimum. At roll ends, overlap over 300 mm minimum. Cover the entire surface of slab.

.6 Inspect slab frequently and repair immediately any damage to sheet materials.

.7 Remove sheet materials after seven (7) days of curing or later. Do not reuse sheet materials.

3.4 USE OF CURING COMPOUNDS

.1 Use of curing compound is prohibited.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 02 41 13 – Selective Site Demolition.

.3 Section 04 43 17 – Exterior Development —Granite Veneer Cladding.

.4 Section 04 03 43.19 – Period Stone Dismantling.

1.2 REFERENCES

.1 Department of Justice Canada (Jus).

.1 Canadian Environmental Assessment Act (CEAA).

.2 Canadian Environmental Protection Act, 1999 (CEPA).

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

1.3 DEFINITIONS

.1 Low-pressure water soaking: less than 72 kPa (500 psi), measured at nozzle tip.

.1 Medium-pressure water soaking: minimum 72 kPa (500 psi) and maximum 144 kPa (1,000 psi), measured at nozzle tip.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Provide proposed cleaning method and type of protection from cleaning residue for in-place conditions.

.3 Product Data:

.1 Provide data sheets for cleaning products, materials, machinery, compressors, tools and hoses.

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06 - Hazardous Materials.

.4 Samples:

.1 Provide samples of cleaning materials for approval of Departmental Representative.

.5 Test and Evaluation Reports:

.1 Provide test results.

.1 Provide surfaces used for test patches.

.2 Proceed with cleaning upon receiving written approval by Departmental Representative concerning tested cleaning methods.

1.5 QUALITY ASSURANCE

.1 Mock-Ups:

.1 Do mock-up tests in accordance with Section 01 45 00 - Quality Control.

.2 Perform tests and cleaning work in presence of a centre de conservation du Québec conservation expert.

.3 Prior to mock-ups:

.1 Ensure area of testing is water tight and decorative elements are protected.

.2 Ensure contaminated water is kept in containers and their disposal respects environmental regulations.

.4 Conduct tests to determine effectiveness of scrubbing with neutral pH detergent in warm water and moderate pressure wash cleaning methods.

.5 Conduct tests to determine effectiveness of water pressure.

.6 Start with lowest impact tests and stop testing at desired level of cleaning is achieved, stop testing immediately when damage is caused.

.7 Test brushing and spraying as alternative to pressure washing. Consult Departmental Representative to review test results.

.8 Locate test patches in inconspicuous places as directed by Departmental Representative.

.9 Do not proceed with work without approval of mock-up.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Ambient Conditions:

.1 Do not use wet cleaning methods when there is threat of frost.

.2 Do not use chemical cleaners when temperature is below 10 degrees C.

.3 Follow manufacturer's written instructions on use of chemical cleaners in accordance with product's temperature range application.

.4 Provide shading to wall to avoid cleaning in full, hot sunlight.

.5 Do not clean if there is risk of chemical spray being blown onto surrounding historic material, publicly accessible areas or plants.

.6 Protect work from strong winds.

PART 2 PRODUCTS

2.1 MATERIALS Suspension system:

.1 Use clean potable water free from contaminants.

.2 Treat water which has high metal content before use in cleaning.

.3 Use air free from oil or other contaminants.

2.2 HOT WATER

.1 Water: potable, clean.

.2 Generate hot water in flash boilers or other suitable appliance.

2.3 SOLVANT AND CLEANING PRODUCTS

.1 Use Liquinox surfactant (detergent) in 2% concentration.

.2 Use Pyrrolidone based solvent such as Pirhana 4 by Fibrelock or Safety Peel by Prosocco to remove grease stains.

.3 Use saturated ammonium bicarbonate (20%) to remove black crust (pollution stains), copper and grease stains.

.4 With Iron Stain remover product only, use Marble Poultice by Prosoco or equivalent as a base for poultice.

.5 Use non-ferrous or plastic mesh as support mechanism against evaporation.

.6 Prepare poultices using ammonium based iron stain remover to treat iron stains on granite.

2.4 TOOLS AND EQUIPMENT

.1 Use brushes with natural or soft plastic bristles.

.2 Use scrapers of wood or plastic.

.3 Use water pumps fitted with accurate pressure regulators and gauges capable of being preset and locked at maximum specified levels.

.1 Water pumps to have rating of 150 kPa.

.4 Use air compressors equipped with on-line oil filters to avoid spraying oil onto masonry.

.5 Use gun equipped with pressure gauge at nozzle end.

.6 Use plastic or non-ferrous metal piping and fittings.

PART 3 EXECUTION

3.1 SITE VERIFICATION OF CONDITIONS

.1 Record existing conditions, by means of photographs before and after cleaning. Advise Departmental Representative of potential complications.

.2 Report to Departmental Representative conditions of deteriorated masonry or pointing not noted on Contract Drawings found before and during cleaning.

.3 Obtain written approval of Departmental Representative before cleaning areas of deteriorated masonry.

3.2 GENERAL PREPARATIONS

.1 Protect operatives and other site personnel from hazards.

.1 Ensure good ventilation in work area.

.2 Ensure workers wear protection to CAN/CSA-Z94.4.

3.3 PROTECTION OF IN-PLACE CONDITIONS

.1 Cover and protect surfaces and non-masonry finishes not to be cleaned.

3.4 EXECUTION OF CLEANING

.1 Proceed with cleaning in accordance with written instructions of methods, systems, tools and equipment approved by Departmental Representative.

.2 Dry brush or scrape accumulations from walls, ledges and cornices.

.3 Pre-wet masonry surface when necessary. Work from bottom of wall upwards to not soil when leaching.

.4 Do not exceed maximum pressure at nozzle or have nozzle closer to masonry than approved by Departmental Representative at tests.

.5 Stop work when cleaning has detrimental effect on surrounding material and plants.

.6 Soften and loosen heavy deposits with prolonged water spray, then brush. Remove thick incrustations with wooden scrapers.

.7 Removal of vegetation or organic growth growing in or on masonry.

- .1 Soak masonry with low-pressure water.
- .2 Follow soaking by gentle scrubbing with natural bristle brushes.

.8 Medium-Pressure Water Cleaning:

- .1 Rinse well all cleaning products.
- .2 Remove accumulated dirt with medium-pressure 350-2700 wash-down at flow rate of 0.25 L/s.
- .3 Use a fan-type nozzle with minimum 375 mm spread.
- .4 Hold nozzle minimum 450 mm from masonry surface.

3.5 CLEAN-UP

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

3.6 PROTECTION OF WORK

.1 Protect finished Work from damage until take-over.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 02 41 13 – Selective Site Demolition.

.3 Section 04 43 17 – Granite Veneer Cladding.

.4 Section 04 03 43.19 – Period Masonry Dismantling.

1.2 REFERENCES

.1 ASTM International Inc.

.1 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.

.2 ASTM A276-13a, Standard Specification for Stainless Steel Bars and Shapes.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-75.1-M88, Tile, Ceramic.

.3 CSA Group.

.1 CAN/CSA-A179-04(CSA-A179-F14), Mortar and Grout for Unit Masonry.

.2 CSA-A3000-F13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 DEFINITIONS

.1 Repair of Stone: mechanical or plastic repair, done to restore original appearance and function of partly deteriorated stones.

.2 Filling: material used to rebuild broken or deteriorated part of stone.

.3 Adhesive: material used to fasten broken/fractured stone elements by direct application at fracture interface and/or by application to added reinforcing elements such as dowels.

.4 Mortar: material used to re-bed the stone element being repaired and to repoint adjacent mortar joints.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for board insulation. Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Application/installation instructions.

.2 Laboratory test reports certifying compliance of products with specification requirements.

.3 Manufacturer's material safety data sheets (MSDS) for safe handling of specified materials and products, in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Supervisor:

.1 Centre de conservation du Québec stone and bronze conservation expert.

.2 Mock-Ups:

.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Construct mock-up of a representative sample of each type of repair specified, with specified materials and methods.

.3 Do not use existing stonework when constructing job mock-up.

.4 Locate where indicated by Departmental Representative.

.5 Select locations of mock-ups in consultation with Departmental Representative.

.6 Notify Departmental Representative 24 hours before commencing mock-up.

.7 Allow mock-ups of plastic repairs to cure at least [3] days.

.1 Obtain Departmental Representative's approval for colour match.

.8 Allow 24 hours for inspection of mock-up before proceeding with work.

.9 When accepted, mock-up will demonstrate minimum standard for this Work.

1.6 INSTALLATION

.1 Ambient Conditions:

.1 Maintain a minimum temperature of 10 degrees C during and 48 hours after repair, throughout thickness of stone.

.2 Allow materials to reach minimum temperature of 10 degrees C prior to use.

.3 Maintain temperature between 10 degrees C and 24 degrees C during repair and 48 hours after, throughout thickness of stone.

.4 Provide heating equipment to maintain specified temperatures. Take precautions to avoid overheating masonry.

.5 Remove work exposed to lower temperatures as directed by Departmental Representative.

.6 Refer to manufacturer's instructions for environmental requirements of products.

.7 Hot weather requirement:

.1 Shade stones from direct sunlight.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Use materials from same manufacturer throughout the Work.

2.2 Lime Mortar:

.1 Restoration mortar for stone: premixed, Reconstec 100 Granite type or approved equivalent.

.1 Formulated to closely match colour, texture and physical properties of stone to be patched.

.1 Ensure formulated material only requires mixing with potable water at site.

.2 Mix Characteristics: anti-shrink.

.3 Physical compatibility with substrate: Mortar compression strength Minimum 40 MPa at 28 days.

.2 Ingredients to match surrounding stones in texture, strength, porosity and colour.

.3 Mix proportions: As recommended by manufacturer.

2.3 ADHESIVE MIXES

.1 Proprietary stone adhesive:

.1 Specially formulated for repair of broken stone units.

.2 Comply with dosage recommended by manufacturer.

.2 Ingredients:

.1 MasonRE by Cathedral Stone type mineral glue. Dosage: compliant with manufacturer’s specifications.

.3 Epoxy mixture for adhesive:

PART 3 EXECUTION

3.1 EXAMINATION

.1 Examine masonry, staging and storage areas and notify Departmental Representative in writing of conditions detrimental to acceptable and timely completion of Work.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Notify Departmental Representative in writing of deteriorated conditions not previously reported (e.g., substrate).

.2 Obtain Departmental Representative's approval and instructions for repair of stone before proceeding.

3.2 GENERAL PREPARATIONS

.1 Obtain Departmental Representative's approval for tools to be employed prior to commencing work.

3.3 REFACING PARTLY DETERIORATED STONE WITH FILLING

.1 Remove dust from cavity and wet surfaces.

.2 Roughen stone surfaces to form grooves in back of cavity, if necessary.

.3 Build up gradually new filling section in layers not exceeding 35 mm thickness.

.4 Use wood float and avoid excessive trowelling to prevent crazing.

.5 Clean filling mortar residue from area surrounding patch: sponge as many times as necessary with clean water. Do this before patching material sets.

.6 Remove laitance with stiff, near-dry fibre brush.

.7 Form mortar to match profile of surrounding stone.

.8 Finish patch to match adjacent stone surface.

3.4 CLEAN-UP

.1 Clean stone work surfaces after repairs have been completed and mortar has set.

.2 Allow mortar to harden minimum 15 minutes before cleaning.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittals Procedures.

.2 Section 02 41 13 – Selective Site Demolition.

.3 Section 04 03 06 – Period Masonry Cleaning.

.4 Section 04 43 17 – Granite Veneer Cladding.

1.2 ADMINISTRATIVE

.1 Conduct a pre-dismantling meeting with Departmental Representative to verify project requirements, equipment, procedures and assigned storage areas.

.2 Use services of a centre de conservation du Québec conservation expert for dismantling of commemorative bronzes.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Submit drawings for anchors stamped and signed by professional engineer with experience in rehabilitating historic structures registered or licensed in Province of Quebec, Canada.

.2 Provide drawings for shoring and bracing temporary framing work.

.3 After dismantling the monuments, submit to the Departmental Representative the dimensional drawings of the stones and anchors identified during the Work. Departmental Representative to analyze existing plans and issue a reassembly plan including specifications for fabrication and installation of anchors required to reassemble stone and bronze components. Provide plan signed and sealed by an engineer member of the OIQ to contractor.

1.4 QUALITY ASSURANCE

.1 Foreperson:

.1 Centre de conservation du Québec stone and bronze conservation expert. This specialist will issue instructions on the method of work to be used for the dismantling and reassembly of the monuments.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store, handle and protect dismantled to avoid altering their finish.

.2 Protect and store stones to facilitate their resetting.

.1 Store dismantled masonry units on wood pallets, protected from potential mechanical damage.

.2 Store each bronze component on custom-made wood supports built by the CCQ and protect from any potential mechanical damage.

.3 Shoring of components as shown in plans and details.

.4 Proceed with temporary storage on a flat and clear surface, providing the necessary 1 m circulation between pallets for cleaning.

.5 Submit list to Departmental Representative

.1 Parts with bronze components should be loaded, transported and unloaded at the Centre de Conservation du Québec. The Quebec Conservation Centre workshop is located within 8 kilometres of Place George-V. The restoration and cleaning of the bronze components will be carried out by the experts of the Centre de conservation du Québec.

.2 Stone components will be loaded, transported and temporarily stored by the Contractor. Temporary storage site shall consist of a flat interior or exterior gravel, grass or asphalt surface that is protected from intrusion and mechanical damage.

1.6 AMBIENT CONDITIONS

.1 Loosen wet masonry only when temperature is above 5 degrees C.

.2 In temperature 5 degrees C and below:

.1 Keep stones dry.

.2 Protect wet stones from freezing.

.3 Reassemble when the ambient temperature is above 10 C or if it is possible to maintain a temperature above 5 C for at least 30 days after the mortar is placed.

.4 Provide a weatherproof enclosure and maintain the ambient temperature above 5 C for at least 30 days after the mortar has been placed.

PART 2 PRODUCTS

2.1 BACKPOINTING AND LEVELLING MORTAR

.1 Same brand materials and aggregates from the same source must be used for all work.

.2 Water: clean and free of ice, grease, acid, organic matter.

.3 Sand: Fine-grained sand, washed and screened, consistent with table below to CSA A179 and ASTM C144.

Sieve Size	% By Weight Passing Each Sieve	% By Weight Retained on Each Sieve
No. 4	100	0
No. 8	90	10
No. 16	70	20
No. 30	50	20
No. 50	30	20
No. 100	15	15
No. 200	0	15

.4 Portland cement: to CSA A3000. Non-staining type GU cement for above ground masonry.

.5 Lime: hydrated lime, Type S, to CANC207-11.

.6 Bedding and jointing mortar to mixing specifications, Portland cement, lime and sand to CSA A179:

.1 Bedding mortar: Type N (1:1:6)

.2 Repair mortar:

.1 Under 600 from ground: Type N (1:1:6).

.2 Above 600 mm from ground: Type O (1:2:9).

.3 Mortar compression strength: 2 MPa to 5MPa at 7 days and 4 MPa to 8 MPa at 28 days.

.4 Mortar grout: jointing mortar, natural colour, no added colouring.

.5 Vicat cone penetration test :

.1 Bedding mortar: 25 to 40 mm.

.2 Backpointing mortar: 18 to 25 mm.

.6 Air content: 8 to 18%.

2.2 ANCHOR ADHESIVE

.1 Hybrid adhesive mortar consisting of urethane methacrylate resin, hardener, cement and water..

.1 Compressive strength: 50 to 70 MPa.

.2 Modulus of elasticity: 1,700 MPa.

.3 Water absorption: 3 to 8%.

2.3 NON-SHRINK GROUT

.1 Pre-mixed containing non-metallic aggregate, Portland cement, plasticizer and water reducer,to CSA A23.1/a23.2. Mortar compressive strength at 38 days: minimum 3.0 MPa, maximum 50 MPa.

2.4 ANCHORING:

.1 Threaded rods, stainless steel to ASTM F593 (AISI 316).

.2 Number, size and location will be confirmed following dismantling of the monuments.

2.5 POLYURETHANE JOINTS

.1 To be used only for joints with this type of sealant in place.

.2 Elastomeric two-component, premium quality, polyurethane base, Colour selected by Departmental Representative.

2.6 MORTAR COMPOUND

.1 Use conventional mortar for Bravoure monument.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Examine masonry, staging and storage areas and notify Departmental Representative in writing of conditions detrimental to acceptable and timely completion of Work.

.2 Document existing conditions with pre- and post-cleanup photographs. Notify Departmental Representative of any complications that may arise.

3.2 PROTECTION

.1 Protect surrounding components from damage during work.

.2 Make good damage to historic fabric.

.3 Obtain Departmental Representative's approval for repair methodology.

3.3 SPECIAL TECHNIQUES

.1 Number and identify stones and other elements on a photographic record.

.2 Before dismantling stones, indicate dimensions of each numbered stone in removal area on a drawing. Store stone in position.

.3 Temporary Marking and Recording:

- .1 Mark stone, on face, before removal using marking product which can be completely erased when required without damaging masonry unit:
  - .1 Ball-point pen on diachylon, attached to stone.
  - .2 Waxless chalk directly on stone.
- .2 Tracking relocated stones and other masonry units:
  - .1 Use numbering, marking, and positioning system shown on drawing.
- .3 Stone location recording system.
  - .1 Prepare chart or card index to:
    - .1 Help locate stones or units when necessary.
    - .2 To manage availability of platforms.
    - .3 To manage work and storage areas.
  - .2 Keep chart or card index up-to-date and, if required, produce copy every day.
  - .3 Prepare chart or card index or drawing to contain relevant information as indicated by example on drawing number.
- .4 Ensure that temporary marking will remain in use: resistant to weather, handling and cleaning until final marking of stones.
- .5 Remove markings and adhesive without damaging units:
  - .1 Brush with vegetable fibre brush: either dry or with water.
  - .2 Use no solvent, acid or other chemical product.

3.4 TEMPORARY SHORING

.1 Construct shoring and cradling, and other temporary framing work needed to support structure, or parts of it, during removal operations and in anticipation of resetting, according to approved shop drawings.

3.5 METHOD FOR LOOSENING STONES

.1 Use approved methods to loosen stones which will cause no damage. Completely remove mortar without damaging stones.

.2 Use only hand held tools.

.3 Loosen wet masonry when temperature is above freezing.

3.6 DISMANTLING AND MOVING STONES

.1 Avoid damaging arrises of stone when removing mortar and freeing up.

.2 Remove excess mortar using hand tools.

.3 To avoid risk of breakage, the Short and Wallick busts must remain anchored to the capstone. This composite piece must be palletized and transported to the Centre de Conservation du Québec.

.4 The anchors of the other bronzes (allegory of Short Wallick and the Voltigeur) must be sawn off.

.5 Sawing the anchors of the stones.

.6 Use wood wedges where required to remove or dislocate stone.

.1 Use flat pry bars protected with impact absorbing protection (burlap, cardboard).

.2 Use regularly inspected nylon hoisting belts. Use minimum 2 belts per stone. It is important that the slings are positioned in places that can support the weight of the bronze when it is lifted by a crane. That is, do not lift by the arms, legs or head. Nor should the attributes worn by the character be stressed. As well as causing breakage, incorrect positioning of the straps can cause the bronze to tip over when in the air, which can be very dangerous for the work and for the handlers.

.7 Protect stone from damage when hoisting and lifting from position.

.1 Use wood shims to isolate units from hoisting belt.

.8 Lifting stones using appropriate equipment (crane and telescopic handler).

.9 Where damage occurs to stone, report to Departmental Representative and repair stone in accordance with Section 04 03 43.13 - Period Masonry Repair.

.10 Make good damage incurred at no additional cost to Contract.

.11 Obtain review of repaired damage by Departmental Representative.

3.7 HANDLING

.1 Place detached stones on wood surfaces during handling. Prevent contact with metal.

.2 When stones are lowered to ground, place directly on wooden platform used for transport or storage.

.3 Transport and keep stones on [wooden platforms].

.4 Ensure that sharp edges of stones do not come into contact with hard objects.

.5 Submit stone units dropped or impacted to Departmental Representative for inspection and approval.

3.8 TEMPORARY STORAGE STAGING AREA

.1 Place stones in designated area of site for cleaning, detailed inspection and for final marking, before storage.

.2 Make stones accessible and retrievable when required.

3.9 CLEAN-UP

.1 Clean stones in accordance with Section 04 03 06 - Period Masonry Cleaning.

.2 Do cleaning operations at above freezing temperature.

.1 After cleaning, protect wet stones against freezing until dry.

.3 Clean stones by wet scrubbing with vegetable fibre brush unless otherwise instructed by Departmental Representative.

.1 Do not use high pressure water jet exceeding 1,000 PSI.

.2 Remove excess mortar with hand tools.

3.10 REASSEMBLY

.1 Curing of the concrete of the structural slabs that will receive the masonry work must be completed prior to reassembly.

.2 Before placing the reconstruction elements, clean with a water jet and moisten the surfaces before laying the bedding mortar.

.3 Apply mortar and lay stone in a level, plumb line.

.4 Anchor stones with stainless steel threaded rods. Drill holes chemically according to adhesive manufacturer's recommendations and inject with adhesive mortar.

.1 Reinforcing bars, threaded rods, connectors should not be bent or folded in place unless specifically directed by Departmental Representative.

.5 Lay heavy stones and protruding stones until the top course has sufficiently hardened.

.6 Clean finished stonework as work progresses.

.7 Repoint.

.1 Mixing should be done with a clean mechanical mixer

.2 Prepare mortars according to the manufacturer's instructions.

.3 Use Mortar within 1½ hours after mixing

.4 Remove droppings and splashes using clean sponge and water. Clean masonry with low pressure clean water and soft natural bristle brush.

.5 Curing of the mortar should begin after the mortar has been placed.

.6 Install blankets or protective structures as required to maintain the temperature above 5C during the curing period recommended by the manufacturer.

.7 Proceed with the installation of the sealant in the indicated areas as per the manufacturer's recommendations.

3.11 DISPOSAL OF WASTE

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 02 41 13 – Selective Site Demolition.

.3 Section 03 30 00 – Cast-in-Place Concrete.

.4 Section 04 03 06 – Period Masonry Cleaning.

.5 Section 04 03 43.19 - Period Stone Dismantling.

.6 Section 04 03 43.13 - Period Masonry Mortaring.

.7 Section 09 63 41 – Granite Dimension Stone.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI A108.1, Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4 -.13, A118.1-.10, A136.1).

.2 ASTM International

.1 ASTM C144, Standard Specification for Aggregate for Masonry Mortar.

.2 ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes.

.3 ASTM C615-C16M, Standard Specification for Granite Dimension Stone.

.4 ASTM C920, Standard Specification for Elastomeric Joint Sealants.

.3 CSA Group.

.1 CAN/CSA-A370, Connectors for Masonry.

.2 CAN/CSA-A371, Masonry Construction for Buildings.

.3 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.4 Terrazzo Tile and Marble Association of Canada (TTMAC)

.1 Tile Specification Guide 09 30 00, Tile Installation Manual.

.2 Tile Maintenance Guide 2000.

.5 South Coast Air Quality Management District (SCAQMD)

.1 SCAQMD Rule 1168, Adhesive and Sealant Applications.

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 granite veneer cladding, engravings and weepholes. Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the province of Quebec, Canada.

.2 Indicate sizes and sections of stone veneer, arrangements of joints and bonding, anchoring, dowelling and cramping.

.3 Each section of stone indicated on shop drawings must bear corresponding number marked on its back or bed..

.4 Coordinate with concrete formwork and installation of curb stones, caldding and coping with commemorative stones.

.4 Samples:

.1 Submit sample for each finish product specified, [2] complete sets of 300 mm x 300 mm stone, representing manufacturer's full range of available colours, textures, and patterns.

.2 Match Stanstead stone as close as possible to pigments and colour of salvaged commemorative plaques.

.3 A sample of engraving filled in with black paint.

.4 Provide two (2) plastic weep holes. Mortar colour to match.

.5 Coloured sealant.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: must have experience and qualifications for cladding installation.

.2 Engraver: must have experience and qualifications for engraving in stone.

.2 Inspection and tests

.1 Allow and enable Departmental Representative free access at all times to plant and work site, to laboratory to verify, examine, supervise quality of materials and manufacture, and to take samples for tests and analyses.

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

.3 Mock-Ups:

.1 Construct mock-ups in accordance with Departmental Representative’s on-site specification.

.1 Construct mock-up panel of granite cladding construction 1200 x 1800 mm and weep hole, showing colours and textures, use of reinforcement, ties, integration of a luminaire, weep holes, jointing, coursing, mortar and quality of work.

.2 Mock-up will be used:

.1 To judge workmanship, substrate preparation, operation of equipment and material application.

.2 Mock-up may be integrated into final work provided it meets Departmental Representative’s 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 in clean dry well-ventilated area in accordance with manufacturer's recommendations.

.2 Store and protect granite cladding from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

.1 Ambient Conditions:

.1 Do not install at temperatures below 12 degrees C or above 38 degrees C.

.2 Maintain temperatures at or above 12 degrees C until cementitious materials have fully cured.

.3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

.2 Field Measurements:

.1 Make site measurements necessary to ensure proper fit of components.

PART 2 PRODUCTS

2.1 STONE

.1 Engraved stone commemorative plaques of Royal 22 Regiment monument walls, salvaged and stored, as indicated in Section 02 41 13 - Selective Site Demolition, 04 03 01.13 - Period Masonry Cleaning, 04 03 43.19 - Period Stone Dismantling.

.2 “Picasso” granite stone type, meeting the appearance, characteristics (color, grain of the stone) to that of the quarry located in Magpie, QC.

Physical properties:

Absorption by weight.	ASTM C97.	0.16%.
Uniaxial compressive strength	ASTM C170.	160.5 MPa.
3 Specific weight.	ASTM C97.	2.646 kg/m3.
Modulus of rupture	ASTM C99.	16.3 MPa.

.2 “Stanstead” granite stone type, meeting the appearance, characteristics (color, grain of the stone) to that of the quarry located in QC, CA

Physical properties:

Density:	ASTM C97.		2,660 kg/cm^3.
Uniaxial compressive strength	ASTM C170.		186 MPa.
Absorption			0.15 %.
Modulus of rupture	ASTM C99.	2,037 Psi	14.1 MPa.

2.2 STONE CLADDING AND COPING

.1 Cladding and coping of walls of commemorative plaques of Royal 22 Regiment, Stanstead granite stone to ASTM C615, with the following characteristics.

.1 Sizes: see plan specifications.

.2 Pattern: see plan specifications.

.3 Finish: Sandblast on exposed surfaces, sawn back, underside and joints.

.4 Rear wall finish, four locations: black paint filled engravings, Royal 22 Regiment cabinets. Engraving pattern provided by Departmental Representative.

.2 Wall and wall coping, for concrete wall of electrical room staircase, ‘camlock’ wall of electrical room, insulated ‘camlock’ wall, valley wall, granite stone, "Picasso" type, to ASTM C615 standard, corresponding to the following characteristics:

.1 Sizes: See landscaping and architecture drawings.

.2 Pattern: see plan specifications.

.3 Finish: Sandblast on exposed surfaces, sawn back, underside and joints.

.3 Salvaged granite stone cladding corresponding to the following characteristics.

.1 Salvaged and stored engraved stone commemorative plaques of Royal 22 Regiment monument walls. Qty. 12

.2 1,003 mm high x 1,111 mm wide.

.3 Thickness: 25 mm.

.4 Refer to sections 04 03 01.13 - Period Masonry Cleaning and Section 04 03 43.13 - Period Masonry Mortaring.

2.3 SEALANTS

.1 Vertical joints on new cladding and horizontal joints on coping, including joints for commemorative plaques: sealing compounds:

.1 Elastomeric two-component, premium quality, polyurethane base, colours selected by Departmental Representative. Non-sag, chemical curing, self-levelling product.

2.4 BACKPOINTING AND LEVELLING MORTAR

.1 Same brand materials and aggregates from the same source must be used for all work.

.2 Water: clean and free of ice, grease, acid, organic matter.

.3 Sand: Fine-grained sand, washed and screened, consistent with table below to CSA A179 and ASTM C144.

Sieve Size	% By Weight Passing Each Sieve	% By Weight Retained on Each Sieve
No. 4	100	0
No. 8	90	10
No. 16	70	20
No. 30	50	20
No. 50	30	20
No. 100	15	15
No. 200	0	15

.4 Portland cement: to CSA A3000. Non-staining type GU cement for above ground masonry.

.5 Lime: hydrated lime, Type S, to CANC207-11.

.6 Bedding and jointing mortar to mixing specifications, Portland cement, lime and sand to CSA A179:

.1 Bedding mortar: Type N (1:1:6)

.2 Repair mortar:

.1 Under 600 from ground: Type N (1:1:6).

.2 Above 600 mm from ground: Type O (1:2:9).

.3 Mortar compression strength: 2 MPa to 5MPa at 7 days and 4 MPa to 8 MPa at 28 days.

.4 Mortar colour: Colour selected by Departmental Representative.

.5 Vicat cone penetration test:

.1 Bedding mortar: 25 to 40 mm.

.2 Backpointing mortar: 18 to 25 mm.

.6 Air content: 8 to 18%.

2.5 ANCHOR ADHESIVE

.1 Hybrid adhesive mortar consisting of urethane methacrylate resin, hardener, cement and water.

.1 Compressive strength: 50 to 70 MPa.

.2 Modulus of elasticity: 1,700 MPa.

.3 Water absorption: 3 to 8%.

2.6 ACCESSORIES

.1 Water: clean and potable.

.2 Anchors: brackets, supports, fasteners, rods or threaded studs, as specified on shop drawings, stainless steel to ASTM F593 (AISI 316).

.3 Backup materials:

.1 Polyethylene, urethane, neoprene or vinyl foam:

.1 Extruded open or closed cell foam backer rod.

.2 Size: oversize 30 to 50%.

.4 Plastic weep hole vents with sealant.

.5 Drainage membrane, waterproofing geotextile.

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 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.3 PREPARATION

.1 Cut granite to shape and dimensions and full to square with joints as indicated.

.2 Join and bed granite pieces as indicated. Make joints maximum 10 mm thick.

.1 Saw or cut beds and joints full square back from face at least two thirds of piece thickness. From that point bed may fall under square 40 mm in 300 mm maximum.

.2 Make bed joints free of large depressions.

.3 Clean sawn backs and beds of rust stains and iron particles.

.4 Execute moulded work from full size details. Make exposed arrises in true alignment and ease slightly to prevent snipping.

.5 Cut or saw cut granite for anchors, clamps, dowels and support systems. Provide Lewis pins and clamp holes in pieces which can not be manually lifted. Do not cut holes in exposed surfaces.

.6 Back-check granite contacting structural members as indicated. Allow minimum of 12 mm clearance between back of stone and concrete structural members. Shape beds of granite resting on structural work to fit supports.

3.4 INSTALLATION

.1 Construction in accordance with CAN/CSA-A371.

.2 Clean granite removing dirt or foreign matter from edges and surfaces. Do not use wire brushes. Do not use metal brushes.

.3 Carefully sort stones, removing chipped, cracked or stained stones and immediately notify the Departmental Representative.

.4 Set granite plumb and accurately in position with anchors securely placed, as indicated on shop drawings. Orient stone veining in direction indicated on shop drawings.

.5 Set facing firmly against angles and around accessories, appliances and other fixed elements to ensure continuity of joints. Size, cut and drill on site to ensure tight-fitting uniform joints with a maximum width of 12 mm.

.6 Attach anchors to back-up wall and to granite. Fill anchor holes and encase anchors in mortar.

.7 Make joints uniform and of indicated width. Keep edges and faces aligned to respect indicated tolerances. Place non-staining resilient cushions at least one joint width back from face to maintain joint width. Keep edges and faces aligned to respect indicated tolerances.

.8 Use plastic weep hole vents approximately every 3.00 m on centre or as needed.

.9 Prevent soiling, chipping or defacing granite. Remove mortar droppings and wash clean.

.10 New cladding and coping: Pointing: remove dirt and loose mortar from joints by using pressure air stream.

.1 Dry joints for caulking with joint compound.

.2 Rub smooth with plastic tool to slightly concave joint.

.3 Point joints with sealant.

.4 Finish joints 1.6 mm beneath stone surface. Tool finish joints to eliminate surplus and shape as indicated.

.11 Commemorative plaques:

.1 Refer to Section 04 03 43.19 - Period Stone Dismantling.

3.5 TOLERANCES

.1 Maximum flatness variations on polished, honed and fine rubbed surfaces at bed and joint arris line may not exceed one-sixth of specified joint width and one-fourth of joint width on surfaces having other finishes. Determine flatness with 1.2 m long straight edge applied in any direction of surface.

3.6 CLEAN-UP

.1 Cleaning during work: Leave Work area clean at end of each day.

.2 Final Cleaning: Remove surplus materials, excess materials, rubbish, tools and equipment.

.1 At completion wash granite with soft fibre brushes, soap powder and clean water.

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 09 91 00 – Painting

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 ASTM International

.1 ASTM A53/A53M-18, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

.2 ASTM A269/A269M-15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service

.3 ASTM A276/A276M-17, Standard Specification for Stainless Steel Bars and Shapes

.4 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength

.5 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.6 ASTM A-780/A780M-09(2015), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings

.7 ASTM D7396-14, Standard Guide for Preparation of New, Continuous Zinc-Coated (Galvanized) Steel Surfaces for Painting

.8 ASTM F3125-15a, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

.3 Canadian Standards Association (CSA)

.1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel

.2 CSA G164-18, 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

.5 CSA W59-13, Welded Steel Construction (Metal Arc Welding)

.4 Canadian Institute of Steel Construction/Canadian Paint Manufacturers Association

.1 CISC/CPMA 2-75, A Quick-Drying Primer for Use on Structural Steel

1.3 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 Submit the required documents/samples in accordance with section 01 33 00 – Submittal Procedures.

.2 Shop drawings

.1 The submitted shop drawings must bear the seal and signature of a licensed engineer registered with the Ordre des ingénieurs du Québec.

.2 Shop drawings must indicate or show materials; core thickness; finishes; connections; joints; anchorage methods; and number of anchors, supports, reinforcing elements, details, and accessories.

.3 All dimensions and other conditions must be verified on-site prior to construction.

1.4 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle all materials and equipment in accordance with the manufacturer's written instructions and section 01 61 00 – Common Product Requirements.

1.5 WARRANTY

.1 Provide a document as specified in section 01 78 00 – Closeout Submittals, stating that the Contractor guarantees the metalwork against permanent deformation, loosening, anchor failure, joint opening, weld failure, rust staining, electrolytic reaction, and deterioration of finishes for two (2) years from the date the Certificate of Completion of Work is issued.

PARTIE 2 PRODUCTS

2.1 MATERIALS

.1 Steel profiles and plates: grade 300W; compliant with CSA G40.20/G40.21

.2 Steel tubing: compliant with CSA G40.20/G40.21

.3 Raw steel sheets: compliant with CSA G40.20/G40.21

.4 Stainless steel profiles, plates, and tubing: grade 316; commercial grade; weldable; seamless; satin finish #4; compliant with ASTM A269/A269M and ASTM A276

.5 Aluminum sheets: general purpose; registered trademark sheets of anodizing quality

.6 Aluminum profiles: 6063-T5 alloy extrusions of anodizing quality

2.2 ANGLE IRONS AND IRON C CHANNELS

.1 Iron C channel profiles for the frame of the wall above the staircase and angle irons to support its stone facing

.1 Dimensions: as shown on the plans

.2 Finish: hot-dip galvanized

.2 Fasteners for concrete surfaces: chemical anchors with washers and nuts

.1 Dimensions: variable depending on the required loads (see article 1.3.2.1)

.2 Finish: hot-dip galvanized steel

2.3 STEEL HANDRAILS

.1 Stainless steel handrails: steel, compliant with CSA G40.20/G40.21 and ASTM A269/A269M; commercial grade 316; satin finish #4; 40 mm nominal outside diameter; formed to the shapes and sizes shown on the plans

2.4 ACCESSORIES

.1 Welding materials: compliant with CSA W59

.2 Welding electrodes: compliant with CSA W48

.3 Anchor bolts and nuts: compliant with ASTM A307

.4 High strength bolts: compliant with ASTM F3125

.5 Grout: non-shrink, non-metallic, fluid, and with a strength of 15 MPa after 24 hours

2.5 ASSEMBLY

.1 The structures must be straight, square, properly aligned, and meet the specified dimensions; joints must be tight and properly secured.

.2 Wherever possible, connections should be welded; otherwise they should be bolted. Exposed bolts must be in countersunk holes and cut flush with the nuts. Exposed fasteners must be of the same material, colour, and finish as the surfaces on which they are installed.

.3 Unless otherwise indicated, self-tapping, shake-proof screws must be used for screwed connections.

.4 Wherever possible, the structures should be adjusted and assembled in the workshop and delivered ready for installation.

.5 Exposed welds must be continuous along the entire length of the joint and filed or ground to a smooth, even surface.

.6 Unless otherwise indicated, elements should be made of steel.

2.6 FINISHES

.1 Galvanization: hot-dip, with 600 g/m^3 zinc coating, in compliance with CSA G164; use galvanization for all steel parts to be installed outdoors or in areas likely to experience high humidity

.2 Shop-applied primer: alkyd anti-corrosion primers for steel surfaces (compliant with CISC/CPMA 2) and for galvanized steel (compliant with ASTM D7396), compatible with the finishing paints described in the requirements of section 09 91 00 – Exterior Paints

.3 Zinc rich primer: ready to use and compliant with ASTM A780; for on-site touch-ups only

.1 Reference product: Galvicon (Galva ZN) from Aerochem

2.7 INSULATING COATING

.1 Aluminum components and surfaces must be insulated from the following materials with two (2) coats of bituminous paint:

.1 Different types of metal components and surfaces, except for small stainless steel, zinc, and white-bronze components and surfaces

.2 Concrete, mortar, and other masonry materials

.3 Wood

2.8 SHOP-APPLIED PAINT

.1 Surfaces must be cleaned according to the instructions in volume 2 of the Steel Structures Painting Council's manual.

.2 All surfaces must be primed with one (1) coat of shop-applied primer.

.3 Surfaces that will be inaccessible after assembly must be coated with two (2) coats of primer of a different colour.

.4 The primer must be used as supplied by the manufacturer, without modification. It must be applied to surfaces that are dry; free of rust, grease, and deposits; and at a temperature of at least 7 °C.

.5 The surfaces to be welded on-site must not be painted.

.6 Clean the surfaces of altered areas to be welded on-site. Touch up the primer before painting them.

.7 Pressure-sprayed and baked-on powder coating system

.1 Primer: vinyl pretreatment wash primer

.1 Epoxy primer (4,000 hr salt spray, ASTM B117)

.2 Finish: polyester powder coating

.1 Colour: to be determined by the Departmental Representative.

.8 High-performance liquid paint system for on-site touch-ups:

.1 Primer: epoxy primer

.2 Finish: acrylic aliphatic polyurethane

.1 Product compliant with AAMA 2604

.2 Colour: to be determined by the Departmental Representative

PARTIE 3 EXECUTION

3.1 EXAMINATION

.1 Verification of conditions: Before installing metal fabrications, ensure that the condition of surfaces/substrates previously installed under other sections or contracts is acceptable and allows the work to be carried out according to the manufacturer's written instructions.

.1 Visually inspect the surfaces/structural elements.

.2 Immediately inform the Departmental Representative of any unacceptable conditions upon discovery.

.3 Begin installation only after correcting unacceptable conditions.

3.2 ASSEMBLY

.1 Unless otherwise specified, weld in accordance with CSA W59.

.2 Ensure that installed metal fabrications are square, plumb, and level; accurately aligned and fitted; and that joints and junctions are tight.

.3 Provide and install appropriate anchors such as dowels, staples, anchor rods, expansion bolts, expansion shells, and toggle bolts.

.4 Exposed fasteners must be compatible with and of the same finish as the material through which they pass or to which they are attached.

.5 Provide parts for work performed by other trades in accordance with the submitted parts list and shop drawings.

.6 Assemble components on-site using high-strength bolts or by welding, in compliance with CSA S16.

.7 Deliver the jigs and parts to be embedded in concrete or built into the masonry to the appropriate location.

.8 After assembly, touch up rivets, welds done on-site, bolts, and burned or scratched surfaces with primer.

.9 Using a zinc-rich primer, touch up galvanized surfaces in areas that have been burned during on-site welding.

.10 If fasteners cannot be concealed, their visual impact must be minimized by making them aligned, evenly spaced, and flush with the base surface.

.11 Fasteners must be free of defects and match the colour, texture, and finish of adjacent materials.

.12 All fasteners must be strong and permanent.

.13 The use of impact fasteners is prohibited.

.14 Where required, perform any drilling, blocking, wedging, and welding needed to complete the work and ensure proper attachment to and integration with the work described in other sections of the specifications.

.15 Bolt threads must be accurate; re-threading on-site is prohibited.

.16 Anchors must be of sufficient size and quantity, and properly installed to sustain the loads and ensure solid and permanent installations.

3.3 TUBULAR HANDRAILS

.1 Install the tubular handrails where indicated.

3.4 TOUCH-UPS

.1 Touch up surfaces that were damaged during installation with a zinc-rich primer.

.2 Cover exposed surfaces and any imperfections with metal filler, then sand to a smooth, even finish.

.3 Protect the elements to be delivered to the site with shop- or factory-applied paint. Provide touch-up paint containers for each colour.

3.5 CLEANING

.1 Cleaning during work: Clean in accordance with section 01 74 11 – Cleaning.

.1 Leave the premises clean at the end of each work day.

.2 Final cleaning: Remove excess materials/equipment, tools, and waste from the site in accordance with section 01 74 11 – Cleaning.

3.6 PROTECTION

.1 Protect installed parts and equipment from damage during construction.

.2 Repair damage to adjacent materials and equipment caused by the installation of metal fabrications.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 03 30 12:01 – Cast-in-Place Concrete (Short Form).

.3 Section 09 63 41 - Stonework.

1.2 REFERENCES

.1 ASTM International

.1 ASTM A53/A53M-07-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A269/A269M, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 CSA International

.1 CSA G40.20/G40.21-F04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/G164-FM92- M92 (C2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA S16-09-09, Design of Steel Structures.

.4 CSA W59-M03(R2008), Welded Steel Construction (Metal Arc Welding)

.5 CSA W59 FM 1989 (C2008), Welded Steel Construction (Metal Arc Welding).

.3 Environmental Choice Program (ECP)

.1 CCD-047-98(R2005), Architectural Surface Coatings.

.2 CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.

.4 Green Seal Environmental Standards (GS).

.1 GS-11-2008-2008, 2nd Edition, Paints and Coatings.

.5 The Master Painters Institute (MPI).

.1 Architectural Painting Specification Manual - current edition.

.6 Cahier de Normes du Ministère des Transports du Québec

.1 Tome 2, Construction routière.

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 and datasheet and include: Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit manufacturer's printed product literature, specifications and datasheet and include: tree grate and corresponding support and fasteners, tree grate protection and drain grate. Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish, limitations and anchors.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in the province of Quebec, Canada.

.2 Design metal stair, balustrade and landing construction and connections to NBC vertical and horizontal live load requirements

.3 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.4 Shop drawings to clearly indicate the following:

.1 Locations and elevations required.

.2 Different types of fasteners and their spacing, and different accessories.

.3 Fabrication and installation details.

.4 Parts specified in the drawings and specifications for handrails are for guidance only. Shop drawings shall specify the dimensions and arrangements of the mounting and fixing parts.

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 in clean dry well-ventilated area in accordance with manufacturer's recommendations.

.2 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Stainless steel:

.1 Stainless steel parts, stainless steel hardware to ASTM-A-276, grade AISI-316, satin finish, #4.

.2 Welding materials: to CSA W59.

.3 Welding electrodes: to CSA W48 Series.

.4 Bolts and anchor bolts: to ASTM A307.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof flat round oval headed screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.5 Profiles must be neat and accurate, free of any snags, depressions or other imperfections. No knots are permitted.

.6 All metalwork shown on the drawings shall be assembled at the factory, ready for assembly at the job site.

2.3 TREE GRATE

.1 Exterior cast aluminum grate, marine grade 535, MIL A8625 anodized finish, Type 2, Class 1, rain type 1,520 x 1,520 x 25 mm thick, non-slip surface, 300 x 300 mm centre opening, similar in appearance to gutter grate, with alternating bar holes for 16.59% drainage opening, containing 80% recycled material, 13 mm maximum openings. Attach grate to frame.

.2 Hot dipped galvanized steel frame and grate support, suitable for supporting and securing tree grate.

.3 Fastener accessories, vandal proof anchors, stainless steel.

2.4 GRATE TREE PROTECTION

.1 Tree protection, circular galvanized steel frame, to match grate, Oblio texture, top and bottom, black polyester powder coated, 1,500 mm high and 450 mm diameter, in two vertical bolted sections.

.2 Hardware for fastening to grate, stainless steel bolts.

2.5 GUTTER GRATE

.1 Exterior high strength cast aluminum grate, marine grade 535, MIL A8625 anodized finish, Type 2, Class 1, rain type, 239 mm wide x 498 mm long x 8.1 mm thick, non-slip surface, similar in appearance to tree grate, with alternating bar holes, for 19.31% drainage opening, containing 80% recycled material, maximum 13 mm openings. Attach grate to frame.

2.6 BIN'S ANCHOR SCREW

.1 Stainless steel anchor screws.

2.7 PROTECTION

.1 Protect steel parts from damage during handling, storage, transportation or installation. Allow air to circulate between the parts, that water does not accumulate and drain freely and that there is no metal-to-metal contact of the parts.

.2 Replace damaged parts.

.3 Return damaged parts for galvanising, painting or replacement.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.

.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Supply components for work by other trades in accordance with shop drawings and schedule.

.6 Make field connections with bolts to CSA S16] [Weld field connection.

.7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

3.3 CLEAN-UP

.1 Cleaning during work:

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: Remove surplus materials, excess materials, rubbish, tools and equipment.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 05 50 00 – Metal Fabrications
.2 Section 07 25 00 – Weather Barriers
.3 Section 07 62 00 – Sheet Metal Flashing and Trim
.4 Section 07 92 00 – Joint Sealants

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 American National Standards Institute (ANSI)

.1 ANSI A208.1-16, Particleboard

.3 ASTM International

.1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
.2 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealled) by the Hot-Dip Process
.3 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood
.4 ASTM D5055-16, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists
.5 ASTM D5456-18, Standard Specification for Evaluation of Structural Composite Lumber Products

.4 Canadian Standards Association (CSA)

.1 CAN/CSA A123.2-03(2013), Asphalt-Coated Roofing Sheets
.2 CAN/CSA-O80 Series-15, Wood Preservation
.3 CSA O112.9-10(2014), Evaluation of Adhesives for Structural Wood Products (Exterior Exposure)
.4 CSA O121-17, Douglas Fir Plywood
.5 CAN/CSA O122-16, Structural Glued-Laminated Timber
.6 CSA O141-05(2014), Softwood Lumber
.7 CSA O151-17, Canadian Softwood Plywood
.8 CSA O153-13, Poplar Plywood
.9 CSA O322-15, Procedure for Certification of Pressuretreated Wood Materials for Use in Permanent Wood Foundations
.10 CSA O325-16, Construction Sheathing
.11 CAN/CSA Z809-16, Sustainable Forest Management

.5 National Fire Protection Association (NFPA)

.1 NFPA 703-2018, Standard for Fire Retardant

.6 Truss Plate Institute of Canada (TPIC)

.1 Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses, 2014

1.3 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

1.4 QUALITY ASSURANCE

.1 Wood marking: classification stamp from an organization recognized by the Canadian Lumber Standards Accreditation Board

.2 Marking of plywood, particleboard, oriented strand board (OSB), and composite wood panels: meets applicable CSA and ANSI standards

.3 Sustainability certification

1.5 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle all materials and equipment in accordance with the manufacturer's written instructions and section 01 61 00 – Common Product Requirements.

PARTIE 2 PRODUCTS

2.1 STRUCTURAL ELEMENTS AND BOARDS

.1 Lumber: S4S finished softwood (bleached on 4 sides), moisture content of 19% or less (S-DRY)

.1 Compliant with CSA O141
.2 Compliant with NLGA Standard Grading Rules for Canadian Lumber
.3 Category: "standard" or higher
.4 Dimensions: as required by the work
.5 Finger-jointed and glued elements: not permitted

.2 Furring, spacers, nailing strips, and subframes: S4S finished softwood (bleached on 4 sides); moisture content of 19% or less (S-DRY)

.1 Boards: "standard" category or higher
.2 Dimensional lumber: "light (clear) framing" category, "standard" category or higher
.3 Posts and square lumber: "standard" category or higher

2.2 PANELS

.1 Douglas fir plywood (Douglas fir): compliant with CSA O121, "construction" category, "standard" grading

.2 Panels used as sheathing: must be compliant with CSA O325

.3 Furring, spacers, nailing strips, nailing bases, and subframes: S4S finished softwood (bleached on 4 sides); moisture content of 19% or less (S-DRY)

.4 Fireproof panels in mechanical and electrical rooms: chemically pressure-treated and kiln-dried plywood to reduce the spread of flames and smoke and to protect the wood from termites and decay, compliant with NFPA 703

.1 Thickness: 19 mm
.2 Dimensions: 1220 mm x 2440 mm
.3 Must be painted before installation

2.3 ACCESSORIES

.1 All-purpose adhesive: compliant with CSA O112.9

.2 Nails and staples: compliant with ASTM D1761

.3 Bolts: with nuts and washers; 12.5 mm diameter (unless otherwise specified)

.4 Nailing discs: flat caps of at least 25 mm in diameter and 0.4 mm thick; made of sheet metal; formed to prevent dishing; bell or cup shapes are prohibited

.5 Fastener finishes

.1 Galvanized metal: compliant with ASTM A123/A123M; for exterior structures, interior structures in very humid environments, and pressure-treated wood structures
.2 Stainless steel: grade 304; for fasteners that cannot be galvanized in compliance with ASTM A123/123M and that are installed under the conditions described in the previous paragraph

2.4 WOOD TREATMENT PRODUCTS

.1 Preservatives: micronized copper azole, a chemical compound of micronized copper (which protects against termites and fungal degradation) and micronized azole (organic co-biocide that protects against copper resistant fungi) that gives the wood a reddish-brown finish and is compliant with CSA O80 series standards. Apply a colour-matched sealer for pressure-treated cut wood to all cuts.

.1 Reference product: pressure-treated wood and sealer for cuts

.2 Fire-retardant products: compliant with CSA O80 and the following requirements

.1 Flame spread index: 0
.2 Smoke power index: maximum 10

PARTIE 3 EXECUTION

3.1 EXAMINATION

.1 Verification of conditions: Before installing the products, ensure that the condition of surfaces/substrates previously installed under other sections or contracts is acceptable and allows the work to be carried out according to the manufacturer's written instructions.

.1 Visually inspect the surfaces/structural elements.

.2 Immediately inform the Departmental Representative of any unacceptable conditions upon discovery.

.3 Begin installation only after correcting unacceptable conditions.

3.2 PRESERVATIVE TREATMENT

.1 Treat wood that will be exposed to the weather with a CSA O80-compliant preservative until adequate net retention is achieved.

.2 After treatment with a micronized copper azole preservative, dry the materials to a moisture content of 19% or lower.

3.3 FIREPROOFING TREATMENT

.1 Pressure-impregnate plywood panels with fire-retardant chemicals, in compliance with CSA O80.

.2 After treatment, dry the materials in a kiln until they reach a moisture content of 19% or lower.

3.4 INSTALLATION – GENERAL

.1 Install components squarely and plumb, at the specified height and level, and in the specified alignment.

.2 Make continuous elements from the longest possible parts.

.3 Assemble, anchor, fasten, attach, and brace elements to ensure the necessary strength and rigidity.

.4 If necessary, countersink holes so that the bolt heads do not protrude.

.5 Ensure the installer places the best side of boards (and the side with the fewest knots) facing upwards.

.6 For treated wood, apply a colour-matched sealer for pressure-treated cut wood to all cuts.

3.5 INSTALLATION OF THE STRUCTURE

.1 Install the joists so that their camber is facing upwards.

.2 Carefully choose the structural elements that will be left exposed. Install lumber and panels in a way that conceals classification markings and signs of deterioration, or sand the markings and signs off of exposed surfaces.

3.6 INSTALLATION OF FURRING AND SPACERS

.1 Install, as needed, furring and spacers to support any cabinets, wall and ceiling finishes, sheathing, trim, soffits, siding, electrical panels, or other structures and keep them away from the walls.

.2 Install furring to support vertical siding if the framing does not have spacers and if the siding cannot be nailed directly to the framing.

.1 Install furring and spacers to ensure the structures are level and vertical; the acceptable tolerance is 1:600.

3.7 INSTALLATION OF SUBFRAMES AND TRIM

.1 Install subframes, nailing strips, and trims around the openings to support the frames and other structures.

3.8 INSTALLATION OF GROUNDS

.1 Install grounds for attaching the fixtures and/or accessories specified in the architectural and engineering plans, as well as the integrated furniture needed to complete the work.

.2 Coordinate with other relevant trades to place nailing bases in the following specific places.

.1 Mechanical equipment:

.1 In all places where mechanical equipment, such as heating cabinets, is to be installed.

.2 Wrought metals:

.1 In all places where required to support metal fabrications.

.3 In any other place where another trade (architecture or engineering) requires a support or a ground to complete their work.

3.9 INSTALLATION OF EXPOSED BACKER BOARDS

.1 Install all backer boards required for mechanical, electrical, and telephone equipment according to the mechanical/electrical and architectural documents.

.2 Paint boards in accordance with section 09 91 00 – Painting.

3.10 CLEANING

.1 Cleaning during work: Clean in accordance with section 01 74 11 – Cleaning.

.1 Leave the premises clean at the end of each work day.

.2 Final cleaning: Remove excess materials/equipment, tools, and waste from the site in accordance with section 01 74 11 – Cleaning.

3.11 PROTECTION

.1 Protect installed parts and equipment from damage during construction.

.2 Repair damage to adjacent materials and equipment caused by the installation of carpentry.

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Notice

.1 Since the building will mostly be underground, the dampproofing membranes must fully cover the raft foundation, foundation walls, upper slab, and sump in order to completely seal the building against water infiltration.

.2 Related sections

.1 Section 07 21 13 – Board Insulation

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-37.3-M89, Application of Emulsified Asphalts for Dampproofing or Waterproofing

.2 CAN/CGSB-37.16-M89, Filled, Cutback Asphalt for Dampproofing and Waterproofing

.3 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound

1.3 DOCUMENTS AND SAMPLES TO SUBMIT

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

.2 The technical data sheets for bituminous dampproofing products must indicate:

.1 The product's characteristics

.2 Its performance criteria

.3 Its application methods

.4 The requirements that must be met

.3 Provide the manufacturer's instructions if the product requires special handling, installation/application, or cleaning procedures.

1.4 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle all materials in accordance with section 01 61 00 – Common Product Requirements.

1.5 INSTALLATION CONDITIONS

.1 Temperature, relative humidity, and moisture content

.1 Only apply dampproofing products when the ambient temperature and the temperature of the surfaces to be treated fall within the limits prescribed by the manufacturer.

.2 Do not install the products if cold winds could make them set too fast and therefore prevent them from curing properly.

.3 Do not apply water repellents in humid weather.

PARTIE 2 PRODUCTS

2.1 BITUMINOUS DAMPPROOFING PRODUCTS

.1 Cold-applied elastomeric, emulsified asphalt membranes: compliant with CAN/CGSB-37.16

2.2 MEMBRANE

.1 Membrane applied in 2 layers: elastomeric membrane reinforced with a 180 g/m^2 non-woven polyester with thermofusible plastic film

2.3 ACCESSORIES

.1 Protective panels

.1 Asphalt core boards

.1 Thickness: 3 mm

.2 Top: reinforced glass-fibre mat with polyethylene film coating

.3 Bottom: reinforced glass-fibre mat

.2 Adhesive for protective panels: synthetic rubber base, compatible with the dampproofing membrane

.2 Board insulation: as per section 07 21 13 – Board Insulation

2.4 MATERIAL COMPATIBILITY

.1 Ensure and prove that all materials to be used are compatible.

PARTIE 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Follow the manufacturer's written requirements, recommendations, and specifications, including any available technical bulletins; instructions for product handling, storage, and use; and technical data sheet indications.

3.2 PREPARATORY WORK

.1 Before installing the products, make sure that the environmental conditions and the condition of the surfaces are suitable for installing the dampproofing membrane.

.2 The substrate's surfaces must be clean and free of frost, grease, oil, and small debris. The concrete must not have protrusions, dimples, or other irregularities.

.3 Make sure that the concrete is smooth, without gaps or honeycombing, before applying the dampproofing membrane.

.4 Gaps, cracks, holes, and other damaged surfaces of the substrate must be repaired before the dampproofing membrane is applied.

3.3 APPLICATION – GENERAL

.1 Apply dampproofing products as described in CAN/CGSB-37.3.

.2 Install flashings and transition membranes around openings, in areas where materials change or switch direction, and in any other location deemed necessary by the Departmental Representative. Flashings and transition membranes must extend at least 200 mm on each side of the joint or change in direction.

.3 Cracks must be primed and covered with a 150 mm wide strip of transition membrane, which must be centred on each crack.

.4 Apply a coat of primer to the surfaces to be covered with the dampproofing membrane, following the manufacturer's instructions.

.5 Coat the outer wall of the foundation walls with a continuous, even layer of dampproofing product from 50 mm below the final grade to the top of the footings.

.6 Overlap the dampproofing membrane over the flashings and transition membranes by at least 150 mm.

3.4 INSTALLATION OF THE PROTECTIVE PANEL

.1 Once the membranes are in place, apply the protective panel adhesive in 12 mm vertical strips spaced 450 mm C/C. Immediately place the protective panel onto the adhesive and press to ensure full contact.

.2 Allow the adhesive to dry before backfilling.

.3 Wrap the corner.

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 07 11 00 – Dampproofing
.2 Section 07 21 16 – Blanket Insulation
.3 Section 07 21 29 – Sprayed Insulation
.4 Section 07 92 00 – Joint Sealants

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C518-17, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
.2 ASTM C612-14(2019), Standard Specification for Mineral Fiber Block and Board Thermal Insulation
.3 ASTM C1289-19, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

.3 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S701.1-17, Standard for Thermal Insulation, Polystyrene Boards
.2 CAN/ULC-S704.1-17, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced
.3 CAN/ULC-S741-08(2016), Standard for Air Barrier Materials – Specification

1.3 DOCUMENTS AND SAMPLES TO SUBMIT

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

PARTIE 2 PRODUCTS

2.1 INSULATION BOARDS FOR FOUNDATIONS AND SLAB-ON-GRADE

.1 Extruded polystyrene (XPS) or expanded polystyrene (EPS) panels

.1 Compliant with CAN/ULC-S701.1
.2 Type: 3 or 4
.3 Minimum thermal resistance: RSI 0.74/25 mm, in compliance with ASTM C518
.4 Compression resistance: 210 kPa (30 lb/in.^{2})
.5 Thickness: according to the plans
.6 Dimensions: 610 mm x 2440 mm
.7 Edges: rebated

2.2 ACCESSORIES

.1 Adhesives: as recommended by the board insulation manufacturer

.2 Fasteners: plastic knock-in dowel with a diameter and length suitable for the thickness of the insulation

.3 Coating tape: UV-resistant polypropylene film coated with a solvent-based acrylic adhesive

.1 Thickness: 0.08 mm

.4 Sealants: compliant with section 07 92 00 – Joint Sealants

PARTIE 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 QUALITY OF WORKMANSHIP

.1 Install insulation on dry substrates only.

.2 Install insulation in a way that provides continuous thermal protection to the building's components and spaces.

.3 Carefully fit insulation around electrical boxes, fixtures, pipes, air ducts, exterior doors and windows, and other protruding elements.

.4 Leave a minimum clearance of 75 mm between the insulation and any heat-emitting components, such as recessed lighting fixtures, and a minimum clearance of 50 mm between the insulation.

.5 Carefully cut and trim the insulation so that it fully takes up the empty spaces. Make tight joints and offset vertical joints. Only use insulation boards without broken or chipped edges. Use the largest possible panel size to minimize the number of joints.

.6 If more than one layer of insulation is to be installed, stagger the vertical and horizontal joints.

.7 Do not cover the insulation until the installation has been inspected and approved by the Departmental Representative.

3.3 SUBSTRATE VERIFICATION

.1 Check the substrate to which the insulation is to be applied and immediately inform the Departmental Representative in writing of any defects found.

.2 Before starting work, make sure the substrate is solid, straight, smooth, dry, and free of snow, ice, frost, dust, and debris.

3.4 INSTALLATION OF RIGID PANEL INSULATION ON FOUNDATION WALLS UNDER THE SLAB

.1 Apply a continuous line of adhesive around the perimeter and in an X shape in the centre of the polystyrene insulation boards, following the manufacturer's recommendations.

.2 Indoor installation: use adhesive to apply the panels to the inside of the perimeter foundation walls (full height of the walls) and under the ceiling slab.

3.5 CLEANING

.1 Once the installation is complete, remove excess materials, scrap materials, tools, and safety barricades from the site.

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 06 10 00 – Rough Carpentry

.2 Section 09 22 16 – Non-Structural Metal Framing

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 American Society for Testing and Materials International (ASTM)

.1 F1667-18a, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

.2 ASTM C553-13, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

.3 ASTM C665-12, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

.4 ASTM C1320-10, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction

.3 Canadian Standards Association (CSA)/CSA International

.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S702-09, Standard for Mineral Fibre Thermal Insulation for Buildings

1.3 DOCUMENTS AND SAMPLES TO SUBMIT

.1 Technical data sheets

.1 Submit the required technical data sheets and the manufacturer's specifications and documentation for the products as per section 01 33 00 – Submittal Procedures.

.2 Manufacturer's instructions

.1 Submit the installation instructions provided by the manufacturer.

1.4 QUALITY ASSURANCE

.1 Test reports: Submit test reports certifying that the products, materials, and equipment meet the physical and performance requirements.

.2 Certificates: Submit documents signed by the manufacturer certifying that the products, materials, and equipment meet the physical and performance requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Per section 01 74 21 – Construction/Demolition Waste Management and Disposal.

PARTIE 2 PRODUCTS

2.1 THERMAL INSULATORS

.1 Mineral fibre blanket and batt insulation made from basalt and steel slag: compliant with CAN/ULC S702 and ASTM C665

.1 Type: 1

.2 Thickness and RSI: as indicated in the plans

.3 Blanket insulation

2.2 ACCESSORIES

.1 Fasteners

.1 Fasteners: 50 mm long, 0.8 mm thick perforated connectors in cold-rolled carbon steel with an adhesive-coated underside; 2.5 mm diameter annealed steel rod, appropriate in length for the thickness of the insulation; 25 mm diameter self-locking washers

.2 Nails: galvanized steel; 25 mm thicker than the insulation; compliant with CSA B111

.3 Staples: legs of at least 12 mm

.4 Tape: type recommended by the manufacturer

.5 Sealant: compliant with CGSB 19-GP-21M

PARTIE 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION OF THE INSULATION

.1 Install insulation in a way that provides continuous thermal protection to the building's components and spaces in accordance with ASTM C1320.

.2 Carefully fit the insulation over the elements to be covered and around electrical boxes, pipes, air ducts, and frames that pass through it.

.3 Do not compress the insulation to fit the spaces that must be insulated. Cut and trim the insulation so that it fully takes up the empty spaces. Use only insulation blankets without tears on the back or edges.

.4 Do not install the insulation until all underlying materials are dry.

.5 Install materials in according to the manufacturer's instructions.

.6 Leave a minimum clearance of 75 mm between the insulation and any heat-emitting components, such as recessed lighting fixtures, and a minimum clearance of 50 mm

between the insulation and Type A chimneys (in compliance with CAN/ULC-S604) and Type B or L vents (in compliance with CAN/CGA-B149.1 and CAN/CGA-B149.2).

.7 If more than one layer of insulation is to be applied, stagger the vertical and horizontal joints.

.8 Do not cover the insulation until the installation has been inspected and approved by the Departmental Representative.

3.3 CLEANING

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

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 06 10 00 – Rough Carpentry

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 ASTM International

.1 ASTM B117-11, Standard Practice for Operating Salt Spray (Fog) Apparatus

.2 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar

.3 ASTM C297/C297M-15, Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions

.4 ASTM C1002-14, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

.5 ASTM D968-15, Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive

.6 ASTM D2247-15, Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity

.7 ASTM E72-15, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction

.8 ASTM E96/E96M-15, Standard Test Methods for Water Vapor Transmission of Materials

.9 ASTM E2098/E2098M-13, Standard Test Method for Determining Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for Use in Class PB Exterior Insulation and Finish Systems (EIFS), after Exposure to a Sodium Hydroxide Solution

.10 ASTM E2134/E2134M-14, Standard Test Method for Evaluating the Tensile-Adhesion Performance of an Exterior Insulation and Finish System (EIFS)

.11 ASTM E2321-03(2011), Standard Practice for Use of Test Methods for Determining the Water Vapor Transmission (WVT) of Exterior Insulation and Finish Systems (EIFS)

.12 ASTM E2430/E2430M-13, Standard Specification for Expanded Polystyrene (“EPS”) Thermal Insulation Boards for Use in Exterior Insulation and Finish Systems (“EIFS”)

.13 ASTM E2486/E2486M-13, Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS)

.14 ASTM G154-12a, Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

.3 Canadian Standards Association (CSA)/CSA International

.1 CAN/CSA-A3000-13, Cementitious materials compendium (contains: A3001, A3002, A3003, A3004, and A3005)

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S134-13, Standard Method of Fire Test of Exterior Wall Assemblies

1.3 DOCUMENTS AND SAMPLES TO SUBMIT

.1 Technical data sheets

.1 Submit the required technical data sheets and the manufacturer's specifications and documentation for the products as per section 01 33 00 – Submittal Procedures.

.2 Submit a 300 mm x 300 mm sample of each proposed colour for the system before preparing a sample of the work.

.2 Manufacturer's instructions

.1 Submit the installation instructions provided by the manufacturer.

1.4 QUALITY ASSURANCE

.1 Test reports: Submit test reports certifying that the products, materials, and equipment meet the physical and performance requirements.

.2 Certificates: Submit documents signed by the manufacturer certifying that the products, materials, and equipment meet the physical and performance requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Per section 01 74 21 – Construction/Demolition Waste Management and Disposal

PARTIE 2 PRODUCTS

2.1 MATERIALS

.1 System description:

.1 The acrylic polymer coating system is created by installing lightweight concrete panels, a polymer base coating, fibreglass reinforcing mesh, and an acrylic topcoat with integrated colour.

.2 Definition:

.1 1/2″ x 36″ x 64″ (12.7 mm x 914.4 mm x 1625.5 mm) or 1/2″ x 36″ x 96″ (12.7 mm x 914.4 mm x 2438.4 mm) exterior-grade concrete panel

.2 Base coat: 100% acrylic copolymer that serves as a base coat for the mesh and the topcoat

.3 Reinforcing mesh: fibreglass mesh, made and recommended by the system manufacturer

.4 Finish: 100% acrylic copolymer with integrated colour and texture; ready to use; concrete grey sanded finish; a sample must be provided

2.2 ACCESSORIES

.1 Lightweight concrete panel fasteners: self-tapping stainless steel screws, as recommended by the coating manufacturer

.2 PVC mouldings and expansion joints: expansion joints following the plans and moulding around all openings and finish changes, as recommended by the coating manufacturer

.3 Joint sealant: compliant with the requirements of section 07 92 00; colour that complements that of the sheathing

PARTIE 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the installation instructions; the manufacturer's written requirements, recommendations, and specifications; and the technical data sheets.

3.2 INSTALLATION OF SUPPORT PANELS

.1 Comply with the occupational health and safety rules for construction, as per section 01 35 29 – Health and Safety Requirements.

.2 Protect metal surfaces in contact with concrete, mortar, plaster, or any other hydraulically bound surface with an insulating coating.

.3 Place the panels on the framing and secure them with screws. Install the support battens opposite the panel joints. Make sure that the elements are flat, aligned, and within the prescribed tolerances.

.4 The substrate must be free of foreign substances such as oil, dust, dirt, solvents, wax, varnish, water, and moisture.

.5 Clean all existing surfaces and sand them with a steel brush to make sure the adhesive sticks well.

3.3 APPLICATION OF THE BASE COAT

.1 Using a stainless steel trowel, apply a full base coat, followed by a second coat to reach a total thickness of 6 mm to 10 mm.

.2 Install the reinforcing mesh into the fresh base coat, then cover it with another coat and level the surface.

3.4 APPLICATION OF THE FINISH

.1 Apply the finish continuously—and in one go—to the entire surface of the panels. The sections that are completed first must be kept damp in order for the finish to dry evenly and to achieve a uniform result.

.2 Interrupt finish trowelling at joints, concealed joints, openings, and other panel elements to avoid changes in the pattern of the finish.

.3 Until it is dry, the top coat must be protected from damage caused by weathering and contamination from air, dust, soot, etc.

3.5 CLEANING

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

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 07 11 00 – Dampproofing
.2 Section 07 21 13 – Board Insulation
.3 Section 07 62 00 – Sheet Metal Flashing and Trim
.4 Section 07 92 00 – Joint Sealants
.5 Section 08 11 00 – Metal Doors and Frames

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants
.2 ASTM E1643-18a, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
.3 ASTM E1745-17, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

.3 Canadian Standards Association (CSA)

.1 CSA A123.22-08(2013), Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

.4 Underwriters' Laboratory of Canada (ULC)

.1 CAN/ULC-S741-08(2016), Standard for Air Barrier Materials – Specification
.2 CAN/ULC-S742-11, Standard for Air Barrier Assemblies – Specification

.5 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type
.2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction
.3 CAN/CGSB-37.50-89, Hot-Applied, Rubberized Asphalt for Roofing and Waterproofing

1.3 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

1.4 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle all materials and equipment in accordance with the manufacturer's written instructions and section 01 61 00 – Common Product Requirements.

1.5 INSTALLATION CONDITIONS

.1 Use solvent curing sealing compounds and vapour-releasing adhesives in open, well-ventilated spaces.

.2 Maintain temperature and humidity at the levels recommended by the material manufacturers before, during, and after installation.

1.6 SCHEDULING

.1 Time the installation of air, vapour, and weather barriers with the installation of the associated sealing materials and devices.

1.7 WARRANTY

.1 Provide a document as specified in section 01 78 00 – Closeout Submittals stating that the Contractor thereby guarantees the air barrier work described herein against loss of sealing, adhesion, or cohesion for five (5) years from the date the Certificate of Completion of Work is issued.

PARTIE 2 PRODUCTS

2.1 AIR AND WEATHER BARRIER MEMBRANES

.1 In sheets: non-woven, water-resistant, high-density polyethylene films compliant with CAN/CGSB-51.32 and CAN/ULC-S741

.1 Air permeance at 75 Pa: 0.01 L/s·m^2 according to CAN/ULC-S742.

.2 Water vapour permeance: greater than 57.5 ng/Pa·s·m^2 (1 perm)

.2 Self-adhering and transition barriers: self-adhering and vapour barriers, water-resistant thermoplastic films laminated to a layer of SBS rubberized asphalt, compliant with CAN/ULC-S741

.1 Nominal thickness: 1.0 mm (40 mils)

.2 Air permeance at 75 Pa: 0.0011 L/s·m^2 according to CAN/ULC-S742

.3 High temperature: composed of SBS polymer modified bitumen, compliant with CSA A123.22

.1 Nominal thickness: 1.0 mm (40 mils)

2.2 VAPOUR BARRIER MEMBRANES

.1 Base and wall: polyethylene films compliant with CAN/CGBS 51.34

.1 Thickness: at least 0.152 mm (6 mils)

.2 Water vapour permeance: maximum 3.4 ng/Pa·s·m^2 (0.06 perm)

.2 Connection tape for base and wall vapour barrier membranes: UV-resistant polypropylene adhesive tape

.1 Width: at least 60 mm

2.3 PRIMERS/ADHESIVES

.1 Primer/adhesive for self-adhering membranes: emulsion polymer base, fast-setting and water-based, compatible with the self-adhering membrane, and recommended by the manufacturer

2.4 SEALING COMPOUNDS

.1 Sealant for self-adhering membrane terminations: thermoplastic sealant compliant with ASTM C920, rubber base, moisture-cured, compatible with self-adhering membrane

.1 Type: S
.2 Grade: NS
.3 Class: 25

2.5 JOINT SEALANTS

.1 As per section 07 92 00 – Joint Sealants

2.6 ACCESSORIES

.1 Fasteners: corrosion-resistant nails long enough to penetrate the structure by at least 19 mm

.2 Supporting washers: minimum diameter of 25 mm

.3 Adhesive tape: for overlaps, according to the membrane manufacturer's recommendations

PARTIE 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Follow the manufacturer's written requirements, recommendations, and specifications, including any available technical bulletins; instructions for product handling, storage, and use; and technical data sheet indications.

3.2 INSPECTION

.1 Ensure that the surfaces are ready to receive the work specified in this section and that the installation conditions are adequate.

.2 Ensure that all surfaces are clean, dry, sound, smooth, and continuous, and that they meet the manufacturer's requirements.

.3 Report any unsatisfactory conditions in writing to the Departmental Representative.

.4 No work may be started until the defects have been corrected. By beginning work, the Contractor is indicating that they have accepted the condition of the structure.

3.3 PREPARATORY WORK

.1 Remove loose or foreign material that could compromise the bond of the materials.

.2 Ensure that all substrates are free of oil and excessive dust; masonry joints must be flush; open joints must be filled; there must be no large gaps, spalled areas, or sharp protrusions on concrete surfaces.

.3 Ensure that there is no moisture on the surface of the substrates before applying the self-adhering membrane and primer.

.4 Metal surfaces must not have any sharp edges or burrs.

.5 Prime the surface of the substrates that are to be sealed according to the manufacturer's instructions.

.6 Fill open joints, seams, and cracks between 3 mm and 13 mm with sealant before installing the air barrier system.

3.4 INSTALLATION OF BASE FLASHING

.1 Use a caulking gun to apply the liquid flashing air membrane to the substrate in a loose zig-zag, then spread with a trowel, joint knife, or roller to create an even coating. Regularly check the thickness when wet to ensure adequate coverage.

3.5 INSTALLATION OF THE AIR BARRIER SHEET MEMBRANE

.1 Unroll the membrane over the substrate, directly over the rough openings, leaving a minimum vertical overlap of 150 mm between sheets. The roll must be straight.

.2 Secure the membrane to the substrate with appropriate fasteners spaced at least 150 mm apart and not more than 450 mm apart on vertical and horizontal stud lines. Do not attach fasteners within 225 mm of rough openings.

.3 Cover all horizontal and vertical joints between membrane sheets with sheathing tape that is at least 75 mm thick and recommended by the manufacturer.

.4 Seal the membrane around the penetrations, using the manufacturer's recommended method.

.5 Before installing the doors, windows, and curtain walls, seal the membrane around the openings with self-adhering membranes, following the manufacturer's instructions. Make sure to overlap the self-adhering membranes with the interior vapour barrier.

3.6 INSTALLATION OF THE SELF-ADHERING AIR BARRIER MEMBRANE

.1 When necessary to ensure the self-adhering membrane adheres to the substrate, apply the self-adhering membrane primer to the substrate, following the manufacturer's recommendations and allow it to dry before applying the membrane.

.2 Seal the inside and outside corners of sheathing boards with a strip of self-adhering air barrier membrane, extending at least 75 mm beyond each side of the corner detail.

.3 For inside corners, pre-treat with a continuous 15 mm bead of termination sealant.

.4 Install the self-adhering air barrier membrane over the substrate continuously and in order, starting at the bottom of the wall and working up, following the manufacturer's written recommendations. Stagger all vertical joints.

.5 Cut into sections, align and position the membrane on the substrate, remove the protective film from the top panel, then press firmly into place.

.6 Check alignment, hold the membrane in place to prevent wrinkling, and remove the protective film from the remaining panels as you progress. Press firmly into place.

.7 Ensure at least 75 mm of overlap on every side and at least 50 mm of overlap on the edges of the next membranes.

.8 Pressure roll all membrane surfaces and overlaps with a roller to ensure full adhesion.

.9 At the end of each work day, seal the top edge of the membrane to the substrate with termination sealant. Apply the sealant with a bevelled trowel to seal the termination and repel water.

.10 Seal the self-adhering membrane terminations, the heads of mechanical fasteners, the masonry tie fasteners, and the edges of penetrations and ducts that pass through the membrane with termination sealant.

.11 Seal the membrane around openings with self-adhering transition membranes according to the manufacturer's instructions before installing the doors, windows, and curtain walls. Make sure to overlap the self-adhering transition membranes with the interior vapour barrier.

.12 At lintels, sills, and wall ends, shape the flashings (weatherstripping) so that water cannot run horizontally past their edges.

3.7 INSTALLATION OF VAPOUR BARRIERS – GENERAL

.1 Ensure that the utility lines have been installed and inspected before installing the vapour barrier.

.2 To minimize the number of joints, use the largest sheet size possible.

.3 Ensure that the sheets form a continuous barrier. If necessary, repair punctures and tears with sealing tape before concealing the work.

.4 Make sure there is an overlap between the interior vapour barrier membrane and the exterior air barrier membrane around openings.

3.8 BASE

.1 Before installing gypsum board, install the vapour barrier on the warm side of the exterior walls and ceiling to form a continuous barrier.

.2 Cut the vapour barrier sheets to the size of the openings, overlap them on structural elements, and seal the joints.

.3 Seal around the vapour barrier as described below.

.1 Apply a continuous bead of sealant to the frame at the edges of the sheet.

.2 Place the edges of the sheet over the sealing bead and press firmly.

.4 Seal the lap joints as described below.

.1 Attach the first sheet to the substrate.

.2 Apply a continuous bead of sealant to the edge of the first sheet, which must sit over a rigid support element.

.3 Overlap the adjacent sheet by at least 150 mm and press it firmly against the sealing bead.

.4 Ensure that the sealing bead is continuous. Smooth out any wrinkles and ripples that form on the sheet where it overlaps the sealant bead.

.5 Seal the joints around switch boxes and outlet boxes that pass through the vapour barrier as described below.

.1 Install a moulded vapour barrier in the form of a box or wrap the boxes with a vapour barrier film large enough to provide at least 300 mm of overlap in every direction.

.2 Apply sealant to seal the joints between overlapping parts and the main vapour barrier, and seal the openings where wiring enters the boxes.

3.9 CLEANING

.1 Clean in accordance with section 01 74 11 – Cleaning.

.2 Once installation and performance testing is complete, remove excess materials, waste, tools, and equipment from the site.

3.10 PROTECTION OF THE WORK

.1 Protect the finished work in accordance with section 01 61 00 – Common Product Requirements.

.2 Take the necessary precautions to prevent adjacent work from damaging the work completed under this section.

.3 Protect the finished structure from the weather.

END OF SECTION

PARTIE 1 GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A240/A240M-15b, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

.2 ASTM A606/A606M-15, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance

.3 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.4 ASTM A792/A792M-10(2015), Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

.5 ASTM B32-08(2014), Standard Specification for Solder Metal

.6 ASTM B370-12, Standard Specification for Copper Sheet and Strip for Building Construction

.7 ASTM D523-14, Standard Test Method for Specular Gloss

.8 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings

.2 Canadian Roofing Contractors Association (CRCA)

.1 Specifications, Covers 2012

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS)

1.2 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

.2 Technical data sheets

.1 Submit the required technical data sheets for the flashing materials, as well as the manufacturer's specifications and documentation. Technical data sheets should indicate product characteristics, performance criteria, dimensions, limitations, and finish.

1.3 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle materials and equipment in accordance with section 01 61 00 – Common Product Requirements.

.2 Waste management and disposal

.1 Per section 01 74 21 – Construction/Demolition Waste Management and Disposal.

PARTIE 2 PRODUCTS

2.1 METAL SHEETS

.1 Galvanized steel sheets: 0.70 mm thick, commercial quality, according to ASTM A653/A653M, with Z275 zinc coating

2.2 PRE-FINISHED STEEL SHEETS

.1 Pre-finished steel sheets, factory-coated with polyvinylidene fluoride

.1 Existing colour to be verified on site

.2 Coating thickness: at least 0.70 mm (24 gauge)

2.3 ACCESSORIES

.1 Protective coating: alkali-resistant bituminous paint

.2 Plastic sealant: compliant with CAN/CGSB-37.5

.3 Base layer for metal flashings: dry coating compliant with CAN/CGSB-51.32, kraft paper lined with a 3.6 to 4.5 kg bituminous coating

.4 Sealants: compliant with section 07 92 00 – Joint Sealants

.5 Cleats and hook strips: of the same material and temper as the sheet metal, minimum 50 mm wide and the same thickness as the sheet to be attached

.6 Fasteners: flat-headed, ring shank roofing nails of appropriate length and thickness for metal flashings, made of the same material as the sheet metal, compliant with CSA B111

.7 Washers: made of the same material as the sheet metal, 1 mm thick, with rubber seals

.8 Touch-up paint: as recommended by the manufacturer of the pre-finished sheet

2.4 FABRICATION

.1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA ‘FL’ series details and as shown in the drawings.

.2 The parts should be shaped into lengths of up to 2,440 mm.

.1 Make sure to provide the necessary clearance at the joints to allow elements to expand.

.3 Hem exposed edges 12 mm on their underside.

.1 Mitre and seal corners with sealant.

.4 Form sections square, true, and accurate to size, free from distortion and other defects that could detract from the appearance or hinder the performance.

2.5 METAL FLASHINGS

.1 Flashings, copings, and molding must be shaped to the indicated profiles, with 0.65 mm thick pre-finished sheet steel. Shape parts up to 2400 mm in length. Provide clearance for expansion at the joints.

PARTIE 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Follow the manufacturer's written requirements and recommendations, including any available technical bulletins; instructions for product handling, storage, and use; and technical data sheet indications.

3.2 INSTALLATION

.1 Install the sheet metal structures according to the instructions.

.2 Conceal fasteners except where the Departmental Representative has agreed to leave them exposed.

.3 Provide underlay under sheet metal.

.1 Secure in place and create 100 mm lap joints.

.4 Counter-flash bituminous flashings where they meet the roof, the frames, and other vertical surfaces.

.1 Flash joints using single lock seams, forming a tight fit over the hook strips, as detailed.

.5 Close the S-shaped end joints at each joint between two (2) steel sheets and seal with a sealant.

3.3 ON-SITE QUALITY CONTROL

.1 On-site checks by the manufacturer

.1 The manufacturer must make recommendations for the use of the product(s) and conduct occasional visits to verify that the installation has complied with its recommendations.

3.4 CLEANING

.1 Clean in accordance with section 01 74 11 – Cleaning.

.2 Once installation and performance testing is complete, remove excess materials, waste, tools, and equipment from the site.

.3 Leave the work area clean and free of grease, stains, and fingerprints.

END OF SECTION

PARTIE 1 GENERAL

1.1 REFERENCES

.1 ASTM International

.1 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications

.2 Canadian General Standards Board (CGSB)

.1 CGSB-19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing

.2 CAN/CGSB-19.13-M87, Sealing Compound, One Component, Elastomeric, Chemical Curing

.3 CGSB 19-GP-14M-84, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing

.4 CAN/CGSB-19.17-M90, One-Component, Acrylic Emulsion Base Sealing Compound

.5 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound

.3 General Services Administration (GSA) - Federal Specifications (FS)

.1 FS-SS-S-200-E2009, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS)

.5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI – Source Specific Standards

.1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications

1.2 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

.2 Technical data sheets

.1 Submit the required data sheets, as well as the manufacturer's instructions and documentation for joint sealant products. Technical data sheets should indicate product characteristics, performance criteria, dimensions, limitations, and finish.

.2 The manufacturer's technical data sheets should cover the following:

.1 Caulking products

.2 Primers

.3 Sealing compounds (all types), including their compatibility with each other

.3 Submit two (2) copies of the Material Safety Data Sheets (MSDS) required under WHMIS, in accordance with section 01 35 29.06 – Health and Safety Requirements.

.3 Samples

.1 Submit two (2) samples of each colour and type of product proposed.

.2 If required, to match adjacent materials, submit dried samples of the sealants, which must be left exposed for each proposed colour.

.4 Manufacturer's instructions

.1 The submitted instructions must cover each of the proposed products.

1.3 CLOSEOUT SUBMITTALS

.1 Submit the required documents and items in accordance with section 01 78 00 – Closeout Submittals.

.2 Operation and maintenance sheets: provide operation and maintenance instructions, which will be incorporated into the maintenance manual.

1.4 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle materials and equipment in accordance with section 01 61 00 – Common Product Requirements and the manufacturer's written instructions.

.2 Delivery and acceptance: Deliver materials and equipment to the site in their original packaging, which must be labelled with the manufacturer's name and address.

.3 Storage and handling

.1 Store materials and equipment off the ground indoors in a clean, dry, well-ventilated area according to the manufacturer's recommendations.

.2 Store joint sealants in a way that protects them from marks, scratches, and scuffs.

.3 Replace damaged materials and equipment with new materials and equipment.

1.5 INSTALLATION CONDITIONS

.1 Environmental conditions

.1 Sealants should only be applied under the following conditions:

.1 Ambient and substrate temperatures are within the range established by the product manufacturer or are above 4.4 degrees Celsius.

.2 The substrate is dry.

.3 The manufacturer's recommendations for the temperature, relative humidity, and moisture content of the substrate for the application and drying of the sealants, as well as the special instructions for their use, have been followed.

.2 Joint width

.1 Sealants should be applied only when the width of the joints exceeds the width specified by the product manufacturer for the indicated purposes.

.3 Substrate

.1 Sealants should be applied only after the substrate has been cleaned of all contaminants that may prevent the products from adhering.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Meet Workplace Hazardous Materials Information System (WHMIS) requirements for the use, handling, storage, and disposal of hazardous materials, as well as the labelling and provision of Material Safety Data Sheets (MSDS) recognized by Health Canada.

.2 The Project Owner must ensure that the building ventilation system is operating at its maximum air intake and exhaust rates while caulking and sealant are being applied. Ventilate work areas as directed by the Departmental Representative, using approved portable supply and exhaust fans.

1.7 WARRANTIES

.1 The Contractor must provide a document stating that they guarantee the waterproofing work against loss of consistency, shrinkage, running, loss of adhesion, and dulling of adjacent surfaces for three (3) years from the date the Certificate of Completion of Work is issued.

PARTIE 2 PRODUCTS

2.1 SEALANTS

.1 Caulking products that emit strong odours, that contain toxic chemicals, or that are not certified as mildew-resistant must not be used in air handling units.

.2 If toxic products must be used, limit their use to areas where fumes can be vented outdoors or to areas where the fumes will be confined behind air barriers, or apply the product several months before the location is to be occupied to allow fumes to dissipate for as long as possible.

.3 For sealants that are approved with a primer, only the indicated primer may be used with the sealant.

.4 Sealant colour: similar to the colours of the materials to which the product is applied. Have the colours approved by the Departmental Representative before applying them.

2.2 SEALANTS – DESCRIPTION

.1 Primers: of the type recommended by the sealant manufacturer

.2 Preformed, compressible, and non-compressible backup strips: must be compatible with primers and sealants

- .1 Polyethylene, urethane, neoprene, or vinyl foam elements
  - .1 Extruded closed-cell foam backer rod, Shore A hardness of 20, breaking load 140 to 200 kPa
  - .2 Elements oversized by 30–50%
- .2 Neoprene or butyl rubber elements
  - .1 Round, solid rods with a Shore A hardness of 70
- .3 Bond breaker tape
  - .1 Polyethylene tape with simple pressure bonding that does not adhere to the sealant

.3 Sealants:

.1 Sealing compound for outside use on walls, siding, and other structures above grade: three-part, epoxidized polyurethane sealant, compliant with CAN/CGSB-19.24-M80

.2 Sealing compound for interior use, for soundproofing and fireproofing partitions and vapour barrier: compliant with CGSB-119-GP-21M

.3 One-component, silicone-based sealant: compliant with CAN/CGSB-19.13-M82 and ASTM C920 (cannot be painted)

.4 Sealant colour: proposed by the general contractor and approved by the Departmental Representative

2.3 CLEANING PRODUCTS FOR JOINTS

.1 Non-corrosive and non-smearing cleaning products (xylol, methyl ethyl ketone, or other), compatible with the sealants and the materials of the joints, according to the sealant manufacturer's written recommendations

.2 Primer: according to the sealant manufacturer's written recommendations

PARTIE 3 EXECUTION

3.1 EXAMINATION

.1 Verification of conditions: Before installing joint sealants, ensure that the condition of surfaces/substrates previously installed under other sections or contracts is acceptable and allows the work to be carried out according to the manufacturer's written instructions.

.2 Visually inspect the surfaces/structural elements.

.1 Immediately inform the Departmental Representative of any unacceptable conditions upon discovery.

.2 Begin installation only after unacceptable conditions have been corrected and written approval has been received from the Departmental Representative.

3.2 PREPARATION OF SURFACES

.1 Check the joint size and the condition of the surfaces to obtain an adequate width-depth ratio in order to apply the backup strips and sealants.

.2 Clear the surfaces of the joints of all undesirable material such as dust, rust, oil, grease, and other foreign matter which may affect the quality of workmanship.

.3 Remove rust, scale, and coatings from ferrous metal surfaces with a wire brush, grinder, or sandblaster.

.4 Remove oil, grease stains, and other marks from non-ferrous metal surfaces with joint cleaner.

.5 Prepare concrete and brick surfaces, as well as glazed and glassy surfaces, according to the sealant manufacturer's instructions.

.6 Do not apply sealants to joint surfaces that have been treated with a filler, curing compound, water repellent, or any other type of coating, unless prior testing has confirmed that the materials are compatible. Remove existing coatings from surfaces as required.

.7 Ensure that the joint surfaces are dry and not frozen.

.8 Prepare the surfaces according to the manufacturer's instructions.

.9 Install the backing strips to achieve the recommended joint depth for the caulking.

3.3 PRIMER APPLICATION

.1 Before applying primer and caulking, mask adjacent surfaces as necessary to prevent soiling.

.2 Apply primer to the sides of joints immediately before applying the sealant, following the sealant manufacturer's instructions.

3.4 BACKING STRIP APPLICATION

.1 Apply bond breaker tape where required, following the manufacturer's instructions.

.2 Check the joint size and make the necessary corrections so its depth is equal to half its width for a minimum depth and length of 6 mm and a maximum width of 25 mm.

.3 After compressing it by about 30%, apply the backing strip to match the desired joint depth and shape.

3.5 DOSAGE

.1 Dose the components in strict accordance with the sealant manufacturer's instructions.

3.6 APPLICATION

.1 Sealant application

.1 Apply the sealant according to the manufacturer's written instructions.

.2 If necessary, apply masking tape to the edges of the surfaces to be jointed to create clean joints.

.3 Apply the sealant in a continuous line.

.4 Apply the sealant with a gun equipped with a suitably sized nozzle.

.5 The pressure in the gun must be strong enough to fill gaps and perfectly fill the joints.

.6 Joints should be made to create a continuous seal free of edges, wrinkles, sagging, air bubbles, and embedded dirt.

.7 Create a slight groove in the exposed surfaces before a skin forms on the joints.

.8 For angle joints, give the caulking a slightly convex shape. Ensure good adherence on both sides of the joint by leaving an air pocket at the centre of the joint under the caulking.

.9 Remove excess sealant as the work progresses and once the work ends.

.2 Drying

.1 Ensure that sealants are dried and cured according to the sealant manufacturer's instructions.

.2 Do not cover joints made with sealants until they have dried thoroughly.

3.7 CLEANING

.1 Cleaning during work: Clean in accordance with section 01 74 11 – Cleaning.

.1 Leave the premises clean at the end of each work day.

.2 Clean adjacent surfaces immediately.

.3 As the work progresses, use the recommended cleaners to remove excess and spilled sealant.

.4 Remove the masking tape at the end of the sealant's initial curing period.

.2 Final cleaning: Remove excess materials, waste, tools, and equipment from the job site in accordance with section 01 74 11 – Cleaning.

.3 Per section 01 74 21 – Construction/Demolition Waste Management and Disposal.

3.8 PROTECTION

.1 Protect installed equipment and components from being damaged during construction.

.2 Repair damage to adjacent materials and equipment caused by the installation of joint sealants.

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 07 25 00 – Weather Barriers
.2 Section 07 92 00 – Joint Sealants
.3 Section 08 71 00 – Door Hardware
.4 Section 09 91 00 – Painting

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 ASTM International

.1 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
.2 ASTM A-780/A780M-09(2015), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings

.3 Canadian Standards Association (CSA)

.1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel
.2 CSA W59-18, Welded Steel Construction (Metal Arc Welding)

.4 Canadian Steel Door Manufacturers Association (CSDMA)

.1 CSDMA, Recommended Specifications for Commercial Steel Door and Frame Products, 2006
.2 CSDMA, Selection and Usage Guide for Commercial Steel Door and Frame Products, 2009

.5 National Fire Protection Association (NFPA)

.1 NFPA 80-19, Standard for Fire Doors and Other Opening Protectives

.6 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S104-15, Standard Method for Fire Tests of Door Assemblies
.2 CAN/ULC-S105:2016, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104
.3 CAN/ULC-S701.1:2017, Standard for Thermal Insulation, Polystyrene Boards

1.3 QUALITY ASSURANCE

.1 Design requirements

.1 Frames installed in exterior walls must be designed to allow the parts (of the doors and frames) to expand and contract freely when their surfaces are subjected to temperatures between -35 °C and 35 °C.
.2 The maximum deflection of steel bay closure elements must not exceed 1/175 of their span under a wind load of 1.2 kPa.

1.4 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

.2 Submit the required shop drawings in accordance with section 01 33 00 – Submittal Procedures.

.1 The submitted shop drawings must bear the seal and signature of a licensed engineer registered with the Ordre des Ingénieurs du Québec.

.2 The shop drawings must show each type of door proposed, the nature of the materials used, the thickness of the bare metal, mortises, reinforcements, the location of exposed anchors and fasteners, hardware arrangements, and finishes.

.3 The shop drawings must show each type of frame proposed, the nature of the materials used, the thickness of the bare metal, reinforcements, glazing beads, the location of exposed anchors and fasteners, and the types of finishes.

.4 The shop drawings must include a schedule identifying each unit, with door marks and numbers corresponding to the numbering on the drawings and the door schedule.

1.5 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle materials and equipment in accordance with section 01 61 00 – Common Product Requirements.

.1 Identify the doors and frames with a label indicating:

.1 The name of the manufacturer

.2 A description of the product and its size

.3 The number of the opening

.2 Place doors and welded frames vertically.

.3 Place doors and frames on blocks at least 100 mm off the floor.

1.6 WARRANTY

.1 Provide a document as specified in section 01 78 00 – Closeout Submittals stating that the Contractor thereby guarantees the metal doors and frames against defects in workmanship or material for two (2) years from the date the Certificate of Completion of Work is issued, under normal usage conditions.

PARTIE 2 PRODUCTS

2.1 FABRICATION OF FRAMES – GENERAL

.1 Frames must be fabricated according to CSDMA standards and must come from the same manufacturer.

.2 Frames must be manufactured according to the maximum frontal dimensions and profiles shown.

.3 External frames: in galvanized steel sheet, compliant with ASTM A653/A653M, with Z275 zinc coating.

.1 Minimum bare metal thickness: compliant with the relevant CSDMA standard, Table 1 - Thickness for Component Parts

.2 Thickness: 1.6 mm (16 gauge)

.3 Mounting: welded

.4 With thermal break

.4 Profiles and reinforcements: steel compliant with CSA-G40.20/G40.21, grade 44W, with Z275 zinc coating according to ASTM A653/A653M.

.5 Frames must be cut, braced, drilled, and tapped as required to accommodate the necessary mortised, templated hardware, using the templates provided by the finishing hardware supplier. Reinforce frames for surface-mounted hardware. Coordinate requirements with section 08 71 00 – Door Hardware.

.6 Cut the mitred joints and other joints, then weld them with a continuous bead.

.7 Grind joints and welded corners smooth, fill with metallic paste, and buff to a smooth, uniform finish.

.8 The manufacturer's nameplates must be placed on the hinge side of the frames so they are hidden from view.

.9 Unless otherwise specified, fasteners must be concealed.

.10 Provide three (3) insertion-type doorstops for each frame that is not equipped with a sealing system.

.11 For frames installed in masonry walls, provide metal boxes, welded to the frame, with connectors to cover and protect recessed power transfers and door contacts.

.12 Frames must be touched up with ASTM A780/A780M compliant zinc-rich primer in places where the zinc coating has been damaged during assembly.

2.2 FRAME ANCHORING

.1 Provide and install appropriate anchors for walls and floors.

.2 Stiffeners and anchors: made of steel with zinc plating according to ASTM A653/A653M, same level as the zinc plating of the frame.

.1 Provide at least six (6) anchors per frame.

.3 The wall anchors must be installed immediately above or below each hinge reinforcement on the hinge jamb, and directly opposite on the strike jamb.

.4 Provide two anchors for jambs whose rabbet opening heights are up to 1520 mm, plus one additional anchor for each additional 760 mm of height or fraction thereof.

2.3 WELDED FRAMES

.1 Weld in accordance with CSA W59.

.2 Frame elements must be accurately mitred or mechanically assembled, then securely welded on the inner walls of the profiles.

.3 The butt joints of mullions, transom bars, centre rails, and sills must be coped precisely.

.4 Welded joints and corners must be ground flat, filled with metallic paste, and sanded to a smooth, uniform finish.

.5 Floor anchors must be securely attached to the insides of each jamb.

.6 Weld in two temporary jamb spreaders per frame to maintain proper alignment during transportation.

2.4 FABRICATION OF DOORS – GENERAL

.1 Doors: swing type, flush, with openings for glass and/or louvres as indicated.

.2 Exterior steel doors must have an insulated core.

.3 Doors must be of the manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gaskets, and hardware in accordance with ASTM E330.

.4 Profiles and reinforcements: steel compliant with CSA-G40.20/G40.21, grade 44W, with Z275 zinc coating according to ASTM A653/A653M.

.5 Doors must be cut, reinforced, and drilled for the mortised, templated hardware as needed.

.6 Holes 12.7 mm in diameter and larger must be drilled in the factory, except mounting and through bolt holes, which must be drilled on-site when the hardware is being installed.

.7 Doors must be reinforced where surface-mounted hardware is installed, if necessary. Exterior doors must be equipped with a flush steel closing profile at the top.

.8 Doors must be touched up with primer where the zinc coating has been damaged during manufacture.

.9 Make the horizontal edges without visible joints. The welds must be made in spots and filled with a filler paste, then smoothed by sanding.

.10 The manufacturer's nameplates must be placed on the doors so they are hidden from view.

2.5 THERMAL BREAK DOORS AND FRAMES

.1 Cladding sheet: hot-dip galvanized steel compliant with ASTM A653/A653M with Z275 zinc plating.

.1 Steel thickness: 1.2 mm (18 gauge)

.2 Thermally broken doors must have an insulated core, and the exterior elements must be separated from the interior elements with a continuous interlocking thermal break.

.3 The thermal break must be made with rigid extruded PVC elements.

.4 Thermally broken frames must separate exterior and interior elements with a continuous interlocking thermal break.

.1 Standard profiles

.5 Doors and frames must be insulated.

.1 Door: injected polyurethane insulation

.2 Frame: rock fibre insulation

2.6 ADHESIVES

.1 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity.

.2 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.7 FACTORY-APPLIED PAINT

.1 High-performance liquid paint system sprayed with a pressure gun:

.1 Primer: vinyl pretreatment wash primer

.2 Primer: epoxy primer

.3 Finish: acrylic aliphatic polyurethane

.1 Colour: to be determined by the Departmental Representative

.4 Provide samples of each colour for on-site touch-ups.

2.8 ACCESSORIES

.1 Door silencers: single stud, neoprene rubber, insertion type

.1 Provide silencers for frames that are not equipped with sound or weather stripping.

.2 Install three (3) silencers on the strike jamb for single doors and two (2) additional silencers on the head for double doors.

.3 The silencers are to be supplied by the frame manufacturer.

.2 Horizontal closing profiles at the top and bottom: extruded rigid PVC profiles filled with glass fibre insulation

.3 Metal filler: according to the manufacturer's specifications

.4 Sealant: compliant with section 07 92 00 – Joint Sealants

PARTIE 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Follow the manufacturer's written requirements, recommendations, and specifications, including any available technical bulletins; instructions for product handling, storage, and use; and technical data sheet indications.

3.2 INSTALLATION – GENERAL

.1 Install doors and frames in accordance with the CSDMA installation guide.

.2 Notify the hardware Departmental Representative in writing 24 hours before beginning installation of steel doors and frames.

3.3 FRAME INSTALLATION

.1 Install components plumb, square, level, and at the proper height.

.2 Fasten the anchors to the adjacent building elements.

.3 Brace the frames firmly in position until they are installed. Install temporary horizontal wood spreaders at 1/3 and 2/3 of the height of the door to maintain the frame width. Place a vertical brace at the centre of the head for openings over 1200 mm wide. Remove the wooden spacers once the frames are in place.

.4 Fasten the anchors and connecting pieces to the walls as required for each model and coordinate the locations of the anchors with the positions of the elements already in the walls.

.5 Make allowances for the structure to bend to ensure that structural loads are not transmitted to the frames.

.6 Caulk the edges of the frames between the frame and adjacent elements.

.7 Maintain the continuity of the air and vapour barriers.

.8 Caulk the interior of the outer frames with low-expansion polyurethane insulation.

3.4 DOOR INSTALLATION

.1 Install doors and hardware, using the templates provided, in accordance with the manufacturer's instructions and the requirements of section 08 71 00 – Door Hardware.

.2 Provide even margins between the doors and jambs and between the doors and finished floor and thresholds as follows:

.1 Hinge side: 1.0 mm

.2 Latch side and head: 1.5 mm

.3 Finished floor and threshold: 13 mm

.3 Adjust the moving parts so that the doors open and close smoothly.

3.5 TOUCH-UPS

.1 Touch up surfaces that were damaged during installation with a zinc rich primer.

.2 Cover the exposed surfaces of frame anchors, as well as any imperfections, with metal filler, then sand to a smooth, even finish.

.3 Re-adjust the doors after all the work is completed, and ensure that they open and close correctly and smoothly.

.4 Protect the elements to be delivered to the site with shop- or factory-applied paint. Provide touch-up paint containers for each colour.

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 08 11 00 – Metal Doors and Frames

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 American National Standards Institute (ANSI)/Builders Hardware Manufacturers Association (BHMA):

.1 ANSI/BHMA A156.1-[16], Butts and Hinges
.2 ANSI/BHMA A156.2-[17], Bored & Preassembled Locks and Latches
.3 ANSI/BHMA A156.3-[14], Exit Devices
.4 ANSI/BHMA A156.4-[13], Door Controls - Closers
.5 ANSI/BHMA A156.5-[14], Cylinders and Input Devices for Locks
.6 ANSI/BHMA A156.6-[10], Architectural Door Trim
.7 ANSI/BHMA A156.8-[10], Door Controls – Overhead Stops and Holders
.8 ANSI/BHMA A156.10-[17], Power Operated Pedestrian Doors
.9 ANSI/BHMA A156.12-[13], Interconnected Locks and Latches
.10 ANSI/BHMA A156.13-[17], Mortise Locks and Latches
.11 ANSI/BHMA A156.14-[13], Sliding and Folding Hardware
.12 ANSI/BHMA A156.15-[15], Release Devices - Closer Holder, Electromagnetic and Electromechanical
.13 ANSI/BHMA A156.16-[13], Auxiliary Hardware
.14 ANSI/BHMA A156.17-[14], Self Closing Hinges and Pivots
.15 ANSI/BHMA A156.18-[16], Materials and Finishes
.16 ANSI/BHMA A156.19-[13], Power Assist and Low Energy Power Operated Doors.
.17 ANSI/BHMA A156.20-[17], Strap and Tee Hinges, and Hasps

.3 Canadian Steel Door Manufacturers Association (CSDMA)/Association canadienne des fabricants de portes d'acier (ACFPA)

.1 CSDMA/ACFPA, Recommended Dimensional Standards for Commercial Steel Doors and Frames [2000]
.2 CSDMA/ACFPA, Canadian Metric Conversion Guide for Steel Doors and Frames (Modular Construction) [2009]

1.3 QUALITY ASSURANCE

.1 Regulatory requirements

.1 Hardware for doors in fire partitions and exit doors must be certified by a Canadian certification organization accredited by the Standards Council of Canada.

.2 Certificates

.1 Submit documents signed by the manufacturer, certifying that the products and materials/equipment meet the physical and performance requirements.

1.4 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

.2 Hardware list

.1 Submit a list of door hardware.

.2 The list must include the prescribed hardware and indicate their make, model, material, function, and finish, as well as any other relevant information.

.3 Electrical diagrams

.1 Submit final electrical diagrams for approval by the hardware Departmental Representative. They must be compatible with the security and fire alarm systems.

.2 Provide an electrical wiring diagram of all electrified components and provide a wiring path diagram.

1.5 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle all materials and equipment in accordance with the manufacturer's written instructions and section 01 61 00 – Common Product Requirements.

.2 Delivery and acceptance: Deliver materials and equipment to the job site in their original packaging, which must be labelled with the manufacturer's name and address.

.3 Pack hardware, including fasteners, separately or in groups of similar items, and label each package with the type and purpose of the item.

1.6 CLOSEOUT SUBMITTALS

.1 Submit the required documents and items in accordance with section 01 78 00 – Closeout Submittals.

.2 Operation and maintenance sheets: provide instructions for the use and maintenance of the door hardware, which will be incorporated into the O&M manual.

.3 Additional materials/equipment

.1 Provide replacement/maintenance materials and equipment as required by section 01 78 00 – Closeout Submittals.

.2 Tools

.1 Provide two (2) sets of the keys needed to service fire exit hardware, locksets, and door closers.

1.7 WARRANTIES

.1 Provide a document as specified in section 01 78 00 – Closeout Submittals stating that the Contractor thereby guarantees the hardware against defects in workmanship and material for one (1) year from the date the Certificate of Completion of Work is issued.

.2 Provide a document as specified in section 01 78 00 – Closeout Submittals stating that the Contractor thereby guarantees the door closers against defects in workmanship and materials for ten (10) years from the date the Certificate of Completion of Work is issued.

.3 Provide a document as specified in section 01 78 00 – Closeout Submittals stating that the Contractor thereby guarantees the locksets against defects in workmanship and material for seven (7) years from the date the Certificate of Completion of Work is issued.

.4 Provide a document as specified in section 01 78 00 – Closeout Submittals stating that the Contractor thereby guarantees the mechanical anti-panic locks against defects in workmanship and materials for three (3) years from the date the Certificate of Completion of Work is issued.

.5 Provide a document as specified in section 01 78 00 – Closeout Submittals, stating that the Contractor thereby guarantees the electrified anti-panic locks against defects in workmanship and materials for one (1) year from the date the Certificate of Completion of Work is issued.

PARTIE 2 PRODUCTS

2.1 GENERAL

.1 All hardware items must be supplied by the same distributor.

.2 All items of the same type must come from the same manufacturer.

.3 In the absence of an ANSI/BHMA standard, the hardware must be able to serve its specific purpose and be of recognized use.

.4 Hardware includes all items listed in the Doors, Frames, and Hardware Table. It includes everything required to complete the work, in accordance with the intent of the drawings and specifications and in compliance with the codes and standards in effect.

.5 Hardware items must be packaged in parcels with the necessary screws and accessories; label the parcels with their destination and purpose.

.6 Provide the door and frame manufacturer with the necessary templates and information for the hardware to be installed properly.

.7 Hardware must be complete, with all accessories, fasteners, spacer shims, brackets, extensions, etc.

.8 Supply and install all low-voltage wiring between the pieces of electrified hardware.

.9 Electrical power (120 V or 240 V), empty conduits, and electrical boxes for all electrified hardware will be supplied and installed at a later date by an electrical contractor.

2.2 FASTENERS

.1 Only fasteners supplied by the manufacturer may be used. Failure to comply with this requirement may compromise warranties and void certification labels, if any.

.2 Provide any screws, bolts, expansion shields, and other fastening devices needed to sufficiently attach and operate the hardware.

.3 Exposed fasteners must have the same finish as the installed hardware.

.4 Where a pull handle will be installed on one side of the door and a push plate installed on the other side, supply fasteners and install them so that the handle can be secured from the other side of the door. Ensure that the fasteners are concealed when installing the push plate.

.5 Use fasteners compatible with the material through which they pass.

2.3 KEYING

.1 Door locks must be ordered with similar master keys, following the hardware list. Prepare a detailed key list in consultation with the Departmental Representative and the hardware Departmental Representative.

.2 Provide twelve (12) master keys for each set of grand-master or master keys.

.3 Stamp keying code numbers on keys and cylinders.

.4 Provide temporary cylinders for use during construction.

.5 Securely hand over all the final cylinders with their keys.

.6 The key system for the external doors will be of the same type.

.7 The Project Owner's hardware Departmental Representative is to send details of the key system directly to the cylinder manufacturer. Send a copy of the purchase order to the hardware Departmental Representative to coordinate and follow up with the cylinder manufacturer.

.8 Allow for new locks to be added to the master key system as required by the Project Owner and compiled by the hardware Departmental Representative.

.9 Allow for the removal of locks on three existing doors.

.10 Allow for the installation of new locks on three existing doors.

.11 Provide the Project Owner and the hardware Departmental Representative with a copy of the key cutting code chart.

PARTIE 3 EXECUTION

3.1 INSTALLATION

.1 Manufacturer's instructions: follow the manufacturer's written requirements, recommendations, and specifications, including technical bulletins and installation

instructions specified in product catalogues and on packaging, as well the technical data sheets.

.2 Supply installation templates and complete instructions to the metal door and frame manufacturers so they can prepare the products for the hardware specified in this section.

.3 Provide the manufacturer's installation instructions with each piece of hardware.

.4 Install the hardware to standard hardware location dimensions in accordance with the Canadian Metric Guide for Steel Doors and Frames (Modular Construction).

.5 If the door stop touches the pull handle, mount the stop so that it strikes the bottom of the door pull.

.6 Use only the manufacturer's supplied fasteners.

.1 Quick release devices, unless specifically provided by the manufacturer, are not acceptable.

.7 Remove the construction cores from the locks once requested by the Project Owner.

.1 Replace the construction cores with permanent cores, and check that the locks operate correctly.

.8 Do not install any visible screws through the doors to attach hardware without approval from the hardware Departmental Representative.

3.2 ADJUSTMENT

.1 Adjust door hardware, closers, and operating and control devices to ensure that they operate smoothly and safely and provide a weather-tight seal.

.2 Lubricate the hardware and operating and control devices, as well as all moving parts.

.3 Adjust the door hardware to ensure a tight fit at points where the door contacts the frame.

.4 Readjust the hardware after the building's ventilation system has been turned on.

3.3 ON-SITE QUALITY CONTROL

.1 The hardware Departmental Representative will inspect the hardware once the work has been completed, at the time of provisional acceptance.

.2 The Contractor must notify the hardware Departmental Representative in writing when hardware installation begins.

.3 The Contractor must notify the hardware Departmental Representative once the hardware installation is complete to schedule an inspection date.

3.4 CLEANING

.1 Cleaning during work: Clean in accordance with section 01 74 11 – Cleaning.

.1 Leave the premises clean at the end of each work day.

.2 Clean hardware with a damp cloth and a non-abrasive cleaner and polish according to the manufacturer's instructions.

.3 Remove the protective film from hardware, if necessary.

.4 Final cleaning: Remove excess materials/equipment, tools, and waste from the site in accordance with section 01 74 11 – Cleaning.

3.5 DEMONSTRATION

.1 Key system setup

.1 Set up a key control system with file key tags, duplicate key tags, a numerical index, an alphabetical index, a key change index, label shields, a control book, and key receipt cards.

.2 Hand over the file keys and duplicates to the Departmental Representative.

.2 Information given to maintenance staff

.1 Provide maintenance staff with the necessary information on the following:

.1 Proper cleaning and maintenance for hardware items.

.2 The description, purpose, handling, and storage of keys.

.3 The use, application, and storage of keys for setting door closers, locks, and exit door hardware.

.3 Demonstrate how the parts function, as well as the adjustment features and lubrication requirements.

3.6 PROTECTION

.1 Protect installed parts and equipment from damage during construction.

.2 Repair damage to adjacent materials and equipment caused by the installation of door hardware.

3.7 HARDWARE LIST

.1 The hardware list includes the type, function, quality, and finish of the items required, but should not be construed as a definitive list of quantity. The Contractor and the hardware distributor must check this list against the plans and specifications, and provide any additional hardware not listed but required to complete the work as intended in the documents.

.2 The plans and hardware complement each other, and any discrepancies or missing items in either document will not be added to the contract unless they are reported to the Departmental Representative prior to tendering.

3.8 HARDWARE GROUPS

Group 01 (Door 001)

QTY	DESCRIPTION	FINISH	MANUFACT.
3	HINGES #TA2314-114 X 114 X FNA	630	
1	STOREROOM LOCK #ND80LD X S/C	630	
1	CYLINDER KEYED TO CUSTOMER'S SYSTEM	626	
1	CLOSER #4040-HCUSH	689	
1	WEATHERSTRIPPING SET #W-27 X W-20S X L.R.	628	
1	DOOR SWEEP #W-35-1 X L.R.	628	
1	ALUMINUM THRESHOLD #CT-410 X CT-40S X L.R.	628	
1	ASTRAGAL #5000T-MD-GE	619	
1	DOOR CONTACT SUPPLIED BY OTHER		

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 05 50 00 – Metal Fabrications

.2 Section 07 92 00 – Joint Sealants

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 ASTM International

.1 ASTM C542-05(2017), Standard Specification for Lock-Strip Gaskets

.2 ASTM C794-18, Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants

.3 ASTM C1376-15, Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass

.4 ASTM D790-17, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

.5 ASTM D1003-13, Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics

.6 ASTM D1929-16, Standard Test Method for Determining Ignition Temperature of Plastics

.7 ASTM D2240-15e1, Standard Test Method for Rubber Property – Durometer Hardness

.8 ASTM E84-18a, Standard Test Method for Surface Burning Characteristics of Building Materials

.9 ASTM E330/E330M-14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

.10 ASTM F1233-08(2013), Standard Test Method for Security Glazing Materials and Systems

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-12.1-17, Safety Glazing

.2 CAN/CGSB-12.2-M91(2017), Flat, Clear Sheet Glass

.3 CAN/CGSB-12.3-M91(2017), Flat, Clear Float Glass

.4 CAN/CGSB-12.4-M91(2017), Heat Absorbing Glass

.5 CAN/CGSB-12.8-17, Insulating Glass Units

.4 Glass Association of North America (GANA)

.1 GANA Glazing Manual – 2008

.2 GANA Laminated Glazing Reference Manual – 2009

1.3 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

.2 Technical data sheets

.1 Submit the required technical data sheets, as well as the manufacturer's instructions and documentation for glazing, sealants, and glazing accessories. Technical data sheets should indicate product characteristics, performance criteria, dimensions, limitations, and finish.

.3 Shop drawings

.1 The submitted shop drawings must bear the seal and signature of a licensed engineer registered with the Ordre des Ingénieurs du Québec, confirming that they meet the requirements and performances stipulated in section 4.1.5.14 of the National Building Code (NBC).

.2 Shop drawings must indicate, show, or include the dimensions of glass attachment systems, requirements, anchorage details, anticipated deflection under loads, related work affecting progress, location, and details of contraction and expansion joints.

.4 Samples

.1 Submit samples of each type of glazing element for review and approval.

1.4 CLOSEOUT SUBMITTALS

.1 Submit the required documents and items in accordance with section 01 78 00 – Closeout Submittals.

.2 Operation and maintenance sheets: provide instructions for the use and maintenance of the glazing, which will be incorporated into the O&M manual.

1.5 CALCULATION CRITERIA

.1 Comply with the following requirements for glazing, fastening systems, and glass materials to meet the requirements of section 4.1.5.14 of the NBC.

.1 The minimum specified horizontal load applied inward or outward at the minimum required height of a guard rail must be 3.0 kN/m.

.2 There must be a concentrated load of 1.0 kN at any given point on the guard rail.

.3 The components of guard rails must be designed to withstand a load of 0.5 kN applied to a 100 mm square, located at any point in the element or elements where it may produce the most critical effect.

.4 The required minimum load, applied vertically at the top of every required guard rail, is 1.5 kN/m.

.5 Loads for handrails must comply with section 3.4.6.5.12 of the NBC.

.2 The glazing must be sized to withstand dead loads, wind loads, and wind pressure and suction forces in accordance with ASTM E330/E330M.

.3 The maximum bend limit of the glass must not alter the physical properties of the glass in any way.

1.6 QUALITY ASSURANCE

.1 Certificates: submit documents signed by the manufacturer certifying that the products, materials, and equipment meet the physical and performance requirements.

.2 Samples

.1 Collect and submit the required samples in accordance with section 01 45 00 – Quality Control.

.2 The samples must include the actual glass pane as well as the fittings and fastening system.

.3 The samples will be used for the following purposes:

.1 To assess the quality of the workmanship, surface/substrate preparation, functionality, and installation of materials.

.4 Collect samples of the work at the designated locations.

.5 Allow twenty-four (24) hours for the inspectors to examine the samples before starting the work.

.6 Once accepted, the samples will be the minimum standard for the work. They can be integrated into the finished work.

1.7 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle all materials and equipment in accordance with the manufacturer's written instructions and section 01 61 00 – Common Product Requirements.

1.8 ENVIRONMENTAL CONDITIONS

.1 Environmental conditions

.1 Ensure that the minimum prescribed temperature is reached before work begins, and maintained while the glazing putty is being applied and for 24 hours after the work is completed.

PARTIE 2 PRODUCTS

2.1 GLASS GUARD RAIL

.1 Tempered laminated glass for guard rails:

.1 Ultra-clear monolithic tempered glass: **minimum 25 mm thick, i.e. two (2) 12 mm-thick sheets of glass**, or according to calculations

.2 Laminating film: 0.060 SentryGlas Plus film

.3 Dimensions: as indicated

.4 3 mm chamfered edges and corners

.5 Finish the edges of the glass with a diamond polish and chamfer

.6 Install the guard rail permanently and securely using a system designed for that purpose.

.2 Glass attachment system:

.1 Continuous extruded aluminum base shoe, 6063-T5 or T6 alloy aluminum profiles compliant with Aluminum Association requirements, free of defects that could impact the strength, appearance, and durability of aluminum elements according to ASTM B221

.2 Fasteners: provide all fasteners for the structural steel elements, rated to withstand the required loads, and resistant to corrosion

.3 Alignment devices: integrated into the shoe to adjust the vertical plane of the glass

.4 The size of the shoes must be determined by a specialized engineer in order to support the required loads:

.1 Interior width: to accommodate the thickness of the glass and the adjustment shims.

.2 Length: according to the manufacturer's indications and maximums

.5 The aluminum finish must be AA-M12-C22-A41 for a thickness of 18 microns, in Natural Aluminum colour.

2.2 ACCESSORIES

.1 Sealants: compliant with section 07 92 00 – Joint Sealants

.2 Setting blocks: neoprene 80-90 Shore A durometer hardness to ASTM D2240, to suit the glazing method, glass installation, and weight and size of glass

.3 Glazing beads: resilient, in silicone, extruded to fit the glazing channel, in the chosen colour

.4 Glass pliers: standard type recommended by the manufacturer

.5 Lock-strip gaskets: according to ASTM C542

PARTIE 3 EXECUTION

3.1 EXAMINATION

.1 Verification of conditions: Before installing glazing, ensure that the condition of surfaces/substrates previously installed under other sections or contracts is acceptable and allows the work to be carried out according to the manufacturer's written instructions.

.1 Ensure that the openings for the glazing are properly sized and within the allowable tolerances.

.2 Ensure that the surfaces of the glazing channels and other recesses are clean and free of obstructions and are ready to receive the glazing.

.3 Visually inspect the surfaces/structural elements.

.4 Immediately inform the Departmental Representative of any unacceptable conditions upon discovery.

.5 Begin installation only after correcting unacceptable conditions.

3.2 PREPARATION

.1 Clean the contact surfaces with a solvent and wipe dry.

.2 Seal porous glazing channels and other recesses with a primer or sealer that is compatible with the frame.

.3 Apply a primer coat to surfaces that are scheduled to be sealed.

3.3 GLASS GUARD RAIL

.1 Install the shoes and glass in the mechanical fasteners according to the manufacturer's recommendations.

.2 Install the glass plates, ensuring that they are square and level.

.3 Install neoprene shims between the glass and the shoe to hold the glass in place.

.4 Apply a silicone sealant where necessary to hold elements in place.

3.4 CLEANING

.1 Cleaning during work: Clean in accordance with section 01 74 11 – Cleaning.

.1 Leave the premises clean at the end of each work day.

.1 Remove all traces of primer, sealant, and caulking products.

.2 Remove glazing putty and other materials from finished surfaces.

.3 Remove all labels once work is completed.

.4 Clean the glazing with a non-abrasive product according to the manufacturer's instructions.

.2 Final cleaning: Remove excess materials/equipment, tools, and waste from the site in accordance with section 01 74 11 – Cleaning.

3.5 PROTECTION

.1 Protect installed parts and equipment from damage during construction.

.2 Once they have been installed, mark each pane of glass with an "X", using a paste or removable plastic tape.

.1 However, do not mark reflective or heat-absorbing glass.

.3 Repair damage to adjacent materials and equipment caused by the installation of glazing.

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 06 10 00 – Carpentry
.2 Section 07 21 16 – Blanket Insulation
.3 Section 07 92 00 – Joint Sealants
.4 Section 09 91 00 – Painting

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM C473-19, Standard Test Methods for Physical Testing of Gypsum Panel Products
.2 ASTM C475/C475M-17, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
.3 ASTM C557-03 (2017), Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing
.4 ASTM C840-20, Standard Specification for Application and Finishing of Gypsum Board
.5 ASTM C954-18, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
.6 ASTM C1002-18, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
.7 ASTM C1047-14a (2019), Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
.8 ASTM C1177/C1177M-17, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
.9 ASTM C1178/C1178M-18, Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
.10 ASTM C1280-18, Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing
.11 ASTM C1325-19, Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units
.12 ASTM C1396/C1396M-17, Standard Specification for Gypsum Board
.13 ASTM C1629/C1629M-19, Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels
.14 ASTM C1658/C1658M-19, Standard Specification for Glass Mat Gypsum Panels
.15 ASTM D3273-[16], Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

.16 ASTM E136-19a, Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C

.3 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S706.1:2020, Standard for Insulating Wood Fibre Boards for Buildings

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction

1.3 DOCUMENTS AND SAMPLES TO SUBMIT FOR APPROVAL/REFERENCE

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

.2 Technical data sheets

.1 Submit the required technical data sheets, as well as the manufacturer's instructions and documentation for gypsum board assemblies. Technical data sheets should indicate product characteristics, performance criteria, dimensions, limitations, and finish.

1.4 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle all materials and equipment in accordance with the manufacturer's written instructions and section 01 61 00 – Common Product Requirements.

.2 Avoid damaging the surfaces or edges of gypsum boards when handling them.

1.5 ENVIRONMENTAL CONDITIONS

.1 Keep the ambient air temperature between 10 °C and 21 °C for 48 hours before and after placing and jointing gypsum boards, and for at least 48 hours after completion of joint treatment.

.2 Apply boards and joint treatment to dry, clean, ice-free surfaces.

.3 Ventilate building spaces with gypsum boards as required to remove excess moisture that could prevent the joint treatment material from drying immediately after application.

1.6 WARRANTY

.1 Submit the required documents in accordance with section 01 78 00 – Closeout Submittals.

PARTIE 2 PRODUCTS

2.1 INTERIOR SHEATHING BOARDS

.1 Standard board

.1 Complies with ASTM C1396/C1396M

.2 Type: X (fire-resistant)

.3 Thickness: 15.9 mm, according to the plans

.4 Dimensions: 1200 mm wide and maximum working length

.5 Edges: thinned

2.2 ACCESSORIES

.1 Steel drill bits: compliant with ASTM C1002

.1 With anti-corrosion treatment for installing intermediate gypsum sheathing boards

.2 Stud adhesive: compliant with ASTM C557

.3 Laminating adhesive: as recommended by the manufacturer, asbestos-free

.4 Casing beads, corner reinforcements, shrink joints, and edges: compliant with ASTM C1047, vinyl, perforated wing, one piece

.5 Sealant: compliant with section 07 92 00 – Joint Sealants

.6 Joint compound: compliant with ASTM C475/C475M, asbestos-free. Follow the recommendations of the gypsum board manufacturer.

PARTIE 3 EXECUTION

3.1 EXAMINATION

.1 Verification of conditions: Before installing the gypsum board assemblies, ensure that the condition of surfaces/substrates previously installed under other sections or contracts is acceptable and allows the work to be carried out according to the manufacturer's written instructions.

.1 Visually inspect the surfaces/structural elements.

.2 Immediately inform the Departmental Representative of any unacceptable conditions upon discovery.

.3 Begin installation only after correcting unacceptable conditions.

3.2 PREPARATION AND MOUNTING

.1 Coordinate the gypsum board installation with structural and mechanical work. Do not install gypsum boards until the subframes, anchors, shims, and electrical and mechanical installations have been approved by the appropriate Departmental Representative.

.2 Fire-resistant and/or soundproof partitions

.1 Install the materials required to provide the required fire or sound rating for the designated partitions.

.2 Unless otherwise specified, build partitions that must have a fire-resistance rating or some level of soundproofing so that they are continuous from the floor to the top deck, including horizontal service spaces.

.3 Install the elements level; the acceptable tolerance is 1:1200.

.4 Place a 150 mm high continuous strip cut from a 12.7 mm thick gypsum board at the base of each partition mounted on the flexible furring.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD SHEATHING

.1 Unless otherwise specified, install and finish gypsum board sheathing in accordance with ASTM C840.

.2 Attach the gypsum board to the furring or metal framing with screw anchors. Install the screws no more than 300 mm apart.

.1 Single-layer sheathing

.1 Install gypsum board on the ceiling first, then on the walls in accordance with ASTM C840.

.2 Install the boards vertically or horizontally, whichever will result in the fewest possible joints.

.2 Double-layer sheathing

.1 Install the boards that form the underlay of the sheathing, followed by the boards that will form the visible face.

.2 Install the ceiling underlay boards before the wall underlay boards, then install the ceiling and wall facing boards in the same order. Offset the joints of the two layers by at least 250 mm.

.3 Unless otherwise specified, install the underside of the sheathing at right angles to the supporting elements.

.4 Lay the boards forming the underside of the wall sheathing so that the joints rest against the supporting elements, then lay the boards on the facing side of the sheathing, offsetting the joints by at least 250 mm from those on the underside.

.3 Apply a continuous 12 mm diameter bead of acoustic sealant around the edges of each partition wall where the gypsum board sits against the framing, where the partitions meet the fixed building elements. Perfectly seal all cuts made around electrical boxes, ducts, etc., in partitions whose perimeters are lined with an acoustic sealant.

.4 For partitions that require specific acoustic performance, apply a continuous 12 mm bead of acoustic sealant in the joints of the underside panels before installing the panels on the facing side.

.5 Lay the boards on the ceiling in the direction that will result in the fewest possible butt joints. Offset the end joints by at least 250 mm.

.6 Lay the gypsum boards vertically on the walls to eliminate butt joints. Except in areas where local codes or assemblies with fire resistance require vertical installation, the boards must be laid horizontally in stairwells and other spaces with large wall surfaces, and the butt joints must be staggered on the studs.

.7 Place the butt joints on the supporting elements. Stagger the vertical joints on different studs on each side of the wall.

.8 Do not install damaged or damp gypsum boards.

.9 Water-resistant glass-mat gypsum boards for tile installation

.1 Install waterproof/water-resistant glass-mat gypsum boards for tile installation in areas that will be exposed to moisture and on specified walls that will be tiled. Apply sealant to edges and ends of gypsum boards and to cuts that expose the gypsum core and fastener heads. Do not apply joint treatment on areas that will be tiled.

3.4 INSTALLATION OF ACCESSORIES

.1 Mount accessories squarely, plumb, or level and secure them at the indicated level. Use full-length pieces whenever possible. Make joints tight, aligned, and securely fastened. Mitre the corners and fit them perfectly, leaving no rough or uneven edges. Secure elements at 150 mm on centre.

.2 Install casing beads around the edges of suspended ceilings.

.3 Install casing beads where the gypsum board meets surfaces with no trim to conceal the junction, and where indicated. Seal the joints with a sealant.

.4 Install continuous insulating strips at the edges of gypsum boards and casing beads that meet metal window and exterior door frames, to provide a thermal break.

.5 Install shrink joints straight and true.

.6 Install expansion joints as detailed, in the same place as the building's expansion and construction joints.

.7 Install expansion joints straight and true.

.8 Install coping on gypsum board partitions that do not extend to the ceiling.

.9 Fit the coping to the partition and attach it to the wall plate with two rows of sheet metal screws staggered at 300 mm on centre.

.10 Install access hatches for electrical and mechanical equipment as specified in their respective sections.

.1 Securely fasten frames to furring or framing systems.

3.5 FINISH

.1 Finish the joints between the boards and in the inside corners with joint compound, tape, and tape coating. Apply these products according to the manufacturer's recommendations and smooth by thinning them to match the surface finish of the boards.

.2 Gypsum board finish: finish gypsum board wall and ceiling sheathing as described below.

.1 Temporary structures: no joint treatment, accessories, or finishing elements necessary.

.2 Concealed areas: install with interior joints and angles covered with tape embedded in the joint compound. Grouted surfaces must be free of excess joint compound, but tool marks and dents are acceptable.

.3 Areas that are to be tiled: bury tape on joints and inside corners into joint compound and apply a separate layer of compound to joints, corners, fastener heads, and other accessories. Grouted surfaces must be free of excess joint compound, but tool marks and dents are acceptable.

.4 Exposed surfaces: bury tape on joints and inside corners into joint compound and apply three separate coats of compound to the joints, corners, fastener heads, and other accessories. Then apply a thin skim coat over the entire surface of the installed sheathing. Grouted surfaces must be smooth and free of tool marks and dents.

.3 Cover angle beads, shrink joints, and trim where required with two coats of joint compound and one coat of tape coating compound, smoothed and thinned to match the finish of the surface of the boards.

.4 Fill depressions left by screw heads with joint compound and tape coating to obtain a smooth surface flush with adjacent gypsum board surfaces so that the depressions are invisible when finished.

.5 Lightly sand any irregular edges or other imperfections. Avoid sanding adjacent surfaces.

.6 After installation is complete, the work should be smooth, level or plumb, free of warping and other defects, and ready to be coated with a finish coat.

.7 Unless otherwise specified, all exposed gypsum board surfaces must be painted in accordance with section 09 91 00 – Painting.

3.6 CLEANING

.1 Cleaning during work: Clean in accordance with section 01 74 11 – Cleaning.

.1 Leave the premises clean at the end of each work day.

.2 Final cleaning: Remove excess materials/equipment, tools, and waste from the site in accordance with section 01 74 11 – Cleaning.

3.7 PROTECTION

.1 Protect installed parts and equipment from damage during construction.

.2 Repair damage to adjacent materials and equipment caused by the installation of gypsum board sheathing.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Action and Informational Submittals.

.2 Section 04 03 06 – Cleaning Historic Masonry.

.3 Section 04 03 43.19 - Period Stone Dismantling.

.4 Section 04 03 43.13 - Masonry - Restoration and Repair

.5 Section 04 43 17 - Exterior - Granite Veneer Cladding.

.6 Section 32 14 13 - Precast Concrete Unit Paving.

~~.7~~ Section 03 30 00 - Cast-in-Place Concrete~~.~~

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)

.1 ANSI/CTI A118.1, Specification for Dry-Set Portland Cement Mortar.

.2 CTI / A118.3, Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.

.3 ANSI/CTI A118.4, Latex-Portland Cement Mortar.

.4 CTI A118.5, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation.

.5 CTI A118.6, Specification for Ceramic Tile Grouts.

.6 ANSI/CTI A118.8, Modified Epoxy Emulsion Mortar/Grout.

.7 ANSI/CTI A136.1, Organic Adhesives for Installation of Ceramic Tile.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM C144, Standard Specification for Aggregate for Masonry Mortar.

.2 ASTM C150, Standard Specification for Portland Cement.

.3 ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes.

.4 ASTM C568, Standard Specification for Limestone Dimension Stone.

.5 ASTM C84, Specification for Metal Lath.

.6 ASTM C615, Standard Specification for Granite Dimension Stone.

.7 ASTM C629, Standard Specification for Granite Dimension Stone.

.3 Canadian Standards Association (CSA International).

.1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.2 CSA O151, Canadian Softwood Plywood.

.4 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168, Adhesives and Sealants Applications.

.5 Terrazzo Tile and Marble Association of Canada (TTMAC)

.1 Tile Specification Guide 09 30 09300, 2006/2007, Tile Installation Manual.

.6 Tile Council of America (TCA), Inc.

.1 2006 Handbook for Ceramic Tile Installation.

.7 Other standards.

.1 ISO 13007 — International Standards Organization. Ceramic Tile - Grouts and Adhesives.

.2 TCNA (HB) — Handbook for Ceramic, Glass and Stone Tile Installation; Tile Council of North America.

.3 TTMAC — Specifications Guide 09 30 00 Tile Installation Manual.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide shop drawings, product data, samples and analyses in accordance with Section 01 33 00 — Submittal Procedures.

.1 Shop Drawings: indicate special patterns, finishes, mechanical fasteners and holes; include locations and details for proposed control joints, paver pattern and size drawings and cross-sections.

.2 Shop Drawings:

.1 Curb types.

.2 Paver types.

.3 Paving with lighting fixture.

.4 Top stone step with tactile stud placement.

.5 Royal 22nd Regiment monument steps with placement of anchors and lighting fixtures.

.6 Wall coping with anchors, including design and specifications.

.7 Curbs-walls and rear brackets, including fastener design and specifications.

.8 Voltigeurs and De la Bravoure monument engravings.

.2 Submit samples as follows:

.1 Obtain approval from Departmental Representative prior to commencing work of this section.

.2 Sets of 300 mm x 300 mm stone representing each type of stone and finish.

.3 Match Stanstead stone as close as possible to pigments and colour of salvaged commemorative plaques.

.4 Sample of polished engraved stone.

.5 All coloured grout.

.6 All coloured sealants.

.7 Tactile stud.

.8 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: must have experience and qualifications for stone installation. Work must be done by qualified personnel, familiar with ASTM techniques and recommendations.

.2 Engraver: must have experience and qualifications for coat-of-arms engraving in stone.

.2 Inspection and tests

.1 Allow and enable Departmental Representative free access at all times to plant and work site, to laboratory to verify, examine, supervise quality of materials and manufacture, and to take samples for tests and analyses.

.2 Contractor must inspect stone pavers and remove and set aside altered pavers prior to installation, including broken, cracked, delaminated or otherwise damaged pavers.

.3 Contractor must inspect paver accessories and remove and set aside altered accessories prior to installation, including broken, cracked, delaminated or otherwise damaged pavers. Any damaged accessories cannot be used for the installation of stone paving and must be removed from the site.

.3 Certificates:

.1 Certificates: 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 Packing, shipping, handling and unloading:

.1 Store materials in dry location and protect from frost, dirt and damage.

.2 Store cementitious materials on dry surface.

1.6 SITE CONDITIONS

.1 Maximum 10 degrees C prior to, during, and 48 hours after completion of masonry work.

.2 Do not apply epoxy mortar and grouts at temperatures below 10 degrees C or above 32 degrees C during Work and 48 hours after Work is complete.

.3 Work carried out during hot or cold weather to CAN/CSA-A371.

.4 Field Measurements:

Make site measurements necessary to ensure proper fit of components.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Physical properties of stone:

.1 Granite stone for steps, Stanstead granite type, meeting the appearance, characteristic (color, grain of the stone) to that of the quarry located in QC, CA.

Physical properties

Density:	ASTM C97.		2,660 kg/cm³.
Uniaxial compressive strength	ASTM C170.		186 MPa.
Absorption			0.15%.
Modulus of rupture	ASTM C99.	2,037 Psi	14.1 MPa.

.2 “Picasso” granite stone type for pavers, edging, stairs, stringers, meeting the appearance, characteristic (color, grain of the stone) to that of the quarry located in Magpie, QC.

Physical properties

Absorption by weight.	ASTM C97.	0.16%.
Uniaxial compressive strength	ASTM C170.	160.5 MPa.
3 Specific weight.	ASTM C97.	2.646 kg/m3.
Modulus of rupture	ASTM C99.	16.3 MPa.

.3 “Peribonka” or “Cambrian” type for top stair tread, meeting the appearance, characteristic (color, grain of the stone) to that of the quarry located in QC, CA.

Physical properties

Absorption by weight.	ASTM C97.	0.05 %.
Density:	ASTM C97.	2,785.61 kg/cm³.
Uniaxial compressive strength	ASTM C170.	171.8 MPa.
Modulus of rupture	ASTM C880.	11.24 MPa.

.4 “Caledonia” type for curbstone, meeting the appearance, characteristic (color, grain of the stone) to that of the quarry located in Rivière-à-Pierre, QC, CA.

Physical properties

Absorption by weight.	ASTM C97.	0.18 %.
Uniaxial compressive strength	ASTM C170.	168.4 MPa.
Specific weight.	ASTM C97.	2,705 kg/m³.
Modulus of rupture	ASTM C99.	11.7 MPa.

2.2 STONE COMPONENTS

.1 Steps of Royal 22 Regiment, Stanstead granite stone to ASTM C615, with the following characteristics.

.1 Sizes: see plan specifications.

.2 Pattern: see plan specifications.

.3 Finish: Sandblast on exposed surfaces, sawn back, underside and joints.

.4 Allow for insertion of light fixtures in stone at monument base.

.2 Paving, Picasso granite stone to ASTM C615, with the following characteristics.

.1 Sizes: see plan specifications.

.2 Pattern: see plan specifications.

.3 Finish: Flamed on exposed surfaces, sawn on sides and underside, 3 mm bevel around edges on top.

.4 Allow for insertion of light fixtures in selected pavers.

.3 Engraved granite pavers for Voltigeurs and De la Bravoure coat-of-arms, Picasso granite stone type to ASTM C615, with the following characteristics.

.1 Sizes: see plan specifications.

.2 Pattern: see plan specifications.

.3 Finish: Pavers, polished on exposed sides, engraved, for 400 x 400 mm cabinets, sawn sides and underside, 3 mm bevel around edges on top. Engraving pattern provided by Departmental Representative.

.1 4 at base of Voltigeurs monument base.

.2 4 at base of Bravoure monument base.

.4 Step treads and stringers, Picasso granite stone to ASTM C615, with the following characteristics.

.1 Sizes: see plan specifications.

.2 Pattern: see plan specifications.

.3 Finish: Flamed on exposed surfaces, sawn back, underside and joints.

.5 Curbs, Picasso granite stone to ASTM C615, with the following characteristics.

.1 Sizes: see plan specifications.

.2 Pattern: see plan specifications.

.3 Finish: Flamed on exposed surfaces, sawn back, underside and joints.

.4 Allow for insertion of light fixtures in selected pavers.

.6 Walls, wall curbs, Picasso granite stone to ASTM C615, with the following characteristics.

.1 Sizes: see plan specifications.

.2 Pattern: see plan specifications.

.3 Finish: Flamed on exposed surfaces, sawn back, underside and joints.

.7 Top step tread and pavers, Wilfrid-Laurier sidewalk, Péribonka or Cambrian granite stone type to ASTM C615, with the following characteristics.

.1 Sizes: see plan specifications.

.2 Pattern: see plan specifications.

.3 Finish: Flamed on exposed surfaces, sawn back, underside and joints. Tactile studs, stainless steel, inserted in stone.

.8 Curbs (tops, transitions, footers), Caledonia granite stone to ASTM C615, with the following characteristics.

.1 Sizes: 200 mm x 352 mm x 1,000 mm min (Ville de Québec type).

Transition strips: 1,500 mm long.

.2 Finish: Joints sawn back, top, underside and back, guillotined face..

2.3 BACKPOINTING AND LEVELLING MORTAR

.1 Same brand materials and aggregates from the same source must be used for all work.

.2 Water: clean and free of ice, grease, acid, organic matter.

.3 Sand: Fine-grained sand, washed and screened, consistent with table below to CSA A179 and ASTM C144.

Sieve Size	% By Weight Passing Each Sieve	% By Weight Retained on Each Sieve
No. 4	100	0
No. 8	90	10
No. 16	70	20
No. 30	50	20
No. 50	30	20
No. 100	15	15
No. 200	0	15

.4 Portland cement: to CSA A3000. Non-staining type GU cement for above ground masonry.

.5 Lime: hydrated lime, Type S, to CANC207-11.

.6 Bedding and jointing mortar to mixing specifications, Portland cement, lime and sand to CSA A179:

.1 Bedding mortar: Type N (1:1:6)

.2 Repair mortar:

.1 Under 600 from ground: Type N (1:1:6).

.2 Above 600 mm from ground: Type O (1:2:9).

.7 Mortar compression strength: 2 MPa to 5MPa at 7 days and 4 MPa to 8 MPa at 28 days.

.8 Mortar grout: jointing mortar, natural colour, no added colouring.

.9 Vicat cone penetration test :

.1 Bedding mortar: 25 to 40 mm.

.2 Backpointing mortar: 18 to 25 mm.

.10 Air content: 8 to 18%.

2.4 ANCHOR ADHESIVE

Hybrid adhesive mortar consisting of urethane methacrylate resin, hardener, cement and water.

.1 Compressive strength: 50 to 70 MPa.

.2 Modulus of elasticity: 1,700 MPa.

~~.3~~ Water absorption: 3 to 8%.

2.3 GROUT MIXES

.1 Stair and stringer grout.

.1 Quick-setting, unsanded, polymer-modified grout to ANSI A118.6, ANSI A118.7 and ISO 13007 CG2WAF.

.2 Minimum compressive strength of 12.5 MPa at 28 days. Maximum aggregate size and grout slump: CAN/CSA-A179.

.3 High quality, fast-setting polymer modified, non-shrinking, non-blooming and uniform in colour.

.4 Colours approved by Departmental Representative and adapted to stone.

.2 GROUT MIXING

.1 Mix batched and delivered grout in accordance with CSA A23.1/A23.2 transit mixed.

.2 Do not use calcium chloride or chloride based admixtures.

2.6 NON-SHRINK GROUT

.1 Pre-mixed containing non-metallic aggregate, Portland cement, plasticizer and water reducer,to CSA A23.1/a23.2. Mortar compressive strength at 38 days: minimum 3.0 MPa, maximum 50 MPa.

2.7 MIX TESTS

.1 Testing Mortar Mix:

.1 Test prepared mortar following CAN/CSA-A179.

.2 Testing Grout Mix:

.1 Test grout to requirements for grout based on property specification and proportion specification.

2.8 SEALANTS

.1 Curb-wall joints, walls, cladding and coping, sealing compounds:

.1 Elastomeric two-component, premium quality, polyurethane base, colours selected by Departmental Representative. Non-sag, chemical curing product.

2.9 ACCESSORIES

.1 Water: clean and potable.

.2 Backup materials:

.1 Polyethylene, urethane, neoprene or vinyl foam:

.1 Extruded open or closed cell foam backer rod.

.2 Size: oversize 30 to 50%.

.3 Anchors: Threaded rods, stainless steel to ASTM F593 (AISI 316).

.4 Brackets: Stainless steel components to ASTM F593 (AISI 316).

~~.5~~ Tactile studs to be seaded, stainless steel, exterior use, quantity to cover entire top step as indicated in specifications and drawings.

.6 Drainage membrane behind walls.

.7 Mounting hardware: Stainless steel expansion bolts, washers, nuts of appropriate dimensions to support works.

2.10 BEDDING AND JOINT MATERIAL FOR PAVERS ON GRANULAR SURFACES

.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 seive 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 Manufactured polymeric sand filler, commercial grade, high performance, colours to be chosen by Departmental Representative

.6 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 micrometres	25 — 65	
600 micrometres	35 — 80	
315 micrometres	10 — 35	
300 micrometres	15 — 20	
160 micrometres	2 — 10	
150 micrometres	2 — 15	

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 EXAMINATION OF EXISTING CONDITIONS.

.1 Verify existing conditions are ready to receive Work.

.2 Verify substrate surfaces are clean, dimensionally stable, cured and free of contaminants such as oil, sealers and curing compounds.

.3 Concrete foundations:

.1 Verify that concrete has been allowed to cure for minimum of 28 days.

.2 Verify concrete floors have not been treated with proprietary curing compounds.

.3 Verify concrete substrate surfaces are steel trowelled to fine broom finish.

.4 Ensure concrete slabs have been finished with maximum permissible variation of 3 mm in 3,049 mm from required plane and not more than 1.5 mm in 300 mm when measured from high points in surface.

.5 Ensure concrete slabs have been finished with maximum permissible variation of 3 mm in 3,049 mm from required plane and not more than 1.5 mm in 300 mm when measured from high points in surface.

.6 Verify concrete floors scheduled to receive stone applied over bonded mortar bed have been screed finished.

.7 Verify substrate surface variation does not exceed 6 mm in 3,049 mm.

.4 Crushed stone foundations:

.1 Ensure that the foundation is at the specified levels, that the compaction is in compliance, that the bedding is at the specified thickness.

.5 Beginning of Work means acceptance of existing conditions.

.6 Inform Departmental Representative of unacceptable conditions immediately upon discovery. Proceed with Work only after receipt of written approval from Departmental Representative.

3.3 PREPARATION

.1 Protect surrounding work from damage or disfiguration.

.2 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.3 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.4 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.5 Ensure joint surfaces are dry and frost free.

.6 Prepare surfaces in accordance with manufacturer's directions.

3.4 INSTALLATION

.1 Carefully sort stones, removing chipped, cracked or stained stones and immediately notify the Departmental Representative.

.2 Set facing firmly against angles and around accessories, appliances and other fixed elements to ensure continuity of joints. Size, cut and drill on site to ensure tight-fitting uniform joints with a maximum width of 10 mm.

.3 Level components in specified locations according to pattern and layout Leave spacing adjacent to vertical elements as indicated on drawings. Use plastic spacers in each corner to align joint width. Follow sizing and pattern as indicated on drawings.

.4 Make cut edges smooth, even and free from chipping. Do not split tile.

.5 Lay out tiles as indicated so that perimeter and cut tiles are no less than half size.

.6 Concrete foundations:

.1 Install materials to requirements of TTMAC Tile Installation Manual - Specification Guide 09300 or the TCA Handbook for Ceramic Tile Installation, as scheduled below.

.2 Set tiles in place while bond coat is wet and tacky, prior to skinning over. Slide tile back and forth to ensure a proper bond and level surface. Avoid slippage.

.3 Clean backs of tiles and back butter tiles to ensure a 95% bond coverage. Apply grout to indicated levels, apply grout to concrete and to tile.

.4 Clean excess mortar from surface prior to final set.

.5 Sound tiles after setting materials have cured and replace hollow sounding tile before grouting.

.6 Ungauged Stone Pavers.

.1 Immediately prior to setting, backbutter tile through push box or box screed to achieve a uniform thickness of tile and mortar.

.7 Keep 2/3 of depth of grout joints free of setting material.

3.5 CONTROL JOINTS

.1 Stone components set on concrete foundation:

.1 Install control joints and expansion joints in paver work.

.2 Keep control and expansion joints free of setting materials.

3.6 RAKING JOINTS

.1 Stone components set on concrete foundation:

.1 Allow an appropriate setting time before grouting pavers. Sound tiles after setting materials have cured and replace hollow sounding tile before grouting.

.2 Apply stain resistant primer to prevent staining of stone.

.3 Work grout into masonry cores and cavities to eliminate voids.

.4 Finish joints 1.6 mm beneath stone surface. Tool finish joints to eliminate surplus and shape as indicated.

.5 Reove excess mortar and clean using clean cloth.

.2 Stone components set on crushed stone foundation:

.1 Sweep dry joint polymeric sand material into joints.

.2 Settle sand by vibrating pavers with plate compactor.

.3 Continue application of joint material and vibrating of pavers until joints are full. Do not vibrate within 1 m of unrestrained edges of pavers.

.4 Complete installation to within 1 m of laying face, with sand-filled joints, [at completion of each work period.

.5 Sweep off excess joint material when installation is complete.

3.7 DISMANTLING MONUMENTS

.1 Refer to Section 04 03 43.19 - Period Stone Dismantling.

.2 Reassemble stonework and install bronzes in the presence of a conservator and a technician from the Centre de conservation du Québec in collaboration with masonry contractor.

.3 Access:

.1 Allow circulation of equipment near monument or surrounding streets in order to transport masonry to established storage place.

.2 In order to carry out dismantling, ensure new location is accessible by equipment from Place George V and Rue de la Place George V.

.3 Provide gravel base near monument to allow the passage of equipment without risk to new finish or getting machinery stuck.

This step is the responsibility of the general contractor.

.4 Concrete base:

.1 Repair of the concrete base of each monument is the responsibility of the general contractor.

.5 Reassembling masonry:

.1 Begin reinstallation of masonry work by reassembling monuments. This step is carried out by the masonry contractor using slings and appropriate lifting equipment.

.2 Reassemble stones in reverse order of dismantling and in same order as before. Identify stones during dismantling to facilitate this operation. Take each stone one by one and place in designated location and on base previously poured by general contractor.
Install dowels to anchor stones, if necessary.

.3 When each monument is reassembled, commence repointing by masonry contractor.

.4 Allow one week once joints are completed to ensure minimal consolidation of the new mortars before reinstallation of the bronzes.

3.8 FIELD QUALITY CONTROL

.1 EXAMINATION

.1 |nspect and replace broken, cracked or damaged pavers.

.2 Manufacturer's field services.

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

3.9 TOLERANCES

.1 Ensure pavers have been finished with maximum permissible variation of 3 mm in 1 mm .

3.10 CLEAN-UP

.1 Proceed with cleaning.

.2 Immediately after installation, remove excess mortar and/or sealant with a rubber scraper and allow approximately half an hour for the joints to dry before undertaking final cleaning.

.3 Do not allow mortar and/or sealant to harden on the stone elements. Works must be free of mortar and other stains. No stains will be tolerated.

3.11 PROTECTION

.1 Concrete foundations:

.1 Protect sealed surfaces from trespass until sealer has dried and hardened. Provide and maintain barricades and signs and employ necessary guards to protect all works during curing.

.2 Prevent all traffic on paved surfaces for a period of 24 hours after grouting.

.3 For stone elements placed on a concrete foundation and having a mortar joint, after installation, cover work with a wet burlap and vinyl sheet for a period of 24 hours for initial curing of the grout and mortar. Ensure that the mortar and grout are protected from precipitation for a subsequent 72 hours to allow sufficient curing.

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 05 50 00 – Metal Fabrications
.2 Section 06 10 00 – Carpentry
.3 Section 08 11 00 – Metal Doors and Frames
.4 Section 09 21 16 - Gypsum Board Assemblies

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 National Research Council Canada (NRC)

.1 National Fire Code of Canada 2010

.3 Master Painters Institute (MPI)

.1 MPI Architectural Painting Specification Manual, 2012

.4 Department of Justice Canada

.1 *Canadian Environmental Protection Act, 1999* (CEPA), c. 33

.5 Society for Protective Coatings (SSPC)

.1 SSPC Painting Manual, Volume 2: Systems and Specifications, 8th Edition

.6 Transport Canada (TC)

.1 *Transportation of Dangerous Goods Act, 1992* (TDGA), c. 34

1.3 DOCUMENTS AND SAMPLES TO SUBMIT

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

.2 Technical data sheets

.1 Submit the technical data sheets and instructions required for each type of paint or coat used in the coating.
.2 Submit the required technical data sheets for the application or use of paint thinner.
.3 Submit the list of colour codes to be used.

1.4 CLOSEOUT SUBMITTALS

.1 Submit the following maintenance information for inclusion in the manual specified in section 01 78 00 – Closeout Submittals:

.1 The name, type, and manner of use of the product
.2 The manufacturer's product number
.3 The colour numbers

.2 Alternative materials and products

.1 Provide alternative materials and products from the same batches as those used. Cover with protective packaging, properly marked with appropriate labels and in accordance with section 01 78 00 – Closeout Submittals.

.2 Quantity: provide two (2) containers of four (4) litres of each colour and type of finish. Mark the paint and coating containers by matching each colour and type of product with the accepted nomenclature of the paint and coatings, specifying the colours chosen for each product.

.3 Transportation, storage, and protection: Follow the Departmental Representative's requirements for the transportation and storage of alternate products and materials.

1.5 TRANSPORTATION, HANDLING, AND STORAGE

.1 Packing, shipping, handling, and unloading

.1 Pack, ship, handle and unload materials and products according to the manufacturer's written instructions and section 01 61 00 – Common Product Requirements.

.2 Acceptance of materials and products

.1 Identify paint and coating products, as well as materials and products used, with labels indicating the following:

.1 Name and address of the manufacturer

.2 Type of paint or coating

.3 Compliance with relevant standards or requirements

.4 Colour number as appears on the list of specified colours

.3 Remove damaged, open, or rejected materials and products from the site.

.4 Storage and protection

.1 Provide a safe, dry, temperature-controlled storage area and maintain it properly.

.2 Store materials and products away from sources of heat.

.3 Store materials and products in a well-ventilated area at a temperature between 7 °C and 30 °C.

.5 The storage temperature of heat-sensitive products should never be lower than the minimum temperature recommended by the manufacturer.

.6 Keep areas used for storage, cleaning, and surface preparation clean and tidy. Once the work is completed, return these areas to their original state of cleanliness.

.7 Only remove the quantities of product that will be used on the day.

.8 Fire safety requirements

.1 Provide one (1) 9 kg ABC chemical fire extinguisher and place it near the storage area.

.2 Place oily rags, waste materials, empty containers, and materials that may spontaneously combust in sealed, ULC-approved containers. Remove these containers from the site daily.

.3 Handle, store, use, and dispose of flammable and combustible products and materials in accordance with the requirements of the *National Fire Code of Canada*.

1.6 INSTALLATION CONDITIONS

.1 Heating, ventilation, and lighting

.1 Provide heating systems to raise the ambient air and substrate temperatures to above 10 °C at least 24 hours before beginning the work, and to maintain these temperatures during and after the work until the surfaces have sufficiently dried and cured.

.2 Provide continuous ventilation for seven (7) days after work ends.

.3 Coordinate the use of the existing ventilation system with the Departmental Representative and, if necessary, arrange for its use during and after the work.

.4 Provide and temporarily install the necessary heating and ventilation equipment if permanent systems cannot be used; if the building's permanent systems cannot meet the minimum requirements, provide and install the additional equipment needed to meet the minimum requirements.

.5 Provide the necessary lighting equipment and maintain a minimum brightness of 323 lux on the surfaces to be painted.

.2 Ambient temperature, relative humidity, and moisture content of the substrate

.1 Do not proceed with painting under any of the following conditions without prior written authorization from the coating product manufacturer:

.1 The ambient air and substrate temperatures are below 10 °C

.2 The substrate temperature is above 32 °C, unless the paint formula to be used is designed for application at high temperatures

.3 The ambient air and substrate temperatures are not within the range recommended by the MPI or the paint manufacturer

.4 The relative humidity is above 85%

.5 It is raining, snowing, foggy, or drizzling, or it is expected to rain or snow before the paint is completely dry

.6 The environmental conditions while the applied product or coating is drying or curing must remain within the specified ranges until the newly applied coating can withstand normal environmental conditions.

.2 When applying the paint, ensure compliance with the following conditions and maximum moisture content of the substrate:

.1 Minimum 28-day curing time for new concrete or masonry surfaces

.2 Maximum moisture content of 15% for wood

.3 Maximum moisture content of 12% for gypsum board

.3 Test the moisture content of the substrates using a properly calibrated electronic moisture meter. For concrete floors, evaluate the moisture content with a simple "cover patch" test.

.4 Test gypsum, concrete, and masonry surfaces to determine their alkalinity.

.3 Surface condition and installation requirements

.1 Apply paint only in areas where the quality of the finished surfaces will not be affected by dust from construction activities or carried by the wind or the ventilation system.

.2 Apply paints and coatings on properly prepared surfaces with a moisture content within the specified range.

.3 Apply the paint once the previous coat is dry or sufficiently cured.

.4 Additional requirements for the application of paint or coatings to interior surfaces

.1 Apply paint products when the temperature at the site can be maintained within the range recommended by the products' manufacturer.

.5 Additional requirements for the application of paint or coatings to exterior surfaces

.1 Only paint when the forecast weather conditions for the entire painting period are in accordance with the manufacturer's recommendations.

.2 Do not apply paint under the following conditions:

.1 The ambient temperature is expected to drop below 10 °C before the paint is fully cured

.2 The ambient and substrate temperatures are expected to drop below the limit recommended by the MPI or the paint manufacturer

.3 The surfaces to be painted are damp, wet, or icy

.3 Provide shelter when painting in cold or wet weather, and maintain it as needed. Heat substrates and ambient air to the manufacturer's recommended temperature and moisture. Protect surfaces until the paint is dry or weather conditions are suitable.

.4 Schedule painting so that any surfaces exposed to direct sunlight are fully painted early in the morning.

.5 Remove paint from surfaces that have been exposed to frost, excessive moisture, rain, snow, or condensation. Prepare these surfaces again and resume painting.

1.7 WARRANTY

.1 Provide a document as specified in section 01 78 00 – Closeout Submittals, stating that the Contractor thereby guarantees the paint work against fading, warping, blistering, and peeling for two (2) years from the date the Certificate of Completion of Work is issued.

PARTIE 2 PRODUCTS

2.1 PAINT SYSTEMS

.1 The number of coats indicated on the paint systems is a minimum. Be sure to follow the manufacturer's recommended spread rate. The painting contractor is responsible for applying, at their own expense, as many coats as necessary to provide a satisfactory cover and finish based on the colours indicated in the plans. Use a grey primer or coloured base, if necessary, to reduce the number of coats needed.

.2 All products in the chosen paint system must be from the same manufacturer.

2.2 INTERIOR PAINT SYSTEMS

.1 Comply with the latest MPI requirements for interior paint coatings, including those for surface preparation and priming.

.2 System 1: For new gypsum board wall sheathing

.1 Preparation: see section 3.5 – Preparatory Work
.2 Primer: water-based latex primer-sealer
.1 Certification: MPI 50
.2 Number of coats: one (1)
.3 Finish: 100% acrylic water-based latex paint
.1 Certification: MPI 43
.2 Finish: semi-gloss (melamine)
.3 Number of coats: two (2)

.3 System 2: For new gypsum board ceiling sheathing

.1 Preparation: see section 3.5 – Preparatory Work
.2 Primer: water-based latex primer-sealer
.1 Certification: MPI 50
.2 Number of coats: one (1)
.3 Finish: latex ceiling paint
.1 Certification: MPI 53
.2 Finish: matte
.3 Number of coats: two (2)

.4 System 3: For plywood equipment support panels

.1 Preparation: see section 3.5 – Preparatory Work
.2 Primer: alkyd primer-sealer and stainblocker
.1 Number of coats: one (1)
.3 Finish: intumescent latex paint
.1 Certification: according to CAN/ULC-S102
.2 Finish: matte
.3 Number of coats: two (2)

.5 System 4: For primed or unprimed ferrous metal

.1 Preparation: see section 3.5 – Preparatory Work
.2 Primer: solvent-based rust-inhibiting primer
.1 Number of coats: one (1)
.3 Finish: solvent-based alkyd rust-inhibiting paint
.1 Finish: gloss
.2 Number of coats: two (2)

2.3 EXTERIOR PAINT SYSTEMS

.1 System E8: for ferrous metal

.1 Preparation: see section 3.5 – Preparatory Work
.2 Cleaner: metal cleaner and rust remover
.3 Primer: solvent-based rust-inhibiting primer
.1 Number of coats: one (1)
.4 Finish: solvent-based alkyd rust-inhibiting paint

.1 Finish: high gloss (glossy)
.2 Number of coats: two (2)

.2 System E9: for galvanized metal

.1 Preparation: see section 3.5 – Preparatory Work
.2 Primer: epoxy rust-inhibiting coating
.1 Number of coats: one (1)
.3 Finish: urethane enamel
.1 Certification: MPI 83
.2 Finish: gloss (platinum)
.3 Number of coats: two (2)

2.4 COLOURS

.1 The colours will be chosen from the full range of colours and shades offered by the manufacturers.

2.5 MIXING AND COLOURING

.1 Colour the coating products before transporting them to the site.

.2 Mix paste, powder, or catalytic curing paints according to the manufacturer's written instructions.

.3 Some thinner may be added to the paint, if necessary, according to the manufacturer's recommendations. Kerosene or similar organic solvents should not be used to thin water-based paints.

.4 Dilute spray paint according to the manufacturer's instructions.

.5 Before and during application, carefully shake the paint in its container to loosen clumps, ensure the pigments are completely dispersed, and preserve colour and gloss uniformity.

2.6 DEGREE OF GLOSS (SHEEN)

.1 Paint gloss is defined as the sheen rating of applied paint, in accordance with following values:

	Gloss @ 60°	Sheen @ 85°
Gloss level 1 – matte finish	Max. 5	Max. 10
Gloss level 2 – velvet-like finish	Max. 10	10 to 35
Gloss level 3 – eggshell-like finish	10 to 25	10 to 35
Gloss level 4 – satin-like finish	20 to 35	Min. 35
Gloss level 5 – traditional semi-gloss finish	35 to 70	
Gloss level 6 – traditional gloss finish	70 to 85	
Gloss level 7 – high gloss finish	Min. 85	

.2 The gloss levels of painted surfaces must match the indications and nomenclature of the surface finishes.

PARTIE 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Follow the manufacturer's recommendations or written instructions, including product bulletins and technical data sheets, as well as instructions for handling, storage, application, and (especially) surface preparation.

3.2 GENERAL

.1 Unless otherwise specified, prepare interior surfaces and paint in accordance with the MPI Architectural Painting Specifications Manual.

.2 Apply paint products according to the manufacturer's written instructions.

3.3 INSPECTION

.1 Inspect existing substrates to determine whether their condition will compromise the proper preparation of surfaces to be painted or coated. Before beginning the work, report any damage, defects, or unsatisfactory or adverse conditions to the Architect.

.2 Perform moisture tests on the surfaces to be painted with a properly calibrated electronic moisture meter; however, concrete floors must be moisture tested with a simple cover patch test. Do not proceed with work until conditions fall within the acceptable range recommended by the manufacturer.

.3 Maximum permissible moisture content

.1 Stucco, plaster, and gypsum board: 12%

.2 Concrete: 12%

.3 Wood: 12%

3.4 PROTECTION

.1 Protect building surfaces and adjacent structures that are not to be painted or coated from flecks, marks, and other damage with non-soiling covers. If the surfaces in question are damaged, clean and repair them as directed by the Departmental Representative.

.2 Protect permanent items such as fire-resistance certification labels on doors and frames.

.3 Protect factory-finished products and equipment.

.4 Ensure the protection of the general public in and around the building.

.5 Remove electrical outlet covers, light fixtures, surface-mounted hardware on doors, bathroom fixtures, and other hardware, as well as surface-mounted fasteners and fittings, before beginning coating. Label and store items in a secure location and re-install them after painting is completed.

.6 Move and cover furniture and portable equipment as necessary during painting. Replace the furniture and equipment as painting progresses.

.7 Place "WET PAINT" signs in occupied areas as while painting is underway. The signs must be approved by the Departmental Representative.

3.5 PREPARATORY WORK

.1 Clean and prepare new and existing surfaces in accordance with the MPI's requirements and the manufacturer's written instructions. Refer to these documents for specific requirements in addition to the instructions below.

.2 Dust the surfaces to remove dust, dirt, and other foreign matter. If dirt remains, wash and brush with a degreasing cleaner, then rinse well.

.3 Wash molds with a solution of one part bleach to three parts water. Wear rubber gloves and safety glasses. Rinse thoroughly with clean water and dry well.

.4 Wash grease, oil, and bitumen with a cloth soaked in cleaning/thinning mineral spirits, and avoid spreading the stains over a larger area. Wipe with clean, dry cloths. Repeat as needed.

.5 Interior wood, paint finish

.1 Seal knots and resin veins with shellac. Smooth out rough spots with sandpaper, then dust.

.6 Interior wood, transparent finish

.1 Carefully remove all dirt, marks, and adhesive residues. If there are iron stains, remove them with wood bleach or a solution of water and oxalic acid. Sand any rough spots, following the wood grain.

.7 Exterior wood, paint finish or opaque stain

.1 The wood must be dry and contain no more than 12% moisture when measured with a moisture meter.

.2 Scrape off resin secretions. Heat if necessary and wash with turpentine. Sand any rough spots. Clean the surface and remove any contaminants. Seal knots and resin veins with shellac. Fill all nail holes and cracks before applying the primer. For preservative-treated wood, ensure that any solvent has evaporated.

.8 Exterior wood, semi-transparent stain finish

.1 Sand any rough spots. Remove marks and stains, either by scraping, sanding, or chemical bleaching with wood bleach or a solution of water and oxalic acid.

.9 Concrete

.1 Ensure that the concrete is free of efflorescence caused by salts or excess moisture and has cured for at least 28 days at 20 °C or higher.

.2 Remove any splashes, splatters, or smears. Remove any dust. Fill any gaps, cracks, honeycombs, or other apparent defects with cement mortar and allow it to harden.

.3 Remove any grease, bitumen, mold release oils, or other contaminants with a degreasing cleaner. Rinse well and let dry.

.4 Treat laitance and efflorescence with a solution of hydrochloric acid and allow the acid to act until the bubbling on the surface of the concrete stops (15 to 20 minutes). Rinse the surface thoroughly with clean water before it dries. Repeat until the concrete is rough. Let the surface dry. (Caution: If no bubbling occurs, a sealant may be present on the surface, and it must be removed before the paint system is applied.)

.5 Grind and/or scarify highly polished concrete, stained concrete, or old concrete that is already coated or otherwise unsuitable.

.6 Test concrete for moisture before applying a paint system. See section 01 73 00 – Execution.

.10 Bricks, stones, blocks, and other masonry

.1 Remove any foreign material or mortar droppings. Remove salts, dust, and sand.

.11 Gypsum plasterboard

.1 Make sure that surfaces are dry and clean, and that the screws and nails are well driven and filled. Sand the joints, then dust.

.12 Plaster

.1 Ensure that the plaster has dried and hardened at a suitable temperature and that the room has been properly ventilated. The plaster must not contain more than 6% moisture when measured with a moisture meter.

.2 Fill in any cracks with spackle after widening the crack. Remove grains and roughness with a scraper.

.13 Iron and steel, small surfaces

.1 Remove rust, mill scale, welding flux, and other solid contaminants with power brushes or sandblasting as appropriate. Steel brushes and emery cloths are acceptable for small jobs. Treat the metal with metal cleaner and rust remover. Rinse with water, then wipe off.

.2 Apply the paint system as soon as possible after cleaning (no more than 4 hours later).

.14 Iron and steel, large surfaces

.1 Remove grease, oil, salts, acids, alkalies, and similar chemical residues with a combination of steam cleaning and a degreasing cleaner.

.2 Apply the paint system as soon as possible after cleaning (no more than 4 hours later).

.15 Very rusty iron and steel, large surfaces

.1 Remove scale, rust, and other coatings with a sandblaster. Scrape and sand chipped paint. Touch up exposed surfaces with a suitable primer.

.16 Steel and cast iron, with shop coating

.1 Wash surfaces with a mineral spirit cleaner to remove all grease, oil, dirt, and dust. Remove rust with a steel brush or emery cloth.

.17 Galvanized metal

.1 Use a mineral spirit cleaner to remove any grease or oil, then treat with metal cleaner and rust remover to ensure the paint system adheres.

.18 Aluminum and light alloys

.1 Clean the surface with metal cleaner and rust remover.

.19 Copper, brass, bronze, and stainless steel

.1 Clean the surface with metal cleaner and rust remover.

.2 Polish stainless steel with metal sandpaper.

.20 Before priming and between subsequent coats, protect cleaned surfaces from contamination by salts, acids, alkalies, corrosive chemicals, grease, oil, and solvents. Apply primer, paint, or other pre-treatment products as soon as possible after cleaning, before the surface becomes contaminated again.

.21 Wherever possible, apply a coat of primer to the concealed surfaces of new woodwork before installation. Use the same products as those recommended for visible surfaces.

.1 Apply a vinyl primer that meets the requirements for MPI product number 36 to knots, gum, sap, and resinous surfaces.

.2 Fill cracks and nail holes with wood filler.

.3 Stain the wood filler before applying it to stained wood.

.22 Sand and dust surfaces between each coat as needed to ensure the next coat adheres properly and to remove any defects visible from a distance of 1000 mm or less.

.23 Touch up shop-primed surfaces with the appropriate product, as directed.

.24 All existing surfaces that are to be painted must first be patched. Holes must be filled and imperfections must be corrected. If necessary, add plaster and sand the surfaces to create a paint-ready surface. Existing paint must also be sanded to roughen it up and allow for good adhesion.

3.6 APPLICATION

.1 The method of application used must be accepted by the Departmental Representative. Unless otherwise specified, apply the product according to the manufacturer's instructions.

.2 Brush and roller application

.1 Apply an even coat of paint with a suitable type of brush and/or roller.

.2 Work the paint into cracks, crevices, and corners.

.3 Paint surfaces and corners inaccessible to brushes using a paint sprayer, pads, or lambskins. Paint surfaces and corners inaccessible to rollers using brushes, pads, or lambskins.

.4 Remove runs and sags with a brush or roller, and paint over overlap marks. Roller-painted surfaces must be free of roller marks and excess paint.

.5 Remove runs, sags, and brush marks from finished surfaces and repaint these surfaces.

.3 Spray application

.1 Provide a sprayer that is designed for the intended purpose, capable of spraying the product to be applied, and equipped with suitable pressure regulators and gauges. Maintain the sprayer in good condition.

.2 While applying paint, keep the ingredients properly mixed in the container via continuous mechanical agitation or intermittent agitation as often as needed.

.3 Apply an even coat of paint, overlapping the surface covered in the previous pass. Back-roll with a dry roller after the first coat has been applied.

.4 Immediately remove runs and sags with a brush.

.5 Use brushes to work paint into cracks, crevices, and other areas the sprayer cannot reach.

.4 Use a pad, lambskin, or dipping method only if there is no other way to paint hard-to-reach surfaces.

.5 Apply each coat of paint as a continuous film of even thickness. Repaint any thin spots or bare areas before applying the next coat.

.6 Allow surfaces to dry and cure properly after cleaning and between each coat for the minimum amount of time recommended by the manufacturer.

.7 Sand and dust the surfaces between each coat to remove any visible defects.

.8 Finish surfaces above and below sight lines according to the requirements for surrounding surfaces, including areas such as the tops of cabinets and closets and projecting edges.

.9 Finish the tops, bottoms, edges, and cutouts of doors according to the requirements for door surfaces after doors have been fitted.

3.7 ELECTRICAL AND MECHANICAL EQUIPMENT

.1 Unless otherwise indicated, paint exposed piping, electrical conduits, brackets/suspensions, ductwork, and other mechanical and electrical equipment with colours and finishes matching adjacent surfaces.

.2 Boiler room, mechanical and electrical rooms: paint exposed piping, electrical conduits, brackets/suspensions, ductwork, and other visible mechanical and electrical equipment.

.3 Other unfinished areas: leave piping, electrical conduits, ducts, brackets/suspensions, and other exposed electrical and mechanical equipment in their original condition, and touch up only scratches and other marks on existing coatings.

.4 Touch up scratches and marks on factory-applied coatings using the product provided by the equipment manufacturer.

.5 Do not paint over nameplates.

.6 Do not paint over automatic sprinkler heads.

.7 Apply primer and one coat of matte black paint to the inside of ductwork that is visible through grilles, registers, and diffusers.

.8 Paint all fire system piping in red.

.9 Apply red enamel paint to the fire alarm and emergency exit lighting system switches.

.10 Paint all natural gas piping in yellow.

.11 Paint both sides and the edges of electrical and telecommunications backboards before installation. Leave equipment in its original condition, except for any necessary touch-ups; paint ductwork, mounting hardware, and other unfinished elements.

.12 Do not paint transformers or the interior equipment of electrical substations.

3.8 SITE TOLERANCES

.1 Walls: no defects visible from a distance of 1000 mm, at a 90° angle.

.2 Ceiling: no defects visible to an observer on the ground, at a 45° angle, under final lighting conditions.

.3 The colour and gloss of the topcoat must be uniform over the entire surface.

3.9 CLEANING

.1 Clean in accordance with section 01 74 11 – Cleaning.

.1 Remove runs, spills, splashes, drips, and overspray as the work progresses, using materials and methods that will not damage the finish of the surfaces.

3.10 RESTORATION

.1 Clean and reinstall all hardware that was removed to facilitate painting.

.2 Remove protective coverings and warning signs as soon as possible after work is completed.

.3 Clean paint splashes from exposed unpainted surfaces. Clean smears and spatter immediately as work progresses, using a compatible solvent.

.4 Protect freshly painted surfaces from runs and dust, to the satisfaction of the Departmental Representative, and avoid scuffing new paint.

.5 Return the areas used to store, mix, and handle paint and clean tools and equipment to their original state, to the satisfaction of Departmental Representative.

END OF SECTION

PARTIE 1 GENERAL

1.1 ASSOCIATED REQUIREMENTS

.1 Related sections

.1 Section 07 92 00 – Joint Sealants

1.2 REFERENCES

.1 The publication dates of the standards listed below are for information purposes only. Refer to the latest version issued by the standards organization.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM F1869-16a, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

.2 ASTM F2170-19a, Standard Test Method for Determining Relative Humidity in Concrete Floors Slabs Using in situ Probes

1.3 DOCUMENTS AND SAMPLES TO SUBMIT

.1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.

.2 Technical data sheets:

.1 For each type of coating to be installed, submit technical data sheets, installation instructions, and general recommendations from the manufacturer.

.3 Samples:

.1 For each colour of each chosen finish, submit a 100 mm x 100 mm rigid sample board.

1.4 CLOSEOUT SUBMITTALS

.1 Submit the required documents and items in accordance with section 01 78 00 – Closeout Submittals.

.2 Operation and maintenance sheets: provide instructions for the use and maintenance of the installed products and incorporate them into the Operation and Maintenance (O&M) manual.

1.5 TRANSPORTATION, HANDLING, AND STORAGE

.1 Transport, store, and handle all materials and equipment according to the manufacturer's written instructions and section 01 61 00 – Common Product Requirements.

1.6 INSTALLATION CONDITIONS

.1 Keep the ambient temperature of the working area and the temperature of the substrate to be coated above 20 °C throughout the installation process and for 48 hours before and after installation.

.2 Do not install flooring finishes on concrete slabs with a moisture content that exceeds the epoxy or primer manufacturer's specifications, based on the calcium chloride test described in standard ASTM F1869.

.3 Do not install flooring finishes on concrete slabs where the relative humidity, as measured with a humidity probe in compliance with ASTM F2170, exceeds the level specified by the epoxy or primer manufacturer.

1.7 WARRANTIES

.1 Provide a document as specified in section 01 78 00 – Closeout Submittals, stating that the Contractor thereby guarantees the epoxy coatings against delamination, peeling, warping, cracking, and discolouration for (1) year from the date the Certificate of Completion of Work is issued.

PARTIE 2 PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

.1 All materials, including primers, resins, hardening agents, topcoats, and protective coatings must be from the same manufacturer.

2.2 EPOXY COATINGS

.1 Epoxy coating (mechanical equipment room): epoxy coating for new concrete slabs and bases

.1 Primer:

.1 Two-component epoxy resin binder, with a solid colour and glossy appearance

.2 Thickness: 8 mils

.2 Topcoat:

.1 Two-component, self-levelling, solvent-free epoxy binder with a solid colour and glossy appearance

.2 Thickness: 12 mils

.1 Flooring: orange peel finish (light), satin

.3 Colour: To be chosen by the Departmental Representative from among the manufacturer's standard colours

2.3 ACCESSORIES

.1 Sealants:

.1 Must be chosen based on the coating manufacturer's recommendations and the use and condition of each joint

PARTIE 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Follow the manufacturer's written requirements, recommendations, and specifications, including any available technical bulletins; instructions for product handling, storage, and use; and technical data sheet indications.

.2 Ensure the requirements for the preparation of the concrete slab described in section 01 73 00 – Execution are followed and that the tests show that the slab falls within the limits indicated by the manufacturer.

.3 Do not start work until site conditions meet the manufacturers' standards and recommendations. By starting the work, the epoxy coating subcontractor is deemed to have accepted the site conditions.

3.2 PREPARATORY WORK

.1 Prepare, level, and repair the concrete surface according to the manufacturer's instructions.

.2 Make sure the surface is dry, clean, and solid. All traces of dust, slurry, grease, oil, dirt, curing or penetration agents, wax, foreign substances, coatings, and disintegrated materials from the surface must be removed.

.1 If necessary, use mechanical means (grit blasting, sand blasting, or any other method recommended by the manufacturer).

.3 Mix products according to the manufacturer's recommendations, until the desired smooth consistency is reached.

.4 Do not dilute products.

3.3 APPLICATION

.1 General

.1 The finish must have a total thickness of 5 mm.

.2 Apply each layer according to the manufacturer's instructions to obtain a strong, even surface of the specified thickness. The finish must form an uninterrupted surface, except where divider strips, sawn joints, or other types of joints are indicated or required.

.2 Primer

.1 Mix and apply the primer by carefully following the manufacturer's installation instructions and directions on the amount of product to use. Apply the finish directly after the surface is primed to optimize its adherence.

3.4 CLEANING

.1 Clean in accordance with section 01 74 11 – Cleaning.

3.5 PROTECTION OF FINISHED WORK

.1 Protect the floor from damage caused by other trades.

.2 Protect the floor from chemicals and water until it is fully cured.

END OF SECTION

PART 1 GENERAL

1.1 OVERVIEW

1. This section covers common topics that apply to all sections involving mechanical and electrical work, particularly Sections 21 through 28, inclusively.

1.2 CODES & STANDARDS

1. All work shall be performed in accordance with the applicable version of the Quebec Construction Code
2. In some cases, when stated in a particular specification section, a more recent standard is cited, apply that version of the standard.

1.3 ALLOCATION OF SPECIALIZED ELECTROMECHANICAL SERVICES BY SPECIALTY

1. Various specialized electromechanical services shall be performed by "specialties," as defined herein.
2. The firm in charge of any "specialty" must ensure that it has all the qualifications necessary to fulfill all the responsibilities assigned to it. In the event that the company does not have all of these qualifications, it shall call upon a company or companies with the required qualifications, so it can meet all of its obligations.

1.4 DESIGN, IMPLEMENTATION AND CERTIFICATION OF SEISMIC MEASURES

.1 All mechanical and electrical work shall meet the requirements of the Quebec Construction Code (current version) regarding earthquake protection. To this end, each specialty shall retain the services of a specialist, an engineer and member in good standing with the Ordre des Ingénieurs du Québec, to perform the calculations, specify the supports and their configuration and supervise the work, all in order to ensure that the entire project is in compliance with the Quebec Construction Code.

.2 Upon completion of the work, for each specialty covered by this policy, a report certifying compliance of the entire work with the Quebec Construction Code shall be produced by the Engineer Specialist and delivered to the Owner through the Engineer. This report shall, at least, contain the following details:

.1 Full project identification

.2 Title of the project

.3 Location of the work (such as the address, floor, sector and department name)

.4 Certification that all structures, systems, supports and other components installed by the Contractor meet the requirements of the Quebec Construction Code regarding earthquake protection.

.5 The operation and maintenance manual shall also include the equipment and accessories that have been added during construction.

.3 To establish his specifications, the Engineer Specialist shall ensure that he identified the correct risk category for the specific facilities of the project. For information purposes, the following information may be used as guidance:

.1 The project is located in Quebec City

.2 The proposed building is not an emergency preparedness facility, an emergency preparedness structure with components and systems that must remain in place AND functional during and after an earthquake without any significant repairs.

.3 The methods, principles and supporting and fastening materials shall comply with or have similar construction to the materials specified in the various sections of this specification. Depending on the specialty, pins, wire or sheet metal strips are not acceptable.

1.5 REVIEW OF DRAWINGS AND SITE

.1 Examine the drawings and proposed work site thoroughly to clearly identify all local conditions that may affect the fulfillment of the contract.

.2 No allowance or surcharge will be made for errors, omissions or interruptions that may have been identified prior to beginning the work by carefully examining the drawings and existing site conditions.

.3 The Contractor shall, prior to submitting his tender, examine the site where the work shall be done or the existing buildings and shall investigate local conditions that may affect the work under this contract. No additional compensation shall be granted to the Contractor for the consequences of failing to complete this examination.

.4 The Contractor shall carefully examine the structural and architectural drawings to ensure that the work for this project can be satisfactorily performed without changes to the building as shown on the plans and, prior to commencing the work, shall examine the work of other trades and report to the Engineer any defects or impediments to the performance of the work described in these specifications or affecting the required warranty.

1.6 SUBMITTALS

.1 Submit required documents and samples in accordance with the "Submittals" clause of Section 01 33 00.

.2 Data sheets shall be submitted as follows:

.1 Material data sheets that have an impact on aesthetics and have been identified on the plans and/or in the specifications as such shall be submitted to the Architect first. The Contractor shall ensure that this procedure is followed to prevent work delays.

For all exposed equipment where there is a choice of finish and colour, this choice shall be made by the Architect from the manufacturer's standard colours, unless otherwise indicated in the Engineer and/or Architect's plans and specifications. The Contractor shall therefore confirm with the Architect the choice of finish and colour preferred by the Architect based on his architectural concept.

Once the data sheets have been reviewed and marked as "accepted" or "compliant" by the Architect from an aesthetic point of view, the data sheets will be returned to the Contractor, who will forward them to the Technical Services department for the technical verification of the product.

.2 Prepare and submit a description form, attached as Appendix "A" and entitled "Data Sheet & Drawing - Product Identification & Details," for each product.

.3 Submit compliance detailed data sheets for each piece of required equipment to be supplied to the Engineer for verification, with all the characteristics mentioned in the specifications and the name of the project. **Each of the shop drawings will be submitted as a single hard copy or PDF, which will be returned to the issuer in "PDF" format via email. This email copy shall be reproduced by the Contractor for use in the maintenance workbooks submitted to the owner. Each unit or equivalent shall be submitted as an individual PDF file. In addition, the Contractor shall update the shop drawing lists indicated in the specifications by the Engineer with each transmission.**

.4 Data sheets shall be tailored to the project and shall have a 60 mm x 60 mm space free of any drawings or writing for approval.

.5 Each data sheet submitted for verification shall be identified by reference to the proposed equipment and its components. Sheets without this identification shall be returned unchecked to the Contractor for resubmission in accordance with this requirement and the Contractor shall be responsible for any delays caused.

.6 Provide samples upon request.

.7 Production of the equipment shall not commence until the data sheets are verified by the Engineer.

.8 Verification of the drawings relates only to the overall configuration and construction of the equipment and does not constitute the validation of all construction details, nor does it constitute the validation of quantities, sizes, or other details, which remain the responsibility of the subcontractor. This verification does not release the Subcontractor from his responsibility for errors, information, dimensions, quantities or other items shown on these drawings and for changes in the drawings and specifications that have not been reported in writing to the Engineer. The subcontractor is therefore responsible for ensuring that his workmanship meets the performance requirements shown on the drawings and specifications.

.9 For each data sheet or shop drawing submitted, the Contractor shall complete the Shop Drawing Tracking Sheet that must be issued by the Engineer. This tracking sheet shall be maintained by the Contractor to clearly identify the dates of shop drawing or data sheet acceptance or rejection.

.10 The contractor shall submit his data sheets and shop drawings with the following nomenclature in the file name:

Example: PL-02_rev00_MaterialsFirewall.pdf:

- Item number referring to the shop drawing list of the specialty in question (lists attached to this specification)
- Revision number

- Short, relevant name

.3 Operating Manual

.1 Presentation

The preliminary document for verification and the final document will be submitted to the Engineer in the following format:

1. 1 bound hard copy
2. 1 digital "PDF" copy

.2 The Operations and Maintenance Manual shall be forwarded and verified by the Engineer prior to provisional acceptance and shall include the following sections:

1. Technical Manual
2. Maintenance Records
3. Performance Data Sheets

.3 Technical Manual

The manual will be assembled by chapter and a table of contents will be prepared. This manual will include the following:

.1 A description of each system and its control/regulation/safety devices

.2 Control/regulation circuit diagram for each system

.3 A description of each system's operation under varying loads or seasons with procedures for display, monitoring and set-point changes.

.4 Instructions for operating each system and component

.5 A description of the steps to take in the event of equipment failure

.6 A table of fixtures referenced on a flow diagram

.7 Colour coding

.4 Engineer-verified data sheets grouped in logical order and assembled with numbered dividers.

.5 The maintenance records shall include the following:

.1 Instructions for maintaining, repairing, operating and troubleshooting each component

.2 A maintenance schedule specifying the frequency and length of time each task should be performed and the tools for performing the task.

.6 The performance data sheets shall include the following:

.1 Performance data supplied by the manufacturer for the equipment, specifying the operating point of each device, taken after commissioning is complete

.2 Equipment performance test results

.3 Any other specific performance data indicated elsewhere in the contract documents

.4 TAB (Test, Adjustment and Balancing) reports in accordance with Section **23 05 93** "HVAC System Test, Adjustment and Balancing"

.7 Verification

.1 For verification purposes, submit a draft of the Operations, Maintenance & Performance Manual to the Engineer. Unless otherwise directed by the Engineer, individual sheets shall not be submitted.

.2 If necessary, make changes to the O&M manual and resubmit to the Engineer.

.8 Additional Information

.1 Prepare additional information sheets and appendices for the Operations and Maintenance Manual if, during the abovementioned training sessions, it is determined that these sheets are necessary.

1.7 DOCUMENTS TO BE KEPT ON SITE

.1 The Engineer shall provide one (1) digital copy of the "issued for construction" or "revised" plans and specifications at the beginning and throughout the project. Provide the number of sets of copies necessary for each phase of the job and immediately indicate any change made during the project to mechanical and electrical equipment, control systems, low voltage control wiring or other devices.

.2 Transfer the information noted on the individual copies to a master copy each week to show the actual mechanical systems and equipment, as installed.

.3 Use a different coloured indelible ink pen for each system.

.4 Keep these drawings on site and make them available for reference and verification.

.5 As-built drawings:

.1 Prior to performing any TAB (Test, Adjustment and Balancing of HVAC systems) procedures, complete the as-built drawings.

.2 Identify each drawing in the lower right-hand corner in letters no less than 12 mm in height as follows: "AS-BUILT DRAWING: THIS DRAWING HAS BEEN REVIEWED AND SHOWS THE ACTUAL MECHANICAL AND ELECTRICAL SYSTEMS/DEVICES AS INSTALLED." (Contractor's Signature) (Date).

.3 Submit drawings to the Engineer for approval and make corrections according to the Engineer's instructions.

.4 Test, adjust and balance HVAC systems with as-built drawings in hand.

.5 Submit a digital copy of the completed as-built drawings with the Operations & Maintenance Manual.

1.8 TRAINING OF OPERATIONS AND MAINTENANCE PERSONNEL

.1 Provide qualified instructors to train operating personnel on the operation of mechanical and electrical equipment. Provide maintenance specialists to train operating personnel on the maintenance and calibration of mechanical equipment and any changes or modifications to the equipment under warranty.

.2 Instruct Owner's designated personnel or their operators on the operation and maintenance of the facility. Schedule training sessions and have personnel sign off on these training sessions. Obtain a list of designated personnel from the Owner.

.3 Instruction shall be given during normal working hours, before any systems are accepted and handed over to operating personnel.

.4 The Operations & Maintenance Manual shall be used for training personnel. Before any training session, provide one copy of the manual to the Operations Manager and the remaining manuals to the Owner.

1.9 KEEPING MATERIALS CLEAN

.1 Prevent dust, dirt and other foreign matter from entering openings in facilities and equipment through suitable measures.

.2 Provide weather protection for all materials.

.3 Ensure that all conduits, pipes, ducts or other channels are kept capped throughout their construction and installation to prevent foreign matter from entering them.

1.10 CONCRETE WORK

.1 All cast-in-place concrete structures related to mechanical and electrical work, such as equipment bases, massifs, floating slabs, sumps, pit and drainage gutters, shall be procured and constructed under the supervision of the General Contractor, unless otherwise specified on the drawings.

.2 Materials/Products: In accordance with Section 01 35 22 ("Sustainable Development - Construction").

1.11 CLEANING THE PREMISES

.1 Upon completing the installation and performance tests, remove excess materials, waste products, tools and equipment from site.

APPENDIX A

DATA SHEET, PRODUCT IDENTIFICATION & DETAILS

PROJECT:	
CIMA+ PROJECT NO.	PHASE:

SPECIALTY OR SUB-CONTRACTOR

CONTRACTOR: Address:
Contact: Telephone: ( ) Fax: ( ) Email:

SUPPLIER: Address:
Contact: Telephone: ( ) Fax: ( ) Email:

SPECIALTY (discipline):	
Data sheet or drawing no. :	
Delivery time (after approval)	
DESCRIPTION :	
SUBMITTED PRODUCT	**DRAWING ISSUED FOR:**
AS IS: ☐	VERIFICATION: ☐
EQUIVALENT: ☐	INFORMATION: ☐
SUBSTITUTION : ☐	COORDINATION: ☐
	OTHER: _____

REFERENCE TO PLAN:
REFERENCE TO SPECIFICATIONS: Section: Article:
NOTES:
REV. ISSUE DATE:

OWNER:

DOCUMENT SUBMITTED TO: (please check)

☐	**ARCHITECT**

☐	**STRUCTURAL ENGINEER**

☐	**MECHANICAL/ELECTRICAL ENGINEER**

☐	

CONTRACTOR: Address:
Contact: Telephone: ( ) Fax: ( ) Email:

PROFESSIONAL VERIFICATION: (stamp)

APPENDIX B

DOCUMENT TRANSMISSION LOG

TRAINING CERTIFICATE

- ☐ Ventilation _____
- ☐ Regulation _____
- ☐ Fire Alarm _____

DOCUMENT TRANSMISSION FOR SPARE PARTS

- ☐ Specify: Transmission date: _____
- ☐ Specify: Transmission date: _____
- ☐ Specify: Transmission date: _____

LETTER OF COMPLIANCE FOR SEISMIC SYSTEMS

- ☐ Plumbing — Transmission date: _____
- ☐ Fire Protection — Transmission date: _____
- ☐ Ventilation — Transmission date: _____
- ☐ Electrical/Lighting — Transmission date: _____

TEST & BALANCING REPORT

- ☐ Ventilation System — Transmission date: _____
- ☐ Fire Alarm System — Transmission date: _____
- ☐ Phase Balancing — Transmission date: _____

OPERATION & MAINTENANCE MANUAL (including DDC items)

- ☐ Plumbing — Transmission date: _____
- ☐ Fire Protection — Transmission date: _____
- ☐ Electricity — Transmission date: _____
- ☐ Ventilation — Transmission date: _____
- ☐ Special Systems
  (specify) : _____ — Transmission date: _____
- ☐ Specify: _____ — Transmission date: _____

LETTER OF GUARANTEE

- ☐ Plumbing — Transmission date: _____
- ☐ Ventilation — Transmission date: _____
- ☐ Fire Protection — Transmission date: _____
- ☐ Fire Alarm — Transmission date: _____
- ☐ Special Systems
  (specify) : _____ — Transmission date: _____

PLANS AS BUILT

- ☐ Plumber — Transmission date: _____
- ☐ Fire Protection — Transmission date: _____
- ☐ Ventilation — Transmission date: _____
- ☐ Regulation — Transmission date: _____
- ☐ Electricity — Transmission date: _____
- ☐ Specify: _____ — Transmission date: _____

OTHER SPECIFIC DOCUMENTS

- ☐ Fire Alarm — Transmission date: _____

END OF SECTION

PART 1 GENERAL INFORMATION

1.1 SCOPE OF WORK

.1 Section overview

.1 Method of installing piping, conduits and fittings.

PART 2 PRODUCTS

2.1 PRODUCTS

.1 Refer to the specific sections that deal with them individually.

Part 3 IMPLEMENTATION

3.1 PIPE & DUCT CONNECTION TO EQUIPMENT

.1 Unless otherwise specified, follow manufacturer's instructions.

.2 Use pipe fittings or flanges to isolate the units from the piping system and simplify the maintenance and assembly/disassembly of components.

.3 Use double-jointed fittings where units are mounted on anti-vibration dampers and piping is subject to movement, or use flexible joints.

.4 Use plastic-coated flexible conduit with the appropriate connectors for electrical or control connections to motors or other equipment subject to vibration or movement.

3.2 CLEARANCES

.1 Provide clearances in accordance with applicable codes and standards.

.2 Provide clearance around equipment to make the inspection, maintenance and monitoring of equipment easier, as recommended by the manufacturer.

.3 Provide sufficient working space for dismantling and removing equipment or parts of equipment, if necessary, without disrupting the operation of other equipment or system components. The size of the space shall be in accordance with the drawings or the manufacturer's recommendations, whichever is greater.

.4 Each contractor shall be responsible for ensuring that all clearance requirements are met by him and other contractors. These spaces must be coordinated with the work site and, in the case of non-compliant clearances, the contractor at fault must relocate his installation at his own expense.

3.3 INSTALLATION OF ELECTRICAL CONDUITS

.1 Refer to the specific sections that deal with this subject individually.

3.4 FACING FLANGES (ROSETTES)

.1 Supply and install facing flanges on exposed side where pipes and ducts pass through walls, partitions, floors and ceiling, wherever necessary, to complete the work in a neat and tidy manner. The exact location of the flanges will be determined at the job site by the Engineer and Architect based on the quality of the workmanship. However, in washrooms, baths, janitorial rooms and other facilities, all pipes shall be flanged.

.2 The inside diameter shall match the outside diameter of the pipe, including lagging. The outside diameter shall be larger than the opening or sleeve.

.3 If the sleeve extends above the finished floor, the flanges or plates shall surround the extension of the sleeve.

.4 Fasten to pipe or finished surface, but not to lagging.

3.5 PRESSURE TESTING OF EQUIPMENT AND PIPING

.1 Notify Engineer at least 48 hours prior to pressure testing.

.2 Test piping in accordance with the applicable sections of Divisions 21, 22 and 23.

.3 Insulate or conceal structures only after tests are approved and certified by the Engineer.

.4 Provide report on tests performed with a brief description of the testing procedure, time limits and other relevant time frames. Identify test witnesses.

3.6 EXCAVATION AND BACKFILL FOR MECHANICAL & ELECTRICAL WORK

.1 All excavation and backfill work for the installation of underground piping and conduits, equipment bases, pits or other structures shall be supplied and performed under Division 31 of the specifications, under the supervision and guidance of the applicable trade under the General Contractor's supervision.

.2 Trenches shall be excavated at the location shown on the drawings. Follow the specified route and, if there are any major obstructions, notify the Engineer who will make the necessary decisions.

.3 The trench shall be deep enough to meet the specified profile of the pipe or conduit and the least width to accommodate the pipe or conduit and ensure the safety of the employees.

.4 The excavation for the piping will be prepared to ensure that no part of the pipe is directly on rock or any other hard surface. The bottom of the trench shall be a sand bed approximately 150 mm in thickness, well compacted to 95% of the modified Proctor density. Care shall be taken to ensure uniform support along the entire length of the pipe.

.5 Backfill shall not be started until the installation is inspected and approved, testing is completed and approval is obtained from the Engineer.

.6 Backfilling of the trench directly over the pipe shall be done with fine sand without stones or pebbles to ensure that all pipes or conduits are covered by at least 100 mm of backfill. The remainder of the backfill shall be done in accordance with the guidelines in Section 31. For pipes or conduits buried in a concrete slab, backfill shall be done in accordance with the guidelines in Section 31.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

1. This section deals with common topics applicable to all sections involving mechanical and electrical work, particularly Sections 21 to 28, inclusively.
2. The General & Special Conditions of Contract, Schedules, Labour Regulations, Owner's Documents, Architect's General & Special Conditions and other bid documents shall form a part of this Section and shall govern the work.

1.2 SCOPE OF WORK

.1 This section includes:

.1 Electrical motors, drives and guards associated with mechanical equipment and systems

.2 The responsibilities of the supplier and installer are indicated on the Motor, Drive and Apparatus Schedule, which is part of the Electrical Installation Drawings, and the responsibilities for the associated mechanical equipment are shown on the Mechanical Systems Schedule, which is part of the Mechanical Installation Drawings.

.3 Electrical wiring and lines for control circuits are specified in Division 26, except for wiring, raceways and connections below 24V associated with the control/regulation systems specified in Division 25. For material and workmanship requirements, refer to Division 26.

1.3 REFERENCES

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).

.2 Electrical Equipment Manufacturers' Association Council (EEMAC)

.3 Health Canada/ Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.4 SUBMITTALS

.1 Submit all required data sheets and the manufacturer's specifications and documentation for the products in accordance with the "Submittals" clause of Section 20 05 01.

PART 2 PRODUCTS

2.1 SUSTAINABLE DEVELOPMENT

.1 Materials/equipment and products: comply with the "Sustainable Development" clause of Section 20 05 01.

2.2 GENERAL

.1 High-efficiency motors, according to ASHRAE 90.1 requirements.

2.3 MOTORS

.1 Electrical work shall be performed in accordance with Division 26 and as follows:

.1 Unless otherwise indicated on the drawings or specifications, starters, protective devices and hand controls for pumps, fans or other equipment shall be supplied, installed and connected under Division 26 of the specifications.

.2 Refer to Division 26 for the control wiring and conduit requirements, except for conduits, wires, cables, connections operating at less than 24 volts, which are control circuits and are specified in Division 26 for the quality of materials and workmanship.

.2 Motors:

.1 All new 1 HP and larger motors shall be equal to or greater than the Premium Efficiency motor requirements as defined by the National Electrical Manufacturers Association (NEMA) in MG 1 (latest edition).

.2 The speed/torque rating for motors shall generally conform to the NEMA Design B standard to ensure that the overload protection for standard starters is effective in preventing overheating during prolonged acceleration.

.3 Unless otherwise specified, all electric motors shall be NEMA standard with drip-proof, lubricated ball bearings, with specifications as shown on drawings. The motors shall be mounted on adjustable bases to adjust the tension. Any motor that may be installed in "difficult" locations where moisture is corrosive, etc., shall be a TEFC model. These locations shall be specified on the drawings or elsewhere in the specifications.

.4 All 25 HP and larger motors shall be protected by thermistors at each stage. Thermistors shall be PTC positive temperature coefficient sensor systems, compatible with Siemens 3RN1 relays, electronic starters or variable frequency drives.

.5 Use NEMA Class F insulation with a Class B temperature rise, a service factor of 1.15 for an ambient temperature of 40°C. Ball bearings shall be ANSI / AFBMA L-10 certified, with 200,000 hours of service.

.6 Unless otherwise indicated on the drawings, the voltage for ⅓ HP and smaller motors shall be 120V, single phase. The voltage for ½ HP and larger motors will be 600V, three phase.

.7 All motors will be supplied with a dynamic balancing quality level of G6.3, as defined by ISO 1940 - Mechanical Vibration.

.8 All motors powered by a variable frequency drive (VFD) shall be in accordance with NEMA MG-1-Part 31.

.9 Use lifetime-sealed, dust-tight, oil-retaining ball bearings with a life of at least 200,000 hours.

.10 All motors, with variable frequency drives, shall be equipped with grounding brushes or insulated ball bearings to prevent damage due to ground leakage currents (Bearing Ground Current Damage).

.11 Motor nameplates shall indicate the operating efficiency value of the motors at full load.

2.4 V-BELT DRIVES

.1 Fit reinforced belts to the correct pulleys on the drive system. All multiple belt units shall have the same specifications.

.2 Use cast iron or steel pulleys, secured to a shaft with removable keys.

.3 For motors from 0.25 kW to 7.5 kW maximum, use standard drive pulleys with pitch adjustable ±10%. Use the mid-range setting for the speed indicated in the RPM range.

.4 For motors over 7.5kW, use split taper bushing and keyway pulleys with a fixed pitch unless otherwise specified. Provide the proper size pulley to ensure a balanced rotation.

.5 Drive systems shall be rated at least 1.5 times the motor nameplate rating. Maintain primary drive shaft off-axis loads within the manufacturer's design limits.

.6 Supply and install a motor mounted on sliding adjustment plates, and provide space for pulley center distance adjustments.

2.5 PROTECTIVE SCREENS

.1 Supply protective screens for open drives.

.2 Screening shall have the following specifications:

.1 Expanded metal mesh welded to a 25 mm steel angle frame

.2 1.2 mm thick galvanized sheet metal top and base

.3 Removable sides for maintenance

.4 Drill a 40 mm diameter hole in the shaft axis to insert a tachometer

.3 Provide and install devices to lubricate these drives and operate test equipment without removing protective screens and, if necessary, extend tubes for normal maintenance.

.4 Install belt guards to ensure that motors can be relocated to adjust belt tension.

.5 For flexible couplings, install removable 2.7 mm-thick galvanized, "U" frame expanded metal screens made from 1.2 mm-thick sheet metal.

.6 Install 20 mm galvanized wire mesh screens on the intake or discharge side of exposed fan blades.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the manufacturer's requirements, recommendations and written specifications, including any available technical bulletins, product handling, storage and installation instructions and data sheet guidelines.

3.2 INSTALLATION

.1 Securely fasten equipment and components in place.

.2 Equipment and components shall be removable for maintenance and shall be easily replaced and secured in place.

3.3 ON-SITE QUALITY CONTROL

.1 On-site testing: Perform tests in accordance with the "Quality Assurance" clause of Section 20 05 01.

3.4 CLEANING

.1 Clean in accordance with the "Cleaning" clause of Section 20 05 01.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI/NFPA-10, Portable Fire Extinguishers.

.2 Refer to the latest version in effect.

1.2 SUBMITTALS

.1 Attach the applicable maintenance logs to the manual referenced in Section 20 05 01.

PART 2 PRODUCTS

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

.1 Multi-purpose, permanent pressure, refillable, ammonium phosphate-based fire extinguishers with a flexible hose and a nozzle with a shut-off valve.

1. Capacity: 4.54 kg (or as directed)
2. Classification: 6A:80B:C

2.2 FIRE EXTINGUISHER BRACKETS

.1 Brackets recommended by the fire extinguisher manufacturer.

2.3 LABELLING

.1 Fire extinguishers labelled in accordance with ANSI/NFPA-10, CAN/ULC-S508 recommendations.

.2 Attach or affix a label to the extinguisher with the year and month of installation. Space shall be available for listing scheduled maintenance dates.

.3 Install a nameplate to identify the exact locations of the fire extinguishers in accordance with NFPA-170.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install or mount fire extinguishers on brackets, as directed.

.2 Fire extinguishers shall be installed with handles 1,400 mm from the finished floor.

END OF SECTION

PART 1 GENERAL

1.1 REQUIREMENTS

.1 Refer to Section 20 05 01.

.2 All piping, fittings and equipment in contact with drinking water must comply with applicable NSF standards and in particular NSF 61.

1.2 SEISMIC MEASURES

.1 Refer to Section 20 05 01.

1.3 COORDINATION BETWEEN SPECIALTIES

.1 Refer to Section 20 05 01.

.2 Participate actively in the abovementioned process, provide any required information and follow the arrangements made between the specialties.

.3 Be responsible for all necessary travel due to a breach of the abovementioned process.

1.4 SCOPE OF WORK

.1 "Plumbing" specialty work includes the supply and installation of all equipment conduits and accessories shown on the drawings for this specialty and described in Division 22 of the specifications.

.1 "Plumbing" specialty work also includes the following:

.1 Designate plumbing system equipment and fixtures in accordance with Section 20 05 53.

.2 All seismic fastening systems for piping and plumbing equipment in accordance with Section 20 05 01.

.3 The connection to municipal networks within one metre of the building's foundation wall

1.5 SUBMITTALS

.1 Submit required documents and samples in accordance with Section 20 05 01.

1.6 PLUMBING SPECIFICATIONS & SET-UP

.1 Ensure that maintenance and teardowns can be done without moving any pipe and conduit joints through the use of unions and flanges, preventing any building structural element or any other installation from becoming an obstacle.

.2 Provide an easy way to lubricate equipment, including "lifetime" lubricated bearings.

.3 Place all skid-mounted equipment on a 100 mm-high slab with beveled edges that extends at least 50 mm all around the equipment for easier cleaning.

.4 Connect drain lines to drains.

.5 Align the sides of equipment, rectangular manhole covers and other fixtures with the building walls, wherever possible.

1.7 SLEEVES

.1 Refer to Section 20 05 01.

1.8 EXCAVATION & BACKFILLING FOR PLUMBING WORK

.1 Refer to Section 20 05 05.

1.9 TESTING OF PLUMBING WORK

.1 Test drain, waste and vent piping for sanitary systems as follows:

.1 Gravity system: Test with a water column of 3 m above the average ground level.

.2 Pumped systems: Test with a water column of 3 m above the pump tank.

.2 For storm sewers equipped with a secure mechanical joint attachment system, the test pressure will be conducted with a column of 3 m above the highest secure joint.

1.10 PROTECTION & CLEANLINESS FOR PLUMBING WORK

.1 Using the appropriate methods, prevent dust, dirt and other foreign matter from entering the openings of devices, equipment and systems.

.2 The "Plumbing" specialty must take all necessary steps to ensure that the inside of all equipment, components and piping is free of debris after installation.

.3 During installation, the seal at each end of the conduits shall be left in place by the Contractor until the next joint is made.

.4 The Contractor shall be responsible for taking all necessary steps to protect all piping systems from all substances that may contaminate their interior and accessories.

.5 Any activity that may, in the opinion of the Engineer, generate dust, dirt and/or contaminants that could adversely affect the environmental quality of the project shall be performed outside the perimeter of the building.

END OF SECTION

PART 1 GENERAL

1.1 DEFINITION OF TERMS

.1 Summary

.1 This section includes:

.1 Installation specifications for piping and fittings.

PART 2 PRODUCTS

2.1 NOT APPLICABLE

PART 3 EXECUTION

3.1 CONNECTIONS TO EQUIPMENT PIPING

.1 In accordance with manufacturer's instructions, unless otherwise indicated. .

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use fittings with unions or flanges to isolate the fittings from the piping system and facilitate the maintenance and installation/removal of the components.

.4 Use double-jointed fittings when units are installed on anti-vibration mounts and piping is susceptible to movement (or use flexible joints).

3.2 CLEARANCES

.1 Provide clearance around equipment to make it easier to inspect, maintain and monitor the unit's operation as recommended by the manufacturer.

.2 Provide sufficient working space to dismantle and remove equipment or equipment parts, if necessary, without disrupting the operation of other devices or system components. The space provided shall be in accordance with the size shown on the drawings or as recommended by the manufacturer, whichever is greater.

3.3 VALVES & FITTINGS

.1 Install shut-off or isolation valves in accessible locations.

.2 Remove the parts inside before soldering any connection.

.3 Unless otherwise indicated, install valves with their operating stems above the horizontal line.

.4 Install valves to provide access for maintenance without removing adjacent piping.

3.4 CHECK VALVES

.1 Install silent check valves on the discharge end of the pumps, in vertical upflow lines and where otherwise indicated.

.2 Install swing check valves in horizontal piping on the discharge end of the pumps and where otherwise indicated.

3.5 DIELECTRIC FITTINGS

.1 Use dielectric fittings compatible with the piping and the system's pressure rating.

.2 Use dielectric fittings to join dissimilar metals.

.3 For dielectric fittings with nominal diameters equal to or less than NPS 2, use bronze unions or valves.

.4 For dielectric connections greater than NPS 2, use copper-steel flanges, dielectric fittings or bronze valves.

3.6 PIPEWORK INSTALLATION

.1 Seal the threads of screw-in fittings with Teflon tape.

.2 Prevent foreign material from entering unconnected openings.

.3 Install piping to isolate individual devices and permit their removal or dismantling, if necessary, without disrupting the operation of other system components.

.4 Assemble piping with fittings manufactured to applicable ANSI standards.

.5 Install exposed piping, fittings, rectangular cleanouts and similar items parallel or perpendicular to the building lines.

.6 Slope piping in the direction of the flow for unrestricted drainage and system ventilation, unless otherwise instructed.

.7 Group pipes wherever possible, as directed.

.8 Ream pipes and remove built-up scale and other foreign material from the piping before assembly.

.9 Plan to compensate for the thermal expansion of the piping, as directed.

.10 Before installing a piping system, clean the piping system in accordance with the applicable sections of Division 22.

.11 Prior to the acceptance of the work, clean and restore the equipment to its original condition, replacing the filters in the piping system.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This section includes:

.1 Thermal insulation for piping and piping accessories in commercial-type applications.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1-[01], Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM B 209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate [Metric].

.2 ASTM C 335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C 411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C 449/C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C 533, Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C 547, Mineral Fiber Pipe Insulation.

.7 ASTM C 795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.8 ASTM C 921-[03a], Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Standard Test Method; Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701, Standard for Polystyrene Thermal Insulation, Boards and Sheathing for Piping.

.3 CAN/ULC-S702, Standard for Mineral Fibre Thermal Insulation for Buildings.

.4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre for Buildings, Part 2: Applications Guidelines.

.5 Refer to the latest versions in effect.

1.3 DEFINITIONS

.1 For purposes of this section, the following definitions apply:

.1 "CONCEALED" - insulated mechanical piping, ducts and equipment in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - items that are "not concealed," as defined herein.

.2 TIAC codes:

.1 CRF: Code Rectangular Finish

.2 CPF: Code Piping (Plumbing) Finish

1.4 SUBMITTALS

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with the "Submittals" clause of Section 20 05 01.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 The installer must be an expert in this field, with at least three (3) years of proven experience in performing work of this type and scope, as described in this section, and must possess the qualifications required by TIAC.

.2 Health & Safety:

.1 Implement the necessary health and safety measures during construction in accordance with applicable "Health and Safety" regulations.

1.6 SHIPPING, STORAGE & HANDLING

.1 Storage and Protection:

.1 Protect materials and equipment from weather and damage that may be caused by pedestrian, equipment and vehicle traffic.

.2 Protect materials and equipment from damage.

.3 Store materials and equipment at temperatures and under conditions required by the manufacturer.

PART 2 PRODUCTS

2.1 FIRE & SMOKE RATING

.1 In accordance with CAN/ULC-S102

.2 Maximum flame spread rating: 25

.3 Maximum smoke developed rating: 50

2.2 INSULATION

.1 The mineral fibre discussed below includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) shall not exceed specified values at 24° C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code A-4: Flexible unicellular tubular elastomer

- .1 Insulation: in accordance with ASTM C534.
- .2 Maximum "k" factor: in accordance with ASTM C518.
- .3 Insulation certified by manufacturer to be free of potential stress corrosion cracking corrodants
- .4 Protective harnesses for every Armafix AF support bracket (or equivalent)

2.3 INSULATION SECUREMENT

.1 Tape (aluminum, 25/50 self-adhesive, minimum 50 mm wide, ULC-rated)

.2 Contact adhesive (quick setting)

.3 Canvas adhesive (washable)

.4 Tie wire (1.5 mm diameter stainless steel)

.5 Bands (stainless steel, 19 mm wide, 0.5 mm thick)

2.4 JACKETS

.1 Polyvinyl chloride (PVC) jackets

- .1 One-piece moulded jackets and sheets (in accordance with CAN/CGSB-51GP, 53M, preformed as required)
- .2 Colour (white)
- .3 Minimum service temperature: -20° C
- .4 Maximum service temperature: 65° C
- .5 Moisture vapour transmission: 0.02 perm
- .6 Thickness: 0.55 mm
- .7 Fastenings:

.1 Solvent-based adhesive compatible with thermal insulation to seal joints and overlaps

.2 Self-adhesive vinyl tape in assorted colours

.2 Canvas jackets:

.1 220 gm/m^2 cotton, plain weave, treated with diluted fire retardant lagging adhesive in accordance with ASTM C921.

.2 Lagging adhesive: compatible with insulation

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the manufacturer's requirements, recommendations and written specifications, including any available technical bulletins, product handling, storage and installation instructions and data sheet guidelines.

3.2 PRE-INSTALLATION REQUIREMENTS

.1 Hydrostatic testing of the piping systems and adjacent equipment shall be completed, witnessed and certified by the competent authority before installing the lagging.

.2 All surfaces requiring lagging or coating shall be clean, dry and free of foreign matter beforehand.

3.3 INSTALLATION

.1 Install in accordance with applicable TIAC National Standards.

.2 Install insulation in accordance with manufacturer's instructions and this specification.

.3 Use two layers with staggered joints when required nominal insulation thickness exceeds 75 mm.

.4 Apply the vapour retarder jacket and finish coat without any interruptions.

.1 Hangers and supports must not pierce the vapour retarder jacket.

.5 Supports & Hangers

.1 Install high compressive strength insulation, suitable for service conditions where no insulation protection saddles or shields are supplied.

3.4 PIPING INSULATION TABLE

.1 Piping insulation shall also include valves, valve bonnets, strainers, flanges and fittings, unless otherwise specified.

.2 The thickness of the insulation shall be in accordance with the specifications in the table below:

.1 Run-outs to individual units and equipment shall not exceed 4000 mm in length.

.2 Exposed run-outs to plumbing fixtures, piping, valves and fittings shall not be insulated.

Piping	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
		Up to 1	1¼ to 2	2½ to 4	5 to 6	8 & over	Finishes
Air Intake Return & Air Conditioning System	A-4	13	13	--	--	--	1 or 2

.3 Finishes (jackets):

.1 Exposed interior piping: canvas jacket

.2 Exposed interior piping: PVC jacket

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM D 2235, Specification for Solvent Cement for Acrylonitrille-Butadiene-Styrene (ABS) Plastic Pipe and Fittings

.2 ASTM D 2564, Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems

.2 Canadian Standards Association (CSA)/CSA International.

.1 CSA B1800 Series, Thermoplastic Non-Pressure Piping Compendium

.2 CSA-B181.2, PVC Drain, Waste and Vent Pipe and Pipe Fittings

.3 CSA-B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings

.3 National Research Council Canada (NRC)/The Institute for Research in Construction

.1 NRC, National Plumbing Code of Canada (2010), including Quebec amendments

1.2 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

Part 2 PRODUCTS

2.1 BURIED PIPING AND FITTINGS

.1 In-ground DWV pipes that comply with the following standards:

.1 CSA-B181.1 (ABS)

.2 ASTM D3034 (PVC DR35) for DN 5 or larger

2.2 ABOVE-GROUND PIPING AND FITTINGS

.1 Above-ground DWV piping in accordance with the following standards:

.1 CSAB181.2/ULC CAN4-S102.2 (XFR system) with a flame spread rating of 25 or less and smoke development of 50 or less

2.3 JOINTS

.1 Solvent-based adhesive for PVC pipe joints (in accordance with ASTM D 2564)

.2 Solvent-based adhesive for ABS pipe joints (in accordance with ASTM D 2235)

Part 3 EXECUTION

3.1 INSTALLATION

.1 Install piping in accordance with Section 22 05 05.

.2 Install in accordance with the requirements of the National Plumbing Code of Canada (2010), including Quebec amendments, unless otherwise specified.

3.2 TESTING

.1 Pressure test buried piping prior to backfilling.

.2 Hydrostatically test piping to ensure that it is unobstructed and that the slope is adequate. Slope must meet National plumbing code

3.3 PERFORMANCE AUDIT

.1 Cleanouts

.1 Make sure the cleanouts are accessible and the cleanout plugs are in the proper location.

.2 Open cleanouts, apply linseed oil and close tightly.

.3 Insert cleanout rod into the cleanout to reach at least the next cleanout.

.2 Ensure that all traps are properly primed and retain their water seal.

.3 Rainwater drainage pipes (downspouts)

.1 Fasten domed roof grates securely in place.

.2 Ensure flow control weirs are properly sized and installed.

.3 Provide a way to handle any roof movement.

.4 Ensure that plumbing fixtures are securely anchored in place, connected to the system and well ventilated.

.5 Place the proper identification label on each pipe (including rainwater, sewage, ventilation and pump discharge piping) with directional arrows on each floor or every 4.5 m (whichever is smaller).

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This section includes:

.1 Submersible pumps, catch basins and accessories for their installation.

1.2 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

PART 2 PRODUCTS

2.1 CATCH BASINS

.1 For catch basin details, see structural drawings.

.2 Catch basin shall be made of 610 mm diameter, 30 MPa reinforced concrete precast sections in accordance with ASTM-C478 and BNQ 2622-410 specifications.

.3 The catch basin, which shall be equipped with a frame and cover at the top, shall be installed with the cover flush with the finished concrete.

.4 The frame of the basin shall be made from STM-20 grade cast iron, 760 mm in diameter and machined for a perfect fit between the cover and the frame.

2.2 DUPLEX PUMPING UNIT

.1 Provide and install, as shown on the drawings, a duplex pumping unit consisting of two (2) submersible pumps, a control panel with electric alternator, mercury-free switch level controls, a high-level alarm and all the necessary accessories for operating the unit, all as described below and shown on the drawings.

.2 Pumps shall be installed in an existing catch basin made of 30 MPa reinforced concrete precast sections in accordance with ASTM C 478 and BNQ 2622 410 specifications (as detailed on the drawings).

.3 Submersible pumps:

.1 Each pump shall have a capacity of 1.67 L/s against a total discharge head of 9 meters. Each motor shall be ½ HP at 230 V, single phase and 60 Hz and the speed shall be 3450 rpm. The discharge diameter shall be DN 2.

.2 The pump and motor cage shall be made entirely of cast iron. The non-clog impeller shall be cast iron, capable of passing solids up to 20 mm in diameter. No screens or grates shall be used. All fasteners shall be 18-8 stainless steel. All surfaces shall be treated against rust. The pump shall be equipped with a handle.

.3 The submersible, open-end winding motor shall operate in clean dielectric oil for cooling the winding and lubricating the bearing housings. Electrical connections to the stator shall be in a sealed, watertight enclosure. The integral shaft of the motor and pump shall be made of stainless steel and be mounted on ball bearings.

.1 The engine shall be protected from water by a double seal with an oil chamber between the two seals. The top seal will operate entirely in oil.

.2 Each pump shall be provided with a flexible 4-wire power cord and flexible moisture probe cord long enough to reach the nearby control panel.

.4 Sealing flanges

.1 Each hydraulic sealing flange shall include a BUNA-N diaphragm seal.

.2 The system shall be equipped with a galvanized steel "T" guide rail, galvanized steel DN2 fittings and a lifting chain with retainer.

.5 Control panel:

.1 The pumping unit shall be equipped with a fully pre-wired factory control panel, mounted within a CEMA 1 cabinet and shall include the following components:

.1 One main disconnect switch with handle on face of box

.2 A fuse block with fuses for each of the two pump motors or two (2) circuit breakers

.3 One magnetic starter with overcurrent protection for each pump motor and "manual off auto" selector switch mounted on face of enclosure

.4 Moisture detectors with terminals

.5 24 volt control transformer with secondary fuses

.6 On, power and over current indicator lights

.7 Electric alternator

.8 High-level alarm with mute button and n.o. and n.c. contacts

.9 Terminals for the connection of the four (4) level controls

.6 Level controls:

.1 The operation of the pumps shall be controlled with four (4) mercury-free float level switches supplied with the unit.

.7 Shut-off and check valves

.1 Supply and install on the discharge pipe of each pump, as shown on the drawings, a cast iron ball valve and check valve with a machinable bronze disc and seat, bolted cover and external weight adjustable lever.

.8 Discharge piping

.1 All pump discharge piping shall be 40 series galvanized steel with threaded or mechanical joints.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the manufacturer's requirements, recommendations and written specifications, including any available technical bulletins, product handling, storage and installation instructions and data sheet guidelines.

3.2 INSTALLATION

.1 Make electrical and mechanical connections between pump, motor and controls, as specified

.2 Inspect the pump unit to ensure it is free of piping.

.3 Once assembly is complete and the cover plate is in place, align the vertical submersible pump unit in the sump.

3.3 ON-SITE QUALITY CONTROL

.1 On-site Testing/Inspection

.1 Check electrical power supply.

.2 Check starter protection devices.

.2 Start pump and confirm that it is operating safely and properly.

.3 Check setting and operation of "MANUAL-OFF-AUTO" selector switch, control and safety devices, audible and visual alarms, overheat protection devices and other safety devices.

3.4 START-UP

.1 General

.1 Procedure:

.1 Check power supply.

.2 Check starter overload heater power.

.3 Start pump and check impeller operation.

.4 Check that the pump is operating safely and efficiently.

.5 Check settings and operation of safety devices, overheat protection devices, audible and visual alarms and other safety equipment.

.6 Check the operation of the MANUAL-ON-AUTO switch.

.7 Check the operation of the alternator.

.8 Ensure that there are no obstructions under the base.

.9 Run the pump continuously for up to 12 hours.

.10 Eliminate conditions that could lead to cavitations, gas expansion or air entrainment in the pump.

.11 La vérification de démarrage et arrêt des pompes doit être fait avec la séquence de fonctionnement des flottes

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This section includes:

.1 Special plumbing system devices, including installation methods and supplies.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM).

.1 ASTM A 126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA).

.1 AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case.

.2 AWWA C701, Cold Water Meters-Turbine Type for Customer Service.

.3 AWWA C702-1, Cold Water Meters-Compound Type.

.3 Canadian Standards Association (CSA)/CSA International.

.1 CSA- B64 Series, Backflow Prevention Devices and Vacuum Breakers.

.2 CSA-B79, Floor, Area and Shower Drains, and Cleanouts for Residential Construction.

.3 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.5 Plumbing and Drainage Institute (PDI).

.1 PDI-G101-[96], Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.

.2 PDI-WH201, Water Hammer Arresters Standard.

1.3 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

.2 Provide data sheets for the following components and devices: valves and piping.

.3 Provide and attach the required maintenance logs to the manual specified in Section 01 78 00 All documents/items shall be submitted upon completion of the work.

PART 2 PRODUCTS

2.1 FLOOR DRAINS

.1 Floor and trench drains shall be in accordance with CSA B79.

.2 Drains shall have a cast iron body, shaped as shown on the plan, with an adjustable head strainer, a trap primer connection and a clamping collar.

2.2 CLEANOUTS

.1 Wall cleanout plugs: heavy-duty cast iron male ferrule with brass or bronze screws and neoprene gasket. For PVC piping, the plugs shall be made of the same material. heavy cast iron with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket

2.3 BACKWATER VALVES

.1 For cast iron piping, valves with cast iron body, bronze seat, bronze flapper and bolted bonnet.

.2 For plastic piping, the valve shall be made of the same material as the piping.

.3 For all underground valves, provide a PVC sleeve that runs underneath the ground access cover.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the manufacturer's requirements, recommendations and written specifications, including any available technical bulletins, product handling, storage and installation instructions, and data sheet guidelines.

3.2 INSTALLATION

.1 Install fixtures in accordance with the requirements of the National Plumbing Code of Canada, including Quebec amendments.

.2 Install special plumbing fixtures in accordance with the manufacturer's instructions and specifications.

3.3 START-UP

.1 Start up the network, including special devices, after the following:

.1 The hydrostatic tests have been completed.

.2 The test certificate has been issued.

.2 Provide continuous supervision during start-up.

3.4 TESTING & ADJUSTING THE SYSTEM

.1 Test and adjust special equipment after completing the following:

.1 All defects detected at start-up have been rectified.

.2 The Certificate of Completion has been issued by the applicable authorities.

.2 Adjustments

.1 Ensure that measured flow and pressure match design parameters.

.2 Make adjustments when flow rate or drawdown is (1) at maximum flow rate or (2) at 25% of maximum flow rate, and when pressure is (1) at maximum and (2) at minimum.

.3 Floor drains

.1 Check that the strainer is in place, accessible and easy to remove.

.2 Clean sediment basket.

.4 Cleanouts

.1 Ensure that covers are gas-tight, secure in place and easy to remove.

END OF SECTION

PART 1 GENERAL

1.1 REQUIREMENTS

.1 Refer to Section 20 05 01.

.2 Allocation of sections

.1 For the allocation of sections to responsible specialties, refer to the table of contents for mechanical and electrical work.

.2 For seismic measures, refer to section 20 05 01.

1.2 SEISMIC MEASURES

.1 Refer to Section 20 05 01.

1.3 COORDINATION WITH OTHER SPECIALTIES

.1 Refer to Section 20 05 01.

.2 Participate actively in the abovementioned process, provide any necessary information and follow the arrangements made between the specialties.

.3 Be responsible for any travel due to the failure to comply with the abovementioned process.

1.4 SCOPE OF WORK

.1 Ventilation specialty work includes the supply and installation of all equipment, ducts and accessories shown on the drawings for this specialty and described in Division 23 of the specifications.

.1 Ventilation specialty work also includes the following:

.1 All seismic restraint systems for ventilation equipment and ducts, as specified in Section 20 05 01.

.2 Provide insulation for ductwork and other equipment.

.3 All ventilation system balancing and airflow adjustments

.4 Provide equipment motors that comply with the requirements specified in Section 20 05 13.

.2 Related work

.1 The following work is not included in the "Ventilation" specialty work, but is covered in other sections of the specifications under the supervision of the General Contractor.

.2 All ventilation system balancing and airflow adjustments

.3 All automatic control work, as specified in Section 25 05 01.

1.5 SUBMITTALS

.1 Submit required documents and samples in accordance with Section 20 05 01.

1.6 EQUIPMENT SUPPORTS & FRAMES

.1 Supply and install all necessary metal supports and frames for supporting the equipment specified in each section.

.2 These supports shall be made of welded metal sections and built in accordance with best engineering practices and provincial codes applicable to this work. This work shall be performed by welders and qualified labour.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not used

PART 3 EXECUTION

3.1 PROTECTION & CLEANING

.1 General

.1 Prevent dust, dirt and other foreign matter from entering openings of equipment, materials and systems through the proper measures.

.2 Ventilation

.1 The ventilation contractor shall take all necessary steps to ensure that the inside of all ventilation equipment, components and air ducts are free of dust, dirt and debris after installation in accordance with the NADCA (National Air Duct Cleaners Association) ACR 2002 standard, which is 0.75 mg/100 cm2 or less.

.2 All ductwork and accessories for ventilation and air conditioning systems shall be delivered to the site with all ends sealed with membranes. Sealing membranes shall be removed only one at a time during the installation of each ductwork section. Any conduit or accessory delivered to the job site in a condition that, in the judgment of the Engineer, does not meet the requirements of this section will be immediately identified by the Engineer for removal from the job site by the Contractor.

.3 During the conduit installation, the seal at each end of the conduit shall be left in place by the Contractor until the next joint is sealed.

.4 The Contractor shall be responsible for taking every necessary step to protect all ductwork from dust and any substances that may contaminate the interior and exterior of the ductwork and accessories. Samples shall be taken at the ventilation contractor's expense to verify cleanliness upon the completion of the work.

.5 If, in the judgment of the Engineer, the Contractor fails to take adequate protective measures and/or if portions of previously installed ducts become contaminated, the Contractor will be required to clean these portions of the ducts at his own expense. If the cleaning proves inadequate, the Contractor must remove portions of the conduit and replace with a new conduit at his own expense.

.6 Any activity that, in the judgment of the Engineer, may generate dust, dirt and/or contaminants that may adversely affect the environmental quality of the project shall be performed outside the building perimeter.

.7 During construction in an area where there is an existing ventilation system, the system shall be shut down. All open ducts, grilles or diffusers shall be sealed to prevent construction dust from entering the ventilation system. In the event that an existing ventilation system cannot be shut down in the construction area, pre-filters shall be installed on all open ducts, grilles or diffusers.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 National Building Code of Canada (NBC) and its supplements

.2 Quebec Construction Code: Chapter 1 - Building.

.3 Refer to the latest versions in effect.

1.2 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

PART 2 PRODUCTS

2.1 SEISMIC CONTROL DEVICES AND SYSTEMS

.1 Refer to 20 05 01.

2.2 VIBRATION CONTROL DEVICES

.1 General

.1 Rigid springs with a lateral stiffness to axial stiffness ratio equal to or greater than 1.2 times the static deflection to height under load ratio (with a displacement reserve of 50% of its displacement under nominal load, equipped with leveling devices)

.2 Ratio of height under load to diameter of spring must be between 0.8 and 1.0

.3 Neoprene-coated springs and hot-dipped galvanized frames for all exterior installations

.4 Colour-coded springs

.5 Insulators shall have static deflection as indicated on the drawings (For each unit, the size, number and location of insulators shall be determined by the manufacturer to achieve the specified static deflections)

2.3 SPRING SUSPENSIONS

.1 Color-coded springs, rust-resistant, painted hanger box, designed to allow the hanger box or a rod to move through a 30° arc without metal-to-metal contact.

.2 Type H2: Suspension with stable spring, elastomeric washer and spring with a moulded isolation bushing recessed in hanger box base.

.3 Type H3: Suspension with stable spring, elastomeric upper-shear element and spring with a moulded isolation bushing recessed in hanger box base.

.4 Type H4: Suspension with stable spring and welded plate with elastomeric washer (moulded isolation bushing recessed in hanger box base).

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the manufacturer's requirements, recommendations and written specifications, including any available technical bulletins, product handling, storage and installation instructions and data sheet guidelines.

3.2 INSTALLATION

.1 Vibration Control Devices

.1 Install vibration control devices in accordance with manufacturers' instructions and adjust studs to make units level.

.2 Do not connect piping, air ducts or electrical conduits to insulated equipment in a manner that reduces the flexibility of the vibration control system and does not transmit any vibration through ducts or air ducts in walls or floors.

.3 Fans shall be installed on insulators and adjusted to level when in use. Care shall be taken to ensure that the unit is well aligned with the ductwork and that no stress is placed on the flexible joints. In the case of fans with stabilizers, the stabilizers shall be adjusted when the fan is in operation.

END OF SECTION

PART 1 GENERAL

1.1 QUALIFICATIONS OF TAB PERSONNEL

.1 Within 90 days of the contract award, submit to the Ministry Representative a list of personnel who will be responsible for performing TAB.

.2 TAB shall be performed in accordance with the requirements of the standard governing the qualifications of the TAB firm and personnel.

.1 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems (current edition)

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC Systems Duct Design TAB (Testing, Adjusting and Balancing) (current edition)

.3 TAB procedures shall be performed in accordance with the recommendations and practices specified in the selected standard.

.4 To fulfill the contractual requirements, comply with the requirements of the applicable TAB standard and use the checklists and forms specified therein.

.5 Comply with the requirements of the applicable TAB standard, including the qualifications of the TAB company and personnel as well as the calibration of TAB instruments.

.6 Comply with the manufacturer's recommendations for calibrating the TAB instruments when these requirements are stricter than the TAB standard recommendations.

.7 The quality assurance requirements of the applicable standard, including performance guarantees, are an integral requirement of this contract.

.1 For systems or components not covered by the TAB standard, use the TAB methods developed by the TAB expert.

.2 In cases where new procedures and requirements are applicable to Contract requirements have been published or adopted by a body responsible for the TAB Standard (NEBB or TABES), the TAB requirements and recommendations contained in these procedures and requirements are mandatory.

1.2 PURPOSE OF TAB

.1 Test to verify that systems are operating safely and properly, determine the actual point of operation and evaluate the qualitative and quantitative performance of equipment, systems and controls at design, average or low load, whether actual or simulated.

.2 Adjust and regulate equipment and systems to meet specified performance requirements and achieve the specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over the entire operating range.

1.3 EXCEPTIONS

.1 The testing, adjustment and balancing of equipment and systems governed by specific standards or codes shall be performed to the satisfaction of the proper authorities.

1.4 COORDINATION

.1 Schedule time within the construction schedule for testing, adjusting and balancing the systems (including repairs and retesting), for completion prior to the acceptance of the work.

.2 Test, adjust and balance each system independently and, subsequently, each system in unison with servo systems.

1.5 PRE-TAB REVIEW

.1 Review the contract documents before construction begins and confirm, in writing, to Ministry Representative that the requirements for testing, adjusting, balancing and all other aspects of the design and installation of equipment and systems are adequate and will ensure the success of the construction.

.2 Review specified standards and other reference documents and report to Ministry Representative in writing all methods proposed in the contract documents that differ from the procedures specified in the standards or reference documents.

.3 During construction, coordinate the location and installation or layout of TAB devices, equipment, accessories, measurement ports and fittings.

.4 Follow the commissioning procedure recommended by the manufacturer of the equipment and systems, unless otherwise specified.

.5 Follow any specific start-up procedures specified elsewhere in Division 23.

1.6 OPERATION OF SYSTEMS DURING TAB

.1 Operate equipment and systems for the length of time necessary to perform TAB procedures and as required by Ministry Representative to verify the TAB reports.

1.7 START OF TAB

.1 Notify Ministry Representative seven (7) working days prior to starting TAB procedures.

.2 Start TAB when building is essentially completed, when the following conditions are met:

- .1 The installation of ceilings, doors and windows and other construction that could affect TAB results
- .2 The application of weatherstripping, sealants and caulking
- .3 The completion of pressure, leakage and other tests specified in other sections of Division 23
- .4 All TAB equipment is installed and operational

.5 Mechanical and associated electrical and control systems that may affect the outcome of the TAB process are operational and have been tested for performance, including the following:

.1 Thermal overload protection for electrical equipment in place

.2 Air systems

.1 Filters in place and clean

.2 Clean air ducts

.3 Ducts, air shafts and ceiling plenums airtight to within specified tolerances

.4 Correct fan rotation

.5 Volume, fire and smoke control dampers installed and open

.6 Access doors and hatches installed and closed

.7 Outlets installed and volume control dampers open

1.8 APPLICATION TOLERANCES

.1 Test, adjust and balance systems until results are no more than the following deviations, plus or minus, from theoretical values.

.1 Laboratory HVAC systems: +10%, -0%.

.2 Other HVAC systems: +/- 5%

1.9 ACCURACY TOLERANCES

.1 Measured values shall correspond to within +/- 2% of actual values.

1.10 TAB INSTRUMENTS

.1 Prior to TAB, submit a list of the TAB instruments (and their serial numbers) to the Ministry Representative.

.2 Calibrate instruments in accordance with the strictest standard or reference document for HVAC or other systems subject to TAB procedures.

.3 Calibrate instruments within three (3) months of commencing TAB procedures. Provide the Ministry Representative with a calibration certificate.

1.11 SUBMITTALS

.1 Prior to TAB, submit the following:

.2 The proposed methodology for testing, adjusting and balancing the systems, if different from the method specified in the applicable standard or reference document.

1.12 PRELIMINARY TAB REPORT

.1 Prior to submitting the official TAB report to the Ministry Representative, submit for verification and approval a preliminary report that indicates the following:

.1 Details on TAB instruments
.2 Details on TAB procedures
.3 Calculations methods
.4 Summaries

1.13 TAB REPORT

.1 The format of the report shall be in accordance with the applicable TAB standard or reference document.

.2 The TAB report shall show results in SI units and include the following:

.1 Project record drawings
.2 System schematics

.3 Submit three (3) copies of the TAB report to the Ministry Representative for verification and approval in English, in D-ring binders, including index tabs.

1.14 DATA VERIFICATION

.1 Reported results are subject to verification by the Ministry Representative.

.2 Provide personnel and instrumentation to verify up to 30% of the reported results.

.3 The Ministry Representative shall determine the number and location of verified results.

.4 Bear costs to repeat testing, adjusting and balancing procedures until results are to the satisfaction of the Ministry Representative.

1.15 SETTINGS

.1 After completing the TAB process to the satisfaction of the Ministry Representative, replace drive or transmission guards, close access doors and hatches, lock adjusters in operating position and verify that sensors are at required settings.

.2 Permanently mark settings, which shall not be deleted or covered in any way.

.3 When "adjustable" pulleys are used on belt drives with 10 HP or larger motors, replace the adjustable pulley with a stationary unit when all measurements and adjustments have been finalized.

.4 When one of the stationary pulleys is used, it is necessary to change the speed, make the necessary substitution, in accordance with established practices, based on the mass to be accelerated and the motor's horsepower and starting torque.

.5 Substitute pulleys are the responsibility of the equipment supplier specialty.

1.16 COMPLETION OF TAB

.1 TAB shall be considered complete after the final TAB Report is approved by the Ministry Representative.

1.17 AIR SYSTEMS

.1 TAB shall be performed in accordance with the strictest requirements of this section or applicable NEBB, SMACNA and ASHRAE standards and references.

.2 Test, adjust and balance systems, equipment, components and controls, as specified in Division 23.

.3 The personnel performing TAB shall be qualified to provide the specified services in accordance with NEBB standards.

.4 The testing, adjusting and balancing of systems shall be performed under the direction of a supervisor qualified to provide the required services in accordance with NEBB standards.

.5 Measurements shall include, but not be limited to, the following as applicable for systems, equipment, components or controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dew point), duct cross-sectional area, RPM, electrical power, voltage, noise rate and vibration level.

.6 The equipment measurement points shall include, but not be limited to, the following (if applicable):

.1 Inlet and outlet of dampers, filters, coils, humidifiers and fans (and any other equipment that causes changes in conditions)

.2 Controllers and controlled devices and instruments

.7 The measurement points for the systems shall be at the following locations (if applicable): main, main branch, sub-branch and run-out ducts (grilles, dampers or diffusers).

1.18 OTHER TAB REQUIREMENTS

.1 General

.1 General requirements for the work specified in this section.

.2 Qualifications of TAB personnel (in accordance with the requirements of the "Air Systems" section)

.3 Quality assurance (in accordance with the requirements of the "Air Systems" section)

1.19 BUILDING PRESSURE CONDITIONS

.1 Adjust HVAC systems, equipment and controls to operate at the specified pressure conditions year-round.

Part 2 Products

2.1 NOT APPLICABLE

Part 3 Execution

3.1 NOT APPLICABLE

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ASTM C518, American Society for Testing and Materials International, (ASTM)

.3 ASTM B 209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).

.4 ASTM C 335, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.5 ASTM C 411, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.6 ASTM C 449/C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.7 ASTM C 547, Specification for Mineral Fiber Pipe Insulation.

.8 ASTM C 553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.9 ASTM C 612, Specification for Mineral Fiber Block and Board Thermal Insulation.

.10 ASTM C 795, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.

.11 ASTM C 921, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation

.3 Thermal Insulation Association of Canada (TIAC), National Insulation Standards (C2004).

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102(C2000), Standard Test Method for Surface Burning Characteristics of building Materials and Assemblies.

.2 CAN/ULC-S701-01, Thermal Insulation Polyotrene, Boards and Pipe Covering.

.5 Standards and codes of the latest edition in effect.

1.2 DEFINITIONS

.1 For purposes of this section, the following definitions apply:

.1 "CONCEALED" - insulated mechanical piping, ducts and equipment in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - items that are "not concealed," as previously defined.

.3 Insulation systems - thermal insulation, fasteners, jackets and other accessories

.2 TIAC codes:

.1 CRD: Code Round Ductwork

.2 CRF: Code Rectangular Finish

1.3 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

1.4 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's instructions for the installation of thermal insulation in accordance with the "Submittals" clause of Section 20 05 01.

.2 Instructions shall specify the installation methods and the required quality of workmanship.

1.5 MANPOWER QUALIFICATIONS

.1 The installer must be an expert in this field, with at least three (3) years of proven experience in performing work of this type and scope, as described in this section, and must possess the qualifications required by TIAC.

PART 2 PRODUCTS

2.1 FIRE & SMOKE RATING

.1 In accordance with CAN/ULC-S102

.2 Maximum flame spread rating: 25

.3 Maximum smoke developed rating: 50

2.2 ACCESSORIES

.1 Mesh:

.1 Rectangular welding rods, 3.2 mm x 25 mm x 30 mm, mild steel, with 16 mm diameter washers for insertion end to permit stapling.

.2 Tinned welding rods, 2.1 mm diameter, length as required, with 32 mm x 32 mm plated fasteners (nylon locking fasteners)

.3 Self-adhesive ULC-rated vapour barrier tape, 100 mm wide, less than 25 for flame spread and less than 50 for smoke generation.

2.3 ADHESIVES & COATING

.1 Vapour barrier adhesive:

.1 Quick setting, fire retardant, fire resistant, light amber, brush application consistency adhesive suitable for bonding or sealing vapour barrier cover tabs.

.2 Adhesive for bonding lagging to metal:

.1 Use same adhesive, as specified, for bonding and sealing vapour barrier jackets.

.3 Canvas jacket coating:

.4 Resin-based, fire retardant, fire resistant, white, brush or spray application consistency, water, petroleum, weak solvent and acid resistant lagging coating.

2.4 INSULATING & FINISHING CEMENT

.1 Insulating cement:

.1 Mineral wool-based insulating cement, operating temperature to 650° C, dry density 640 kg/m3, gray in colour.

.2 Finishing cement:

.1 Hydraulically set insulating cement finish, service temperature to 650° C, dry density 640 kg/m3, light grey in colour.

2.5 INDOOR VAPOUR RETARDER MASTIC

.1 A sprayable, flame-retardant, fire-resistant sealant suitable for application as a finish on reinforcing membranes or as a joint sealer.

2.6 JACKETS

.1 Canvas jacket

.1 ULC-approved insulating canvas with a flame spread rating of less than 25 and a smoke generating capacity of less than 50.

2.7 INSULATION SYSTEMS

.1 Moisture-proof rigid insulation for ducts: temperature up to 120° C (Type C-1):

.1 Material:

.1 Rigid fibreglass board in accordance with CGSB 51 GR 10A, with factory-installed RFFRK vapour barrier coating in accordance with CGSB 51-GP-52, which has the following properties:

- Density: 48 kg/m^3
- Thermal conductivity: 0.033 W.m./m2/^{o} C
- Permeance index: less than 0.3 perm
-

.2 Adhesive:

.1 Compatible with insulation

.3 Finish:

.1 On exposed ducts and plenums, finish with ULC-listed insulating fabric bonded with fire retardant coating. No additional finish is necessary on concealed ducts and plenums.

.2 Moisture-proof flexible duct insulation: operating temperature up to 120° C (Type C-2).

.1 Material:

.1 Flexible fibreglass mat, in accordance with CGSB 51 GP 11M, with a factory-installed, RFFRK-type, reinforced aluminum vapour barrier cover, in accordance with CGSB 51 GP 52, Type 1, which has the following physical characteristics:

- Density: 12 kg/m3
- Thermal conductivity: 0.0375W.m./m2/^{o} C at 24° C
- Permeance index: less than 0.03 perm

.2 Adhesive:

.1 Compatible with insulation

.3 Finish:

.1 On exposed ducts and plenums, wrap insulation with semi-rigid cardboard and cover with a ULC-listed insulating cloth, securely taped.

.2 No additional finishing is necessary for concealed ducts and plenums.

PART 3 EXECUTION

3.1 GENERAL

.1 Insulation shall not be installed until all necessary hydrostatic tests have been completed, all surfaces are clean and dry, all heating cables or ribbons are installed where required and approval is obtained from the Engineer. Insulation shall be clean and dry during the installation and application of all finishes.

.2 Work shall be done by qualified tradesmen and as neatly as possible.

.3 Vapour barriers shall be continuous and cover insulated surfaces without interrupting or puncturing the suspension brackets.

.4 Install insulation products, accessories and finishes strictly in accordance with manufacturer's recommendations. Specified adhesives, sealants and coatings shall be applied in accordance with manufacturer's recommendations for minimum coverage per litre.

.5 The installation of the insulation shall be in accordance with the requirements of the manufacturers and the installation methods specified in the Thermal Insulation Association of Canada's Mechanical Insulation Best Practice Guides.

3.2 INSULATION - VENTILATION DUCTS & PLENUMS

.1 Moisture-proof rigid insulation (Type C-1):

.1 Cut insulation to fit between joints and stiffeners and fasten to outer surface of duct or plenum by pressing on suitable mechanical fasteners, such as welded spikes, spaced 300 mm apart, center to center maximum. Install at least two (2) rows of fasteners on each side. Secure insulation with washers or snap-in clips.

.2 Abut all joints carefully and seal all joints and cracks with 100-mm wide self-adhesive FSK vapour barrier tape and metal corners on the edges. Also, seal all fastener penetrations with joint tape to protect the vapour barrier.

.2 Moisture-proof flexible insulation (Type C-2) :

.1 Wrap the duct with the thermal liner and abut the circumferential joints carefully and overlap the longitudinal joints by at least 50 mm. Bond the liner to the surface of the duct with bonding adhesive in strips of 100 mm spaced approximately 200 mm center to center. In addition, secure the liner to the bottom of the rectangular ducts with ful-surface adhesive and mechanical fasteners (for both the sides and top of the rectangular ducts). Secure the liner to the duct with the proper mechanical fasteners spaced no more than 300 mm apart.

.2 For the circumferential joints, staple the 50 mm surface flange with 13 mm flared staples spaced 150 mm center to center and seal joints with 100 mm wide FSK self-adhesive vapour barrier tape. For the longitudinal joints, staple overlap with 13 mm flared staples spaced 150 mm center to center and seal joints with 100 mm wide FSK self-adhesive vapour retarder tape. Also, seal all mechanical fastener penetrations with vapour retarder tape.

.3 Insulation - Ventilation Ducts & Plenums

.1 Canvas jacket:

.2 Cylindrical ducts: Wrap the thermal liner with semi-rigid cardboard, overlapping all joints by at least50 mm, cover with a thermal liner primed with a sealant and seal with a second coat of the same sealant applied by brush.

.3 Rectangular ducts and plenums: Install "Dur-A-Bead" metal corner beads on all edges and cover with an insulating cloth primed with a sealant. Finish with a second coat of the same sealer.

3.3 TABLE - DUCT INSULATION

.1 Install insulation where specified in the following table.

.2 Insulation thickness shall be in accordance with the specification in the following table.

PLACE	TYPE	TOTAL THICKNESS			
		25 mm (1 in.)	38 mm (1½ in.)	50 mm (2 in.)	75 mm (3 in.)
All outdoor air intake plenums and ducts	C-1 (rigid)			X	
All exhaust or excess air plenums	C-1 (rigid)			X	

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)

.2 American Society for Testing and Materials

.1 ASTM A653- Standard Specification for Sheet Steel, Zinc coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition 2005.

.2 SMACNA HVAC Air Duct Leakage Test Manual, 2012, 2nd Edition.

.3 Duct CleanLiness for New Construction Guidelines

.4 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

.4 National Fire Protection Agency Association (NFPA).

.1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-02, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 NFPA 96-01, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

1.2 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

.2 Shop and installation drawings of all ductwork (see Section 20 05 01)

.3 Shop drawings shall indicate the pressure rating and sealing class of each system.

.4 Shop drawings shall indicate the joints and sheet sizes with a table showing these details.

1.3 QUALITY ASSURANCE

.1 Indoor Air Quality Management Plan

.1 Implement SMACNA's "Indoor Air Quality Guideline for Occupied Buildings under Construction" during the construction phase.

PART 2 PRODUCTS

2.1 PRESSURE CLASS

.1 Positive or negative pressure class shall be determined by the normal maximum operating pressure of the systems multiplied by 1.50 or a minimum of 500 Pa (2").

.2 Maximum operating pressure shall be determined by the static pressure specified for the fan(s) in the system and shall apply throughout the length of the system to both suction and pressure.

.3 For systems where the fan is part of a prefabricated or assembled air handling unit, the pressure class shall be calculated from the pressure "external" to the air handling unit (i.e. by reducing the specified value of the fan, the pressure drop attributable to coils, filters and plenum effects). For filters, consider the value of clean filters.

This external pressure will apply to the entire length of the system, both in terms of suction and pressure.

.4 By default, the 500 Pa (2" or less) pressure class shall be applicable to the following portions of the systems:

.1 Portion downstream from end units

.2 Portion of air transfer sections

2.2 AIR DUCT SEALING

.1 In accordance with the requirements set out in the SMACNA HVAC Air Duct Leakage Test Manual in addition to the requirements set out in Article 2.3 "Duct Leakage Class" of this section.

2.3 DUCT SEALING CLASS

.1 Sealing shall be as follows for rectangular, circular or oval ducts:

Sealing Class	Sealing Requirements	Static Pressure Class
A	All transverse and longitudinal joints and all penetrations through the duct wall	Over 750 Pa (3")
B	All transverse and longitudinal joints	500 Pa (2") to 750 Pa (3")
C	All transverse joints	500 Pa (2") or less

2.4 SEALANTS

.1 Description

.1 Water-based, oil-resistant, fire-retardant sealant capable of withstanding temperatures from -30°C to 60°C

2.5 SEALING TAPE

.1 Description

.1 50 mm (2") wide polyvinyl treated loose weave fibreglass membrane tap

2.6 SELF-ADHESIVE SEALING TAPE

.1 Description

.1 Self-adhesive "Peal'n seal" tape in rolls with modified elastomeric butyl adhesive covered with 50 mm (2") wide aluminum sheet

2.7 SEALING MATERIALS

.1 Description

.1 Preformed butyl-polyisobutene sealant capable of withstanding temperatures ranging from 40°C to 70°C

2.8 SEALING TAPE

.1 Description

.1 Insulating and self-adhesive tape with water vapour resistance.

2.9 GALVANIZED STEEL AIR DUCTS (LOW PRESSURE)

.1 Generally, this section applies to all air duct systems shown on the drawings with a pressure rating of less than 500 Pa (2" water), except for ducts specified as non-galvanized steel.

.2 Materials

.1 Galvanized steel sheet in accordance with ASTM A653-13 (Category G-90)

.3 Fabrication

.1 Circular ducts

.1 Circular ductwork shall be manufactured in accordance with SMACNA Chapter 3 and SMACNA Table 3-5 (positive pressure) or Table 3-6 (negative pressure).

.2 Thicknesses based on the fabrication method shall be as specified by the standard. However, a minimum thickness of 24 GA (0.70 mm) is mandatory at all times, despite a smaller gauge listed in the standard.

.3 Joints:

.1 Sealing Class C (joints in accordance with SMACNA standard)

.2 Sealing method: See Method #3 in Part 3 of this section

.2 Rectangular ducts

.1 Rectangular ducts shall be fabricated in accordance with SMACNA Chapter 2 and SMACNA Table 2-3 or Table 2-10 (adapted to the construction choice).

.2 Thicknesses based on the method of fabrication shall be as specified by the standard. However, a minimum thickness of 24 GA (0.70 mm) is mandatory at all times, despite a smaller gauge listed in the standard.

.3 In selecting ductwork construction, the use of interior supports is not acceptable, unless approved in advance and will never be accepted for ductwork less than 1200 mm (48") wide.

.4 Joints:

.1 Sealing Class C (joints in accordance with SMACNA standard)

.2 Sealing method:

.1 "T" section joints (see Method #3 in Part 3 of this section)

.2 "Pittsburgh" joints (see Method #4 in Part 3 of this section)

.5 Based on the general practice of sheet metal fabricators in the region, conventional "T" joints and reinforcements with keys will be considered and accepted as equivalent to the T-24a joint, provided the dimensions and fasteners specified for this joint in the current SMACNA standard are met. The limitations and accessories set forth for this joint shall apply in full except for the "Gage" referred to herein. Notwithstanding the above, the limitation shown in Figure 2.1 of Chapter 2 for the T-24A joint (Limited to 2 in wg pressure class), this assembly may be used for the 750 Pa (3") pressure class provided the specified thickness is increased by "one gage" and for the 1000 Pa (4") pressure class by "2 gages." This limitation shall not apply to the T-24A joint.

.6 Moreover, the addition of a continuous key is mandatory and the screws shall be installed at a maximum of 12 mm from the surface of the duct, 25 mm from the end (corner) and 150 mm c/x as per figure 201 of chapter 2-T-24A.

.7 During the field installation, no more than three (3) sections of 1170mm (46") in length or two (2) sections of 2340mm (92") in length will be allowed to be pre-assembled to the floor. This is a requirement to prevent collapsing at the joint(s).

.8 When using keyed conduit joints, use two (2) layers of preformed sealant with adhesive on both sides made of butyl-polyisobutene and capable of withstanding temperatures ranging from 40°C to 70°C.

2.10 FITTINGS

.1 Fabricate fittings in accordance with SMACNA Chapter 4

.2 Rounded-angle elbows

.1 Rectangular ducts: standard radius elbows (bend radius 1.5 x duct width)

.2 Circular ducts: large radius elbows (bend radius 1.5 x duct diameter)

.3 Sharp bends - Rectangular ducts

.1 Duct size equal to or less than 400mm: elbows with single layer baffles

.2 Ducts larger than 400 mm: elbows with double thickness deflectors

.4 Branch fittings

.1 Rectangular main and branch: 45 degree entry to branch

.2 Circular main and branch: 45 degree main entry with transition fitting

.3 Volume dampers shall be provided in branch ducts near main duct fittings

.4 Main branches shall be equipped with exhaust or separation vanes

.2 Fittings

.1 Fabricate fittings in accordance with SMACNA Chapter 4

.2 Rounded-angle bends

.1 Rectangular ducts: standard radius elbows (radius of curvature 1.5 x duct width)

.2 Circular ducts: large 3- or 5-piece radius elbows (bend radius 1.5 x duct diameter)

.1 90° elbows shall be in three (3) sections up to 225 mm (9") diameter and in five (5) sections for 250 mm (10") diameter and larger.

.3 Branch fittings

.1 Rectangular main and branch ducts: 45 degree entry on branch

.2 Circular main and branch conduits:

.1 45-degree entry on main with transition fitting

.2 Elbows, "Y" branches, 45-degree lateral tees, 45-degree lateral crosses, reductions, transitions and prefabricated sheet steel plugs in two (2) sizes larger than the duct of the same size

.3 Each circular or oval branch to a rectangular duct or supply air plenum shall be made with a prefabricated starter bell

.3 Volume control dampers shall be provided in branch ducts near connections to main duct

.4 Main branches shall be equipped with exhaust or separation vanes

.4 Transition elements

.1 Diverging elements: opening angle not to exceed 20 degrees

.2 Converging elements: opening angle not to exceed 30 degrees

.5 Offsets

.1 Large radius rounded bends

.6 Obstacle deflectors (to maintain the same cross-sectional area)

.1 Maximum opening angles shall be the same as for transition elements

2.11 SUSPENSION METHOD

.1 In general, ducts shall be suspended with rods in accordance with SMACNA Chapter 5 above

.2 In addition, the following restrictions shall apply:

.1 There shall be a side-to-side suspension at each duct cross joint

.2 Spacing

.1 Rectangular ducts

.1 Hangers shall be in accordance with Table 5.1 of the above standard. However, only rods will be acceptable, and their minimum diameter shall be 6 mm (¼") and the maximum spacing between hangers will be 2400 mm (8 ft).

.2 Circular ducts

.1 Hangers shall be in accordance with Table 5.2 of the above standard. However, only rods will be acceptable, and their minimum diameter will be 6 mm (¼") and the maximum spacing between hangers will be 2400 mm (8") for smooth conduits and 3600 mm (12 ft) for spiral ducts.

.3 Type of suspension

.1 All ducts shall be suspended by a pair of rods with a U-shaped iron made of folded sheet or rolled steel angle.

.2 Specifications shall be as per Table 5.3M, but with a lower limit of 62 kg for each trapezoid.

.3 For round ducts, use belts with folded ears made of roll formed flat iron with folded and drilled ears and a pair of rods.

.4 Stems are equipped with threaded nuts. The use of spring nuts is not acceptable. Pins or bands are not acceptable.

.5 Attachments to steel structural members shall be made of prefabricated "C" shaped elements with clamping bolts.

.6 For any support subjected to a load of 100 kg or more, install with a retaining slat.

.7 No "friction" device (spring clip) will be accepted.

.8 The expanding anchor bolts shall be equipped with a coupling nut to attach the support rod.

.9 No anchor rods shall be retained, except by the steel deck. However, if deck is covered with concrete, anchor rods may be installed through the concrete and bent 90 degrees to a minimum of 20 mm above the deck plate prior to pouring.

3.1 GENERAL

.1 Installation of above-ground ductwork

.1 Install steel air ducts, as indicated on the drawings, in accordance with SMACNA standards.

.2 Avoid breaking the vapour barrier membrane of the insulation when installing clamps or hangers.

.3 Install balancing dampers in all branches and as indicated.

.4 Anchor all vertical ducts on each floor with appropriately sized angle brackets located above the floor. Support angles shall be securely anchored to floor and bolted to ducts. Where ducts are in shafts, support angles shall be installed across the width of the shaft with ends attached to shaft walls or floor structure.

.5 Supports for externally lagged metal ducts will be located on the outside of the insulation. Between the support and the insulation, there shall be a sheet of 1.31 mm (18 gauge) galvanized sheet metal 150mm (6") wide.

.2 Duct access doors

.1 Install airtight access doors at the following locations:

.1 Each manual control damper

.2 .Each automatic control damper

.3 Each fire damper

.4 Each air intake, exhaust and excess air plenum

.5 Each drain pan

.6 All locations indicated on the drawings

.7 Each location where any unit or accessory requires maintenance

3.2 SUSPENSIONS

.1 Install suspension straps as per SMACNA requirements.

.2 Provide suspension angles with lock nuts and washers.

3.3 WATERTIGHT DUCTS

.1 Provide and install watertight ducts at the following locations:

.1 On fresh air intake ducts

.2 On fresh air intake plenums

.3 On excess air and exhaust air plenums

.2 Shape the bottom of the ducts without making longitudinal joints. Seal from inside with appropriate sealant.

.3 Shape bottom of intake, exhaust and excess air plenums without making longitudinal joints. ERV weld all longitudinal and transverse joints and seal from inside with a coat of appropriate sealant. Ensure that the bottom of the plenum will support the weight of a person without buckling. Install drain fittings at the bottom of the plenums with the diameter indicated on the drawing, which will be connected to the drainage system by the Division 22 "Plumbing" as follows.

.4 All ducts indicated.

3.4 SEALING & WATERPROOFING

.1 Method #1

.1 Apply sealant to outside face of joints, as recommended by manufacturer.

.1 Embed sealing tape in sealant and cover with at least one layer of sealant, as recommended by manufacturer.

.2 Method #2 (alternative to Method #1)

.1 Apply self-adhesive sealing tape to outside face of joints, as per manufacturer's recommendations.

.3 Method #3

.1 Apply sealant to exterior face of joints, as recommended by manufacturer.

.4 Method #4

.1 Apply sealing tape to exterior face of joints, as recommended by manufacturer.

3.5 PORTS FOR MEASURING AND TESTING INSTRUMENTS

.1 Install instrumented, chained and capped 25mm plugs at required locations to seal testing and balancing ports, ensuring plugs are suitable for duct use.

3.6 DUCT CLEANING

.1 All ducts shall be cleaned at the factory and upon delivery to the job site (the ends shall be sealed with the proper film).

.2 Duct cleanliness shall be maintained in accordance with SMACNA. This applies to all supply and return ducts as per the "Advanced Level" subsection of the "Duct Cleanliness for New Construction Guidelines." For exhaust ducts, apply this standard to any ducts upstream of the energy recovery units.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA).

.1 SMACNA, HVAC Duct Construction Standards, Metal and Flexible-1985.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

PART 2 PRODUCTS

2.1 GENERAL

.1 Dampers shall be manufactured in accordance with applicable SMACNA standards.

2.2 AUTOMATIC CONTROL DAMPERS

.1 General

.1 Parallel blade control dampers

.2 Insulated dampers installed in outdoor air intakes, outdoor stale air (exhaust) outlets and excess air units

.3 All other dampers shall be uninsulated

.4 Blades shall not exceed 1500 mm in length and the damper area shall not exceed 2.3m².

.5 Dampers exceeding 1200 mm in height shall be fitted with a mid-height reinforcing bar on their inner side.

.6 All dampers shall be fastened to flanged air ducts to provide access to the drive system.

.7 When the damper exceeds 2.3 m^2, return axle assemblies shall, depending on the number of actuators in use, be used.

.8 After final balancing, all connections between damper motors and blade shafts shall be drilled and permanently fastened with set screws.

A complete damper schedule showing the design and sizes of each damper shall be submitted for approval prior to production.

.2 Uninsulated automatic control dampers

.1 150 mm wide aerodynamic AIR-FOIL blades made of extruded aluminum, double-walled with synthetic rubber seal on frame sides to obtain less than 0.6% air loss at 2.48 kPa.

.2 Extruded aluminum 11.1mm hexagonal pivot rod punched into blades.

.3 "Double seal" pads with Celcon inner pad, fastened to the hexagonal rod, pivoting on an outer polycarbonate pad inserted in the frame.

.4 Drive components installed in frames without air flow.

.5 Acceptable product: Tamco, Series 1000 or approved equivalent.

2.3 BACKDRAFT DAMPERS

.1 6.35mm x 19mm extruded aluminum damper frames and 1.57mm minimum thick extruded aluminum blades.

.2 Synthetic rubber gaskets along the blades and inside the frames.

.3 Drive system with a lever arm and two (2) DELRIN fabricated bushings fastened to each blade edge.

.4 1.6 mm thick UPVC double rails on each side.

.5 0.8% air loss at 0.99 kPa air pressure.

.6 Acceptable product: Tamco, Series 7000 or approved equivalent.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the manufacturer's requirements, recommendations and written specifications, including any available technical bulletins, product handling, storage and installation instructions and data sheet guidelines.

3.2 INSTALLATION

.1 Install dampers in accordance with SMACNA recommendations and manufacturer's instructions.

.2 Install dampers to prevent vibrations.

.3 Install the controls in visible and easily accessible locations.

.4 Install automatic control and backdraft dampers in accordance with manufacturer's recommendations and install gaskets, as specified in Section 23 31 13, between air ducts and damper frames.

.5 Seal multiple damper module joints with silicone-based sealant.

.6 Install an access door near each damper. Refer to Section 23 33 23.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible (Latest version)

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

PART 2 PRODUCTS

2.1 GENERAL

.1 Accessories shall be manufactured in accordance with SMACNA HVAC Duct Construction Standards.

2.2 FLEXIBLE FITTINGS

.1 Conventional heating, ventilation and air conditioning installation

.1 Fans and air handling units shall be fitted with factory-made neoprene-coated glass cloth connections on both sides. The fitting band shall be no more than 150 mm in length between the metal parts that need to be joined, and shall be installed with the clearance necessary to prevent the transmission of any vibrations. Allow 100 mm movement for high-pressure fans and 50 mm for low-pressure fans.

.2 The metal fitting band shall be fabricated from the same material as the connecting duct.

.3 Copper braid equivalent to a #8 conductor shall be installed for each 2000 perimeter to ensure electrical ground continuity

2.3 AIR DUCT ACCESS DOORS

.1 Provide and install access doors at all locations specified below and/or wherever necessary for equipment access. Shop drawings of all access door designs shall be submitted for approval prior to fabrication. Door dimensions shall also be submitted for approval.

.2 Type 1 Access Doors (ducts installed in mechanical rooms)

.1 Doors shall be angle frame reinforced and designed to operate without buckling. The doors shall be fitted with rubber gaskets, hinged and equipped with a minimum of two (2) latches for a tight, secure seal.

.2 Access doors in uninsulated plenums and ducts shall be made of 22 gauge galvanized steel.

.3 Doors installed in plenums or insulated ducts will be fastened to a galvanized angle frame flush with the front of the insulation. These doors shall consist of 22 gauge double wall construction, filled with rigid fibreglass insulation, equal in thickness to the insulation of the duct or plenum.

.4 All hardware shall be corrosion resistant for heavy duty use.

.5 Access doors on metal ducts shall be fabricated from the same material as the ducts. Doors shall be made from aluminum on aluminum ducts and stainless steel on stainless steel ducts, etc.

.3 Type 2 access doors (low and medium pressure systems)

.1 Type 2 Access Doors shall be prefabricated, double wall oval shape ("Sandwich Construction").

.2 Frame shall be one piece, seamless, 0.70mm (24 gauge) galvanized die cast steel. Frame shall be mechanically fastened to the duct.

.3 Gasketing shall consist of extruded neoprene.

.4 Door panels shall be 0.70 mm (24 gauge) press formed galvanized steel with die cast closure.

.5 Insulation inside the door shall be 25 mm (1") of fibreglass covered with a galvanized steel sheet of the same gauge as the door panel.

.4 Locations

.1 Access doors shall be installed in the following locations:

.1 Each manual or automatic control damper

.2 Each air intake and outlet

.3 All locations indicated on the plans

.4 All locations where any unit or accessory requires maintenance

2.4 INSTRUMENTATION ACCESS

.1 Provide and install duct instrumentation access at all locations, as specified below and/or necessary.

.2 Instrumentation access shall consist of heavy duty, 16 gauge steel construction, fully zinc plated, equipped with a cam action handle with neoprene expansion plug and chain.

.3 Access doors shall be equipped with a neoprene gasket and shall be fastened to the air ducts with three (3) metal screws.

.4 Instrumentation access shall have a 28mm interior diameter and a length of 25mm or 50mm depending on the thickness of the insulation.

.5 Instrumentation access shall be furnished at the following locations:

.1 Airflow measurement

.1 Inlet, wall or roof mounted

.2 Intake and discharge of other fans

.3 Main ducts and main branches

.4 As shown on the drawings

.2 Temperature measurement

.1 Outdoor air intakes

.2 Inlet and outlet of coils

.3 Downstream from any point where two converging air streams with different temperatures meet

.4 As shown on drawings

.3 Locations

.1 150 mm center to center on both sides of a rectangular air duct

.2 Two points on the circumference of a circular duct, located at 90 degrees from each other

2.5 TURNING VANES

.1 All 90° rectangular elbows 300" in thickness and larger shall be equipped with double wall guide vanes, prefabricated with steel.

.2 Turning vanes shall be made of 18 gauge galvanized steel, hollow, shaped vanes with small curvature radius.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the manufacturer's requirements, recommendations and written specifications, including any available technical bulletins, product handling, storage and installation instructions and data sheet guidelines.

3.2 INSTALLATION

.1 Flexible fittings

.1 Install in the following locations:

.1 Intake and discharge sides of air delivery units and fans

.2 Intake and discharge sides of air exhaust and return fans;

.3 As specified

.2 Length of flexible sleeves: 100 mm

.3 Minimum distance between metal end pieces when system is in operation: 75 mm

.4 Install flexible couplings in accordance with SMACNA recommendations.

.5 When the system is in operation:

.1 Metal components at each end of the flexible coupling shall be aligned properly

.2 Cloth shall have some flexibility

.3 Elsewhere as shown

.6 Access doors and portholes

.1 Sizes:

.2 300 mm x 300 mm for an inspection door

.3 300 mm x 150 mm in the case of a hand hole

.4 200 mm x 125 mm in the case of a porthole

.5 As indicated

.7 Locations

.1 Required to provide access to airflow control dampers

.2 Required to provide access to devices requiring periodic maintenance

.3 Required by code

.4 Elsewhere as indicated

.8 Instrument test ports

.1 General

.1 Install components in accordance with SMACNA recommendations and manufacturer's instructions.

.2 Locate to permit easy manipulation of instruments

.3 Install insulation port extensions, as required.

.4 Location

.1 Airflow readings

.1 Ducted inlets to roof and wall exhausters

.2 Intake and discharge side of other fans

.3 Main ducts and main branches

.4 As indicated

.2 Temperature readings

.1 Outside air intakes

.2 Inlet and outlet of coils

.3 As indicated

.9 Turning vanes

.1 Install in accordance with recommendations of SMACNA and as indicated.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Air Movement and Control Association (AAMC)

.1 AMCA Publication 99-2003, Standards Handbook (Revised 2003)

.2 AMCA 300-1996, Reverberant Room Method for Sound Testing of Fans.

.2 American National Standards Institute (ANSI)

.1 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS)

1.2 SYSTEM DESCRIPTION

.1 Performance requirements

.1 Technical data from manufacturers' literature shall be reliable data, confirmed by tests conducted by or on behalf of the manufacturers by independent laboratories, certifying compliance with applicable codes and standards.

.2 Equipment characteristics: flow rate, static pressure in Pa, speed in rpm, mechanical power in bhp, size and model and sound level.

.2 Fans: statically and dynamically balanced and built to AMCA 99

.3 Sound level: to AMCA 301; tested to AMCA 300.

.4 Equipment performance ratings: based on testing to ANSI/AMCA 210.

.5 Bearings: Lifetime sealed ball bearings with sealed dust and oil retention seals, with a minimum certified service life of 200,000 hours.

.6 Inaccessible bearings shall be fitted with extension tubes for lubrication that extend to the outside of the pipe or unit.

.7 Motor horsepower shown on the drawings shall be considered the minimum. The fan manufacturer shall be responsible for the final selection of the motor, which shall have sufficient power to overcome the inertia of the fan and accelerate the fan to operating speed without overloading the motor.

1.3 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

PART 2 PRODUCTS

2.1 FANS - GENERAL

.1 Motors

.1 As required by Section 20 05 13 and this section.

.2 To be used with speed variation devices, if necessary, as indicated.

.3 Power as shown on drawings

.4 Two speed type, two windings, if necessary, as indicated.

.5 Two speed type, one split winding, constant horsepower, constant or variable torque as indicated.

.6 Motors shall be energy efficient in accordance with section 20 05 13.

.7 All motors connected to a variable frequency drive (VFD) shall be the "Inverter Duty" type and shall be equipped with a bearing protection device such as a "Bearing Isolator Shaft Grounding Ring."

.2 Accessories and other components: sets of matching V-belts, adjustable sliding mounting bases, belt guards, coupling housings, safety grilles at suction and/or discharge ports, as shown on the drawings and as specified in Section 20 05 01 - Common Motor Requirements for HVAC Equipment and other components indicated.

.3 Factory application of primer paint prior to assembly of parts, in a colour selected from the manufacturer's standard range.

.1 Drainage points provided on the volute, as indicated.

.4 Bearing lubrication system with extension tubes where bearings are not readily accessible.

.5 Vibration isolation: as per section 23 05 48.

.6 Flexible connections: as per section 23 33 23.

2.2 IN-LINE SQUARE CENTRIFUGAL FANS

.1 Provide and install as shown on the drawings, square centrifugal fans, including accessories as shown on the drawings and described below.

.2 Each fan cabinet shall be made of high strength structural steel with a baked enamel, alkyd finish. The fan cabinet shall be equipped with removable panels for access to movable parts.

.3 The non-overloading impeller of each fan shall be made of 100% aluminum and shall be statically and dynamically balanced. All blades shall be backward inclined and single wall.

.4 Motor shall be externally mounted on a base, permitting belt tension adjustments. Ball bearings shall be fitted with external lubrication fittings, as per Clause 2.1.5 of this section.

.5 Motor, belt drive and bearings shall be isolated from the fan air stream. Each fan shall be fitted with a belt guard bolted to the fan housing, covering the motor pulley and belt. Where shown on the drawings, fans shall be fitted with an inlet and outlet screen made of galvanized welded wire, 13 mm x 13 mm mesh, fastened to a metal frame.

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the manufacturer's requirements, recommendations and written specifications, including any available technical bulletins, product handling, storage and installation instructions and data sheet guidelines.

3.2 INSTALLATION

.1 Install fans in accordance with manufacturer's instructions.

.2 Install fans as specified with flexible connections as specified in Section 23 33 23 and flexible electrical conductors.

.3 Install flexible connection sleeves at fan inlet and outlet. Ensure metal collars on fittings are parallel and have at least 25mm of flexibility between the duct and fan when the fan is running.

.4 Install vibration isolators as shown on the drawings. Flexible connection sleeves shall not have no tension when fan is running.

.5 Furnish, fabricate and install all required brackets, frames and brackets for mounting all ceiling and floor mounted fans.

.6 Provide maintenance clearances and install all access doors as indicated or required.

.7 Maximum length of fan suspension rods shall not exceed 760 mm. Above this length, the contractor shall supply and install a galvanized steel angle bracket securely fastened to the building structure.

.8 Provide and install all prefabricated bases for the installation of typical roof ventilators or place ventilators on field fabricated bases as shown on the drawings and as directed by the manufacturer.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI)/ National Fire Protection Association (NFPA)

.1 ANSI/NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM E 90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.4 Society of Automotive Engineers (SAE).

1.2 SYSTEM DESCRIPTION

.1 Performance requirements:

.1 Technical data from the catalogues and documentation of manufacturers shall be deemed reliable based on the results of tests conducted by the manufacturers themselves, or on their behalf by independent laboratories, certifying compliance with the requirements of applicable codes and standards.

1.3 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

PART 2 PRODUCTS

2.1 FIXED LOUVRES

.1 Construction: Fully welded, flush ground and polished joints.

.2 Blades: weatherproof, aluminum profile design. Materials: 12 gauge (2mm) 6063 T5 alloy with stiffening boss, with blade length up to 1500mm.

.3 Frame, head, sill and jambs: 100 mm in depth, minimum 10 gauge (3 mm) thick, 6063 T5 alloy, with approved sealing groove integrated into the element.

.4 Mullions: placed no more than 1500 mm apart.

.5 Fasteners: SA-194-8F stainless steel with SA-194-SFB nuts and soft neoprene washers between aluminum surface and bolt head, or between nut, stainless steel washer and aluminum body. Heat treated, water hardened and annealed metal.

.6 Birdscreen: 12 gauge (2mm) diameter wire aluminum mesh with 12mm mesh, mounted on a U-shaped frame on the inside of the louvres.

.7 Finish: Duracron applied by a licensed finishing company in accordance with manufacturer's instructions. Colour to be selected by Architect.

Part 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the manufacturer's requirements, recommendations and written specifications, including any available technical bulletins, product handling, storage and installation instructions and data sheet guidelines.

3.2 INSTALLATION

.1 Install louvres, intakes and other vents in accordance with manufacturer's and SMACNA recommendations.

.2 Reinforce and brace components, as specified.

.3 Fasten components securely in designated openings. Caulk to seal tightly.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 52.1, Gravimetric And Dust Spot for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter (ANSI Approved).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-115.10, Disposable Air Filters, Removing Solid Particulate Matter in Ventilation Systems

.2 CAN/CGSB-115.18, Medium Efficiency Large Area Panel Type Air Filters

.3 Underwriters' Laboratories of Canada (ULC)

.1 ULC-S111, Standard Method of Fire Tests for Air Filters

.4 Submittals

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

PART 2 PRODUCTS

2.1 GENERAL

.1 Filters, frames, gaskets and seals shall be in accordance with NFPA and ULC codes (regulating devices shall be in accordance with CSA standard, where applicable).

.2 Only non-combustible materials shall be used in the construction of the filter bank.

.3 Air pressure gauges for 0-250 kPa range filters shall be supplied, one for each filter bank greater than 1900 L/s.

.4 Efficiency: as per ASHRAE Standard 52-1 and 52.2 for determination of airborne dust. The efficiency of the so-called "absolute filter" is tested with 0.3 micrometer (Um) diactyphalate smoke.

.5 Dust holding capacity: AFI test

.6 Frames and racks

.1 Install prefabricated galvanized steel frames and supports for filters with gaskets between frames and walls. Assembly frames: 16 gauge (1.6mm) thick, constructed of "T" channels

.7 Filters shall be suitable for air at 100% relative humidity

2.2 ACCESSORIES

.1 Mounting frames: Permanent, U-shaped, extruded aluminum frames made of the same material as the enclosure/hood, 1.6 mm thick, unless otherwise specified.

.2 Gaskets: to ensure leak-free operation.

.3 Blanking plates: as required, to fit all openings, made of the same material as the frames.

.4 Access and maintenance: through filter bank side doors/access panels.

2.3 DISPOSABLE FILTERS

.1 Disposable filters (pre-filters) shall have a minimum efficiency of 30% to 35% (MERV-8).

.2 Pre-filters shall have a nominal thickness of "2" (50 mm).

.3 Disposable cartridges shall be made of synthetic fibre fabric reinforced with a wide mesh mounted in a strong, impermeable, non-combustible cardboard frame.

.4 Filters shall be manufactured with a minimum of 48 plies per linear meter (15 plies per linear foot) and a minimum air filtration area of 2.4 m² (16.5 sq. ft.) for a 600 mm x 600 mm (24" x 24") filter.

.5 Pre-filters shall meet UL Class 2 requirements. Minimum efficiency shall be based on ASHRAE 52.1-1992.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with the manufacturer's requirements, recommendations and written specifications, including any available technical bulletins, product handling, storage and installation instructions and data sheet guidelines.

3.2 INSTALLATION - GENERAL

.1 Install filters as per manufacturer's instructions, providing adequate clearance for access to replace or service filters.

3.3 FILTER ELEMENTS

.1 Upon acceptance of the work, replace any filter element with a new one.

.2 Upon acceptance of the work, filter elements shall be new and clean, as shown by a pressure gauge test.

3.4 AIR FILTER PRESSURE GAUGE

.1 Install the type of pressure gauge indicated for each filter bank (pre-filter bank, end filter bank) and place in a suitable location where it can be easily read.

.2 Mark each pressure gauge with the manufacturer's recommended initial and final pressure drop (at maximum storage capacity).

END OF SECTION

PART 1 GENERAL

1.1 CODES & STANDARDS

.1 Section 20 05 01 - General requirements – General contractor

.2 ANSI/ISA 5.5, Graphic Symbols for Process Displays

.3 ANSI/IEEE 260.1, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units)

.4 ASHRAE STD 135, BACNET - Data Communication Protocol for Building Automation and Control Network

.5 CEA-709.1, Control Network Protocol Specification

.6 TIA/EIA-568-B, Commercial Building Telecommunications Cabling Standards Set

.7 TIA/EIA-569-A, Commercial Building Standard for Telecommunications Pathways and Spaces

1.2 ACRONYMS & DEFINITIONS

.1 List of acronyms for this section:

.1 AI - Analog Input

.2 AO - Analog Output

.3 BACnet - Building Automation & Control Network

.4 BI - Binary Input

.5 BO - Binary Output

.6 EMCS - Energy Monitoring & Control System

.7 HVAC - Heating, Ventilation & Air Conditioning

.8 I/O - Input/Output

.9 IDE - Interface Device Equipment

.10 ISA - Industry Standard Architecture

.11 LAN - Local Area Network

.12 LCU - Local Control Unit

.13 LCU - Local Control Unit

.14 MCU - Master Control Unit

.15 NC - Normally Closed

.16 NMU - Network Management Unit

.17 NO - Normally Open

.18 PCI - Peripheral Control Interface

.19 PID - Proportional, Integral and Derivative

.20 TCU - Terminal Control Unit

.21 UPS - Uninterruptible Power Supply

.22 VAV - Variable Air Volume

1.3 DEFINITIONS

.1 Point: may be logical or physical.

.1 Logical points: values calculated by system such as setpoints, totals, counts, derived corrections and may include, but not limited to result of and statements in CDLs.

.2 Physical points: inputs or outputs which have hardware wired to controllers which are measuring physical properties, or providing status conditions of contacts or relays which provide interaction which related equipment (stop, start) and value or damper actuators.

.2 Point Name: composed of two parts, point identifier and point expansion.

.1 Point identifier: a name comprised of three descriptors: a “area” descriptor, a “system” descriptor and a “point” descriptor, for which a database must be able to allocate a dynamic field for the point identifier. “System” is system that point is located on.

.1 Area descriptor: building or part of building where point is located.

.2 System descriptor: system that point is located on.

.3 Point descriptor: physical logical point description. For point identifier “area”, “system” and “point” will be short forms or acronyms.

.2 Point expansion: comprised of three fields, one for each descriptor. Expanded form of short form or acronym used in “area”, “system”, and “point” descriptors is placed into appropriate point expansion field.

.3 Bilingual systems to include additional point identifier expansion fields of equal capacity for each point name for second language.

.1 System to support use of numbers and readable characters including blanks, periods or underscores to enhance user readability for each of the above strings.

.3 Point Object Type: points fall into following object types:

.1 AI (analog input)

.2 AO (analog output)

.3 BI (binary input)

.4 BO (binary output)

.4 Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5.

.1 Printouts: to ANSI/IEEE 260.1.

1.4 COORDINATION WITH OTHER SPECIALTIES

.1 Refer to Section 20 05 01 General requirements – General contractor

.2 Participate actively in the abovementioned process and provide any necessary information and follow the arrangements made between specialties.

.3 Be responsible for any necessary travel due to the failure to comply with the abovementioned process.

1.5 SEISMIC MEASURES

.1 Refer to Section 20 05 01.

1.6 SCOPE OF WORK

.1 The work of the "Automatic Control" section includes, but is not limited to, the following.

PART 2 PRODUCTS

2.1 PRODUCTS

.1 All equipment shall be essentially catalogued products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest model or design capable of meeting the requirements of this specification. When two units of the same equipment classification are specified, these units shall be the products of a single manufacturer but not all component parts of the system need to be from the same manufacturer. Each major component shall have a prominently displayed nameplate showing the manufacturer's name, address, model and serial number.

PART 3 EXECUTION

3.1 AUTOMATIC CONTROL WORK SET-UP

.1 General

.1 Control devices shall be electrical and electronic, as shown on the drawings, and shall comply with the requirements below.

.2 Certain devices or accessories, such as valves, sensor or thermostat wells and flow switches, shall be furnished under this section, but shall be installed in piping, ductwork or equipment under the sections for this work or these systems. Provide installers with all information pertinent to the installation of these devices or accessories and supervise their installation.

.3 Coordinate with related work covered by other sections to provide space and clearance for the installation of control devices such as damper motors, valves and linkages. All equipment shall be readily accessible for maintenance and adjustments.

.4 Control systems shall regulate and operate mechanical equipment and systems in accordance with the specified sequences of operation. All materials, equipment and accessories, which may or may not be specified or indicated, but are a requirement for the operation of the systems, are covered by this section.

.5 Control devices shall be installed to provide stable service without detrimental vibrations, maintaining adequate accuracy.

.6 All control devices, thermostats and valves shall be located as shown on the mechanical drawings.

.2 System design and responsibilities

.1 The drawings do not show the size of the conduits or the type of wiring connecting the individual components of the energy management and control system. Take ownership of the designs for these connections to meet present and future capabilities.

.3 Electrical installation safety

.1 Electrical work shall be performed in accordance with the requirements of the Canadian Electrical Code, NFPA 70 and ANSI C2. Electrical wiring, terminal blocks and high voltage contacts shall be fully enclosed or adequately safeguarded and identified to prevent accidental injury to personnel.

.4 Manufacturer's recommendations

.1 When installation procedures, or any part of them, must be done in strict accordance with the manufacturer's recommendations for any equipment, printed copies of these recommendations shall be submitted to the Engineer prior to installation, which shall not be permitted until the Engineer receives these recommendations. Failure to produce these recommendations will lead to the rejection of the equipment

.5 Wiring

.1 Except for line voltage wiring (over 30 volts), assume full responsibility for all associated and required wiring. The term "wiring" shall be interpreted to include the supply of all necessary wire, cable, conduit, miscellaneous materials and workmanship to install a complete and operational system. If any deviations from the contract drawings become necessary, submit to the Engineer for approval the details of these deviations, including changes in the affected portions of the project and the reasons why these deviations are necessary.

3.2 EXISTING CONTROL DEVICES

.1 Use existing wiring and control lines as indicated.

.2 Reusable control equipment can be reused as originally configured if the devices comply with applicable codes, standards and requirements.

.1 No changes shall be made to the original design of an existing device without the Engineer's written permission.

.2 If there is any doubt about reusing existing equipment, provide new equipment with a suitable design for the project.

.3 Existing devices scheduled for reuse shall be inspected and tested following the contract award and prior to the installation of new devices.

.1 Provide a test report that lists each device scheduled for reuse and indicates if it is in good condition or in need of repair.

.2 Failure to provide a test report shall mean that the Contractor accepts the existing devices.

.4 Defective components

.1 Provide, with the test report, specifications or functional requirements to support the results.

.5 Prior to beginning any work, submit a written request for authorization to disconnect any control devices and take the equipment out of service.

.1 The Contractor's responsibility for control devices that must be incorporated into the EMS commences upon receiving written authorization.

.1 The Contractor shall be responsible for the repaired components and devices.

.2 The Contractor shall be responsible for the cost of repairs necessitated by negligence or the misuse of equipment.

.3 The Contractor's responsibility for existing control devices ends upon acceptance of the complete EMS system.

.6 Remove existing control devices that will not be reused or are not necessary. Place them in an approved storage area for disposal as directed.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This section includes:

.1 Description of automatic control conduits and wiring

1.2 REFERENCES

.1 National Building Code of Canada (NBC) and its Supplements

.2 Quebec Construction Code - Chapter 1 - Building

.3 CSA C22.20 Canadian Electrical Code, Part I and Quebec Amendments 1.262 No. 03 Methods of Testing Electrical Wires and Cables

1.3 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

PART 2 PRODUCTS

2.1 ELECTRICAL WIRING

.1 Electrical control wiring shall be installed in accordance with the Canadian Electrical Code and the Quebec Electrical Code. Electrical conduits shall have a maximum fill rate of 50%.

.2 Complete execution of control wiring as shown on drawings, including cables, wires, joint boxes and conduit systems.

.3 120V or 24V (automatically controlled) wiring, located in mechanical rooms or where exposed, shall be installed in thin wall conduits (EMT). The wiring shall be at least 18 AWG for 24 V and shall comply with the Quebec Electrical Code for 120 V. Wiring located in the ceiling spaces shall not be installed in thin-wall conduits (EMT), but shall be fastened to the structure in the ceiling space.

.4 Cables for connecting sensors, transmitters, programmable logic controllers, digital terminal controllers or other devices, shall be PVC FT4 orange, 105°C insulated 600 V, containing two or three shielded stranded conductors, 18 AWG, and installed in thin wall conduits (EMT).

.5 Cable for 24 V power supply to electronic transmitters shall be independent of 4 to 20 mA feedback signal cable.

.6 A single cable for each transmitter shall run from the transmitter to the connection terminals of the digital controllers.

.7 Control wire sizes shall be designed to provide a voltage loss less than 5% of the supply voltage.

.8 FT-6 "cable plenums" shall be permitted only in room ceilings where cables remain accessible, for room sensor connections, secondary level communications and 24V power to equipment connected to air supply terminal units.

.9 The use of FT-4 "cable plenums" shall be permitted only if these cables run through metal conduits.

.10 When using non-ducted cables, cables shall follow the building lines and be neatly tied at least every 1.5 m with hooks (as used by computer network installers) designed specifically for this purpose.

.11 Grounding of the entire Automatic Control Contractor's installation shall be done in accordance with the recommendations of equipment manufacturers and applicable codes.

.12 Connect the power supply for building automation equipment to the emergency circuit when the building is equipped with a generator.

.13 Control cables shall be identified at both ends with the network point number in black ink on a white background. Typically, for a controller numbered 10,000 with a #4 analog output, this network point should be identified 10,000.SA4.

.14 This section shall require the installation of 120V single phase control panels. The manufacturer of the controls shall review the electrical drawings to identify the accessories, connections and diagrams already under the responsibility of the electrician. This section shall be primarily for completing all required electrical wiring for operating the controls. The 120 V connections to electrical panels must be done in coordination with the electrician.

.15 All relays shall be installed in CEMA-1 enclosures unless otherwise specified on the electrical drawings and specifications.

.16 Relays and current transmitters shall be supplied and installed by the Control Contractor. The Control Contractor shall coordinate with the Electrician.

.17 The Control Contractor shall obtain a copy of the electrical drawings and specifications clearly indicating the connection points to the control division and any other changes that have been made to the electrical drawings to meet the requirements of this section. These drawings shall be supplied to the electrical contractor for the purpose of annotating the electrical drawings "as annotated" by the Contractor.

2.2 CONDUIT SYSTEM

.1 A complete conduit system shall connect all electrical and electronic equipment to the control panels, starters, digital terminal controllers, facility control panels and programmable logic controllers of existing mechanical networks, as well as the main communication network and communication sub-networks.

.2 EMT thin wall metal conduits with fittings shall be in accordance with CSA C22.2 No. 83.

.3 The size of the EMT conduits for the installation of shielded stranded cable shall be as shown in the table below:

Conduit	Number of Cables
13 mm	2
19 mm	4
25 mm	7
31 mm	12
38 mm	16
50 mm	27
63 mm	45
75 mm	65
100 mm	115

.4 Pull boxes and junction boxes shall be made of welded steel with flat screw-on covers for surface installations.

.5 Outlet boxes shall be made of at least 100 mm x 100 mm steel sheets on terminal blocks.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install systems and applicable controls in accordance with approved shop drawings and manufacturer's recommendations, by qualified tradesmen in accordance with Régie du bâtiment du Québec regulations.

3.2 WIRING

.1 Instruct qualified tradesmen to install electrical wiring in accordance with the rules of the Régie du bâtiment du Québec.

.2 Provide, install and connect all control wiring as follows:

.1 Cables for all control devices connected to the control and energy management system

.2 All network telecommunication cables

.3 Run all wiring and identify wiring to Owner's standards.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 The general requirements specified in Section 25 05 01 shall be an integral part of this section.

.2 The system shall be modular in design to increase its capacity and functionality, adding equipment and operating devices.

1.2 SCOPE OF WORK

.1 Supply, install, program and commission a "EMCS" (Energy Management and Control System), including Master Control Panels (MCP), Local Control Panels (LCP), Terminal Control Panels (TCP) and all other components to create a complete and functional "EMCS."

.2 Supply and install cluster control panels, as specified, for digital controllers.

.3 Supply and install communication network.

.4 Design control diagrams and panels (create control plans)

.5 Program control sequences established.

.6 Start up on-site systems with a technician.

.7 Commission and verify the control sequences to optimize the operation of the controlled systems.

.8 Integrate mechanical equipment via the "BACnet" interface supplied with the equipment.

PART 2 PRODUCTS

2.1 COMMUNICATION NETWORK AND PROTOCOLS

.1 Communication protocol:

.1 Except for special cases, on the primary and secondary networks, the communication protocol for all digital controllers used for automatic control, management and third-party systems shall be in accordance with ASHRAE 135.1-M - BACnet standard (Appendix J)

.2 Communication shall be on two levels: the primary network operating on Ethernet TCP/IP precepts and a secondary network (or secondary networks) operating on the EIA RS485 MS/TP (Master-Slave/Token Passing) standard.

.3 On the main Ethernet TCP/IP network, the switches, autonomous controllers, communication management controllers, data server, operation stations and third-party components (such as chillers and electrical power management systems) shall be integrated.

.2 Primary network:

.1 The Ethernet TCP/IP backbone, in accordance with IEEE 802-3, shall be supplied and installed by a telecommunications specialist, authorized by one of the cable manufacturers, who can provide ANSI/TIA/EIA 568 A certification.

.2 Depending on the distance, cables shall be copper, Category 5E/6/6E or fibre optic, whatever the distance requires.

.3 Cabling and active components shall be selected for 10/100/1000 Mbps service.

.4 Cables dedicated solely to the building automation system shall be orange in colour, except for Ethernet cables.

.5 All equipment on this network shall be interconnected by active components. Switches shall be manufactured by recognized manufacturers

.6 An Ethernet access point (via laptop) shall be installed in each mechanical room.

.3 Secondary networks:

.1 Secondary communication networks (BACnet MS/TP) shall be based on a controller that manages and transfers communications between the primary and secondary networks.

.2 Cables dedicated solely to the building automation system shall be orange in colour.

2.2 STAND-ALONE DIGITAL CONTROLLER CHARACTERISTICS

.1 General specifications for the components:

.1 Acronyms:

.1 LCP - Local Control Panel

.2 LLCP - Local Lighting Control Panel

.3 MCP - Master Control Panel

.4 NMU - Network Management Unit

.2 General:

.1 The physical and functional specifications of the components and accessories identified in this document represent the minimum requirements that must be met both on and off the project.

.2 All digital controllers shall be ASHRAE 135-2010 compliant and BTL (BACNet Testing Laboratory) certified.

.3 All control points and automatic control loops in the system shall be on a single controller. The only acceptable exception is acquisition (readout) points that are used solely for analysis or supervision (alarm) on MCP or LCP controllers.

.4 Digital controllers shall be capable of operating under the following environmental conditions:

.1 Temperature 0 to 50 °C

.2 Relative humidity: 10% to 90% (non-condensing)

.3 Performance:

.1 The communication performance shall be designed to ensure that the scan time for stand-alone digital controllers and specific applications (MCP, LCP, LLCP and TCP) shall be less than two seconds.

.2 Data acquisition times from detection to initialization for critical alarms at operating stations shall be less than five seconds. To this end, the performance, quantity and configuration of the NMU or MCP controllers shall be validated and verified on site.

.4 Building Automation System:

.1 The Contractor shall implement all dynamic graphics, including graphics for control equipment that are part of the integration.

.2 Segregation by building and user must associate viewing or control rights based on the authorization assigned to the user (minimum three levels) as follows:

.1 User level: view values.

.2 Intermediate level: command and re-adjustment certain operating conditions.

.3 Supervisor level: control and re-adjustment all operating conditions and user management.

.3 All equipment and software shall be standard, regularly manufactured for this type of system, and not designed and manufactured specifically for this project. All components, software and functionality shall be part of the manufacturer's available and catalogued products as of the submission date.

.4 The communication protocol for components connected to the communications backbone shall be Ethernet TCP/IP compliant and shall run on the latest Windows platform. Communications shall be unicast and capable of handling network equipment such as routers. Component addresses shall be assigned in coordination with the representative of the Ministry.

.5 The building automation system, through the operating stations, shall support bi-directional information transfers, dynamic graphics display and information management.

.6 The building automation system shall provide the ability to assign each type of point, both physical and virtual, limit conditions and states of operation. When these limits are reached and an adjustable time delay has elapsed, a message shall be stored and transmitted to the control and alarm receiving stations. The contractor shall perform all required operational configurations, maintaining compatibility with existing software at the various control stations.

.7 All specified functions shall be performed by a main network component, (PMU, MCP or other). <u>Any use of an external computer based workstation shall be rejected.</u>

.8 The alarm status shall be retained in the memory of the PMU and MCP for a period of at least 72 hours to provide the user with a summary alarm report for that period, if necessary.

.9 There shall be three choices of message destinations from the identified extensions with the ability to assign specific time periods based on occupancy or non-occupancy (business hours versus night/weekend/holidays).

.10 Alarm messages shall be accompanied by the building identification code, alarm description and text that can be modified by the building manager.

.11 Alarms shall be handled in two different ways: The first one processes the alarms continuously and interacts dynamically based on the established programming. Simultaneously, the other mode treats them in an informative way, emitting visual alarm notices and sending messages to the different management stations.

.12 The building automation system shall be capable of obtaining readings from any or all points (including analog and binary, inputs and outputs, temperature, pressure, humidity, status and power) at regular intervals with date and time stamps. It must be possible to totalize meter readings and produce periodically or on demand a totalized consumption report, and group at least four types of points in the same table (reading and compilation) for all network data. All sampled values must be stored in the RMU and MCP memory for a period of at least 72 hours to provide the user with a summary report for that period, if necessary.

.2 Network Management Units (General Purpose Digital Controllers or GPCs)

.1 The RMU is a network management module, managing communications and monitoring control and access functions on the higher-level Ethernet TCP/IP network. The protocol for transferring information over the Ethernet TCP/IP backbone shall be ASHRAE 135.1-M-BACnet. This type of controller shall be BTL B-BC certified (BACnet Building Controllers).

.2 The communication interface shall provide supervision, historical data collection and communication for digital controllers on secondary communication networks.

.3 With the exception of third party systems, communication on the secondary network shall be via the "RS485 MS/TP" mode, based on the ASHRAE 135.1-M- BACnet standard communication protocol.

.4 Communication shall be transparent "peer to peer" with all other controllers on the network (PMU, MCP and power control system) in the higher hierarchy network.

.5 The operating system shall operate in real time.

.6 Stand-alone first level management controllers (RMUs) shall be configured and have sufficient quantity to provide a 50% reserve for each communication "bus" to specific application controllers (Local Control Panel - LCP and/or Terminal Control Panel - TCP) and/or third-party controllers for future addition.

.7 Sufficient internal memory shall support the database and operating system. External type memory shall not be acceptable.

.8 The minimum hardware requirements for communication management controllers (CMUs) shall be as follows:

.1 A 32-bit (byte) microprocessor shall be capable of supporting any software necessary to meet the prescribed requirements.

.2 Minimum addressable memory capacity shall be at the discretion of the manufacturer. However, it shall have sufficient capacity to amply meet all technical and functional requirements specified in this document. In addition, the memory shall have sufficient capacity to provide the local historical archiving of data from all subnetworked I/O points with a 15 minutes sampling period for a period of 48 hours. This memory shall include, but not be limited to, the following:

.1 EEPROM non-volatile memory shall be capable of containing the operating system, supervisor, application program, subroutines and descriptions of other possible configurations. External memories shall not be acceptable.

.2 Battery-backed RAM (minimum 72 hour run time to reduce the need to recharge operating data in the event of a power failure), shall have sufficient capacity to hold control logic, application parameters and operator-modifiable operating data/software, such as schedules, setpoints, alarm triggers and PID constants, which shall be capable of modifying online from the operator's panel or an external operator interface. RAM shall be downloadable from the workstations.

.3 The RMU shall be equipped with a non-stop clock accurate to ± 5 seconds per month, capable of indicating year/month/day/hour/minute/second, supported by a battery that will last for at least 72 hours in the event of a power failure.

.9 The controller shall be equipped with a plug to connect a portable operator station.

.3 Master Control Panels "MCP" (General Purpose Digital Controllers or "GPC"):

.1 Digital controllers shall be installed in close proximity to the systems under supervision or control.

.2 For each digital controller (MCP), provide at least 10% of the free connection points for each point family (inputs/outputs). In addition, each standalone controller (MCP) shall have at least 25% of the memory spaces free for future programming changes or archiving of historical data.

.3 If local expansion cards are in operation, the number of additional points shall be limited to 50% of the total theoretical capacity of the controller, as shown on the data sheets of the manufacturers.

.4 PCM controllers shall be configured and provisioned to provide a 50% reserve for each communications "bus" to specific application controllers (Local Control Panel - LCP and/or Terminal Control Panel - TCP) and/or third party controllers for future upgrades.

.5 Controllers shall communicate directly on the Ethernet TCP/IP top level network. The protocol for transferring information over the Ethernet TCP/IP backbone shall be ASHRAE 135.1-M- BACnet. This type of controller shall be BTL B-BC (BACnet Building Controllers) certified.

.6 Communications shall be transparent ("peer to peer") with all other stand-alone digital controllers (MCP) in the higher level network.

.7 Sufficient internal memory shall support the database and operating system. External type memory shall not be acceptable.

.8 The minimum hardware requirements for stand-alone digital controllers (SDCs) shall be as follows:

.1 A 32-bit (byte) microprocessor shall be capable of supporting any software necessary to meet the specified requirements.

.2 The minimum capacity of the addressable memory shall be at the discretion of the manufacturer. However, the memory shall have sufficient capacity to amply satisfy all technical and functional requirements described in this document. In addition, the memory shall have sufficient capacity to provide the local historical archiving of data from all subnetworked I/O points with a 15 minutes sampling period for a period of 48 hours. This memory shall include, but not be limited to, the following:

.1 EEPROM non-volatile memory shall be capable of containing the operating system, supervisor, application program, subroutines and descriptions of other possible configurations. External memories shall not be acceptable.

.2 Battery-backed RAM (minimum 72 hour run time to reduce the need to recharge operating data in the event of a power failure), shall have sufficient capacity to hold control logic, application parameters and operator-modifiable operating data or software, such as schedules, setpoints, alarm trip points and PID constants, which shall be capable of modifying them online via the operator's panel or an external operator interface. RAM shall be downloadable from operator stations.

.3 The MCP shall be equipped with a non-disruptive clock accurate to ± 5 seconds per month, capable of indicating the year, month, day, hour, minute and/or second, supported by a battery that will last for at least 72 hours in the event of a power failure.

.9 The controller shall be equipped with a plug to connect a portable operator station.

.10 Inputs/outputs (maximum and minimum for each MCP controller):

.1 Inputs supporting the following signal types:

.1 Minimum quantity of eight inputs (four analog and four discrete). Note that the addition of I/O modules shall be acceptable.

.2 Minimum accuracy of analog inputs: 10 bits

.3 10K ohms thermistor

.4 0 to 10 VDC or 0 to 5 VDC

.5 0/4 to 20 mA

.6 Dry contacts

.2 Outputs supporting the following types of signals:

.1 Minimum quantity of eight outputs (four analog and four discrete). Note that the addition of I/O modules shall be acceptable.

.2 Minimum accuracy of analog outputs: 8 bits

.3 Triac relay (Form C)

.4 0 to 10 V DC

.5 0/4 to 20 mA

.3 For each MCP, the number of inputs/outputs during the project shall be limited to 48 physical points. At least 25% of free branch points of each type of I/O points shall be added to each MCP.

.4 Expansion modules shall increase the I/O capacity of any controller. To maintain performance, the addition of inputs/outputs through the use of expansion modules shall be limited to 50% of the total theoretical capacity shown on the data sheets of the manufacturers.

.5 Each MCP controller shall be linked to a permanently mounted local display keypad to view input/output point values and control outputs with manual override instructions to the operating software. The keypad with local display shall be installed in the same mechanical room, no more than 18 m away from the controller. One keypad with local display shall serve multiple controllers, if the following conditions are met:

.1 The local display keypad shall be installed in the same mechanical room as the controllers;

.2 The distance between the keypad with display and each controller shall be no more than 18m.

.6 In the absence of this functionality, "in/out/auto" switches with potentiometer and manual override instructions to the operating software shall be installed on the analog outputs.

.4 Local Control Panels "LCP" (Advanced Digital Application Controllers or "AAC"):

.1 Local digital controllers shall be installed in close proximity to the systems under supervision or control.

.2 For each digital controller (LCP), provide at least 10% of free connection points for each family of points (inputs/outputs). In addition, each stand-alone controller (PCL) shall have at least 25% free memory space for future programming changes.

.3 If local expansion cards are in operation, the number of additional points shall be limited to 50% of the total theoretical capacity of the controller, as shown on the data sheets of the manufacturers.

.4 Programmable stand-alone controllers based on microprocessor architecture for multi-tasking and real-time digital control shall not require a link to a higher level controller for "stand-alone" operation upon loss of communication with the communication network.

.5 Controllers shall communicate directly on the secondary communication network, which shall be an RS485 MS/TP network. The protocol for transferring information over the secondary RS485 MS/TP communication network shall be ASHRAE 135.1-M- BACnet. This type of controller shall be BTL B-AAC certified (BACnet Advanced Application Controllers).

.6 Communications shall be transparent "peer to peer" with all other stand-alone digital controllers (LCPs) in the higher level network.

.7 The minimum hardware requirements for LCPs shall be as follows:

.1 One 32-bit microprocessor (bytes)

.2 The minimum capacity of the addressable memory shall be at the discretion of the manufacturer. However, it shall have sufficient capacity to amply satisfy all technical and functional requirements specified in this document.

.1 In the event of a break in transmissions between the PMU/MCP and the LCP, or failure of the LCP, the LCPs shall continue to perform their control functions. Controllers that go into a default mode of operation or cannot open or close positions shall be unacceptable.

.3 Inputs/outputs (minimum for each LCP controller):

.1 Inputs supporting the following signal types:

.1 Minimum quantity of eight inputs (four analog and four discrete). Note that the addition of I/O modules shall be acceptable.

.2 Minimum accuracy of analog inputs: 10 bits

.3 10K ohms thermistor

.4 0 to 10 VDC or 0 to 5 VDC

.5 0/4 to 20 mA

.6 Dry contact

.2 Outputs supporting the following types of signals:

.1 Minimum quantity of eight outputs (four analog and four discrete). Note that the addition of I/O modules shall be acceptable.

.2 Minimum accuracy of analog outputs: 8 bits

.3 Triac relay (Form C)

.4 0 to 10 V DC

.5 0/4 to 20 mA

.3 For each LCP, the number of inputs/outputs during the project shall be limited to 48 physical points. At least 25% of free connection points, of each type of input/output points shall be added to each LCP.

.4 Expansion modules shall increase the I/O capacity of a controller. To maintain performance, the addition of inputs/outputs through the use of expansion modules shall be limited to 50% of the total theoretical capacity shown in the data sheets of the manufacturers.

.5 Each LCP controller shall have a permanently mounted local display keypad to view input/output point values and control outputs with manual override instructions to the operating software. The keypad with local display shall be installed in the same mechanical room, no more than 18 m from the controller. One keypad with local display shall serve multiple controllers, if the following conditions are met:

.1 The keypad with local display shall be installed in the same mechanical room as the controllers.

.2 The distance between the keypad with display and each controller shall be less than 18m.

.6 If this feature is unavailable, "in/out/auto" switches with potentiometer and manual override instructions to the operating software shall be installed on the analog outputs.

.7 The controller shall be equipped with a plug to connect a portable operator station.

.5 Terminal Control Panels "TCP" (Digital Application Controllers "DAC"):

.1 The automatic control system for specific applications shall govern the operation of the room control, such as air supply terminal units, fan coils or perimeter heating elements (including radiators and electric baseboard heaters).

.2 For each terminal unit

.3 For each PCT, the number of inputs/outputs used during the project will be limited to 12 physical points.

.4 Each application specific controller (ASC) dedicated to room control is connected through a secondary RS485 MS/TP communication subnet (Bacnet protocol) to a stand-alone UGR, PCM or PCL (Ethernet/IP) management controller providing bi-directional transparency of information throughout the building. This type of controller must be BTL B-ASC (BACnet Application Specific Controllers) certified.

.5 The automatic control system for specific applications shall control the operation of the room control, such as air supply terminal units, fan coil units or perimeter heating elements (including radiators, electric baseboard units and heating coils).

.6 For each terminal unit (such as air supply terminal units, fan coil units and baseboard heaters), a digital controller installed on the unit (or in the ceiling nearby in the case of baseboard heaters and radiators) shall provide independent control and flexibility in the installation and manage information based on environmental conditions.

.7 For each TCP, the number of inputs/outputs during the project shall be limited to 12 physical points.

.8 Each application specific controller (ASC) dedicated to room control shall be connected through a secondary RS485 MS/TP communication subnet (Bacnet protocol) to a stand-alone RMU, MCP or LCP (Ethernet/IP) management controller, providing bi-directional transparency of information throughout the building. This type of controller must be BTL B-ASC (BACnet Application Specific Controllers) certified.

.9 Each control unit shall be capable of operating independently of other components in the building automation system and shall be capable of controlling the terminal unit independently if there is a loss of communication or an upstream component on the communication network.

.10 It shall be possible for the user to change setpoints, minimum and maximum flow rates via the building automation system or a laptop computer.

.11 Application specific controllers shall be programmable. The use of programmable controllers only shall be prohibited.

.12 Controllers shall be capable of operating independently or in a network with a management controller (RMU or MCP, if applicable), providing full information transparency for application-specific TCP controllers.

.13 The TCP controller shall digitally control all components of the room, such as terminal air supply units, terminal reheat systems or perimeter heaters.

.14 Recommended Control Mode - Specific Application:

.1 Proportional output for flow control damper modulation

.2 Time proportional outputs for cyclic control of reheat coils and baseboard heaters

.3 Proportional 'float' mode control acceptable for radiator valves due to the inertia of this process

2.3 OPERATOR STATION SOFTWARE

.1 Control station software

.1 The software shall have the capability of handling at least 5,000 points in a dynamic, real-time, full-color graphic format with the following specifications.

.1 Value display

.2 Status display (auto, manual)

.3 Display of the physical address (dynamic display upon request)

.2 All command and graphic modifications shall be made while still connected to the system. (without interrupting the communication link)

.3 Upon completion of the work, provide all updates (controllers and software) to have the latest version.

.4 Full-colour graphic interface software specifications

.1 The software shall run under the latest Windows platform and provide full access to all control panel functions in both local and remote modes.

.2 The mouse shall be capable of communicating with one of the MCPs and dynamically displaying the schematics in interactive panoramas accessible through menus. All points (such as temperatures, humidity, controllers, alarms, status and commands) shall be displayed and modified. The keyboard shall only make changes to numerical values.

.3 French display: The display must be in French for any interventions by an "intermediate" level user.

.4 Graphical diagrams shall be added or modified through a simple to use menu driven generator program that provides the following functions:

.1 Draw rectangles, circles and lines

.2 Write, add and modify text with a choice of fonts and sizes

.3 Move and change the size of drawings

.4 Screen libraries and standard symbols

.5 Modify wallpapers

.5 Choice of content color

.6 Static formats of screen panoramas shall be directly editable and transformable while linked to the software. Otherwise, the contractor shall provide original software that can translate drawings into these formats without any alterations, for each computer station.

.7 Provide dynamic drawing generator software to add, modify or remove dynamic displays. The dynamic format shall provide the ability to move from one schematic to another without returning to the main menu. The final dynamic screen panorama support capacity required by the software, without modification, shall be at least 1000 (one thousand).

.8 Provide any software or add-ons to provide the functionality of the abovementioned management requirements (i.e. viewing periodic or trending statements/viewing and editing text).

.5 Software localization and licensing

.1 Each software installation shall contain the original computerized copy and instruction booklets and a computerized file containing all initial self-installation settings.

.2 A basic software version and a graphical software version shall be included, with their licences and user rights on different stations. Supply, installation, programming and configuration to local applications shall be part of this contract.

.3 Provide the necessary rights and configuration to manage, control and supervise functions in "dynamic graphics and control" mode to a minimum of two users simultaneously.

.4 The Contractor shall be responsible for the configuration and operation of the software system, maintaining existing software systems from other manufacturers on any workstation.

.6 Screenshots (graphics and informational)

.1 The Contractor shall create screen panoramas depicting the systems in place and displaying their features.

.2 Sample list of panoramas:

.1 Key plan showing the building and direct access to each floor

.2 Floor plans of affected floors showing location of control panels and direct access

.3 Floor plans shall show the location of each system and direct access.

.4 Floor plans of affected floors shall show actual and setpoint temperatures of each space.

.5 Floor plans of the affected floors shall show specific sensor locations and values:

.1 Outdoor sensors

.2 Relative humidity

.6 Complete schematics of each mechanical system

.7 Interactive access menus for stored data and results (trend)

.8 Data and results transfer commands

.9 Table of alarm points with dynamic access to the applicable system

.10 Table of points with control in MANUAL position

2.4 OPERATING SEQUENCE AND PROGRAMMING

.1 General

.1 The programming language for stand-alone digital controllers and application specific controllers shall be text or GUI-based.

.2 The text-based sequence shall describe the operation of the system as shown on the operating sequences. If the operating sequences differ from the proposed options, the sequences shall be approved by the representative of the Ministry.

.3 Standard operating sequences shall be submitted to the representative of the Ministry and demonstrated prior to approval.

.4 The operating sequences shall be shown graphically.

.5 The operating sequences shall be based on the following guidelines:

.1 During occupied periods:

.1 The operating schedule for each system shall be at least one hour before and after the occupied time and optimize the start time via programming when outside conditions are favourable.

.2 Interlock system between components and systems serving adjacent zones:

.1 Sequences shall be based on the thermostat readings from the same zone to limit the "hot-cold" effect between adjacent systems.

.2 Each operating sequence shall be "restrictive" when there is a need for the system to operate contrary to the needs of the zone it serves.

.3 Manual adjustments by the occupant: limit the temperature set point of the adjustable room sensors to between 22°C and 24°C through programming.

.2 During unoccupied periods:

.1 Temporary start of main systems if room sensors detect a temperature outside the following protection setpoints:

.1 Minimum 16°C in winter and maximum 28°C in summer

.2 Operate until setpoint conditions are restored to "unoccupied" mode

.3 Room controls

.1 Adjustable zone allocation: The Contractor shall verify and ensure during installation that all units within a zone are controlled by the zone sensor.

.2 Programmatically limit the set point range of adjustable room thermostats to between 22°C and 24°C.

2.5 CLUSTER CONTROL PANELS

.1 Digital controllers for the Energy Management and Control System (EMCS) shall be installed in suitable, locked, CEMA1 rated cluster control panels (metal cabinets).

.2 The installation and selection of components in the panels shall be in accordance with the representative of the Ministry.

2.6 SUMMARY LIST OF CONTROL POINTS

.1 The points shown on the drawings or otherwise specified shall be listed as control points which shall be interpreted and managed by the digital control system. Any other requirements listed in the technical specifications, technical drawings, control sequences or other contract documents shall be added by the Contractor, as if specified in these documents.

2.7 ACCESS LEVELS

.1 Upon the operator's request, the EMS shall be capable of providing the status of each "measurement point", "system" or group of points, for an entire "zone" or the entire network on a printer or monitor, at the discretion of the operator. The EMS shall also do the following:

.1 Represent analog values as numbers, marked with a negative sign (if applicable)

.2 Update the analog values and displayed status as new values become available

.3 Indicate points where alarms have been triggered by flashing, reverse video, different colours, bracketing, or other methods to make these points stand out from the others.

.4 Updates shall be driven by value changes at the device level (in the case of polling transmissions, the interval shall be no more than two seconds)

PART 3 EXECUTION

3.1 INSTALLATION

.1 The Energy Management and Control System shall be installed by the system supplier and not a subcontractor.

.2 Install systems and controls by qualified tradespeople licensed by the Province of Quebec.

.3 Perform the work in accordance with these drawings, specifications, all applicable standards and codes, and the laws and regulations of authorities with jurisdiction.

.4 Obtain and pay for all permits required by the authorities, obtaining Certificates of Acceptance from them and paying all related fees.

.5 Provide and install all necessary wiring and conduits to provide electrical power to control panels in rooftop units from the high voltage terminal block in the unit.

.6 Provide and install all required wiring and conduit between electrical equipment (such as sensors and motors) and control panels.

.7 Provide and install all wiring and conduit between digital controllers.

.8 Identify all equipment with black lettering on white phenolic plastic plates fastened with rivets.

.9 Identify all conduits that penetrate a wall, floor or ceiling with self-adhesive tape (every 1500 mm).

END OF SECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Section 25 05 01 "Automatic Control - General Work Output Requirements" is an integral part of this section.

.2 Provide all required sensors, instrumentation and control devices for the complete implementation of the energy management and control system.

1.2 SUBMITTALS

.1 Submit required data sheets and manufacturers' product specifications and documentation in accordance with the "Submittals" clause of Section 20 05 01.

PART 2 PRODUCTS

2.1 GENERAL

.1 The control equipment shall be in accordance with the specifications and requirements below:

.2 Unless otherwise specified, all equipment shall be from one manufacturer and shall be installed and maintained by the same manufacturer.

.3 For the protection of the control and regulation systems, a device shall be fitted to keep them off line during power outages.

.4 The contractor shall comply with the terms of these specifications by connecting to the sensors, transmitters and motors as shown on the drawings and specifications.

.5 These specifications include the minimum requirements for sensors, transmitters, motors, relays, and other services and materials that shall be supplied by the Contractor.

.6 All other controls and interface devices shall be supplied by the Contractor even if not specified in this section, but indicated or specified in other sections of these specifications or on the drawings.

2.2 TEMPERATURE SENSORS & TRANSMITTERS

.1 General

.1 Each Room Sensor (RS) shall be equipped with a setpoint adjustment and temperature sensor.

.2 The setpoint adjustment allows occupants to change the room temperature setpoint at their discretion. The setpoint can be locked out, bypassed or changed based on any schedule or any other conditions that may apply.

.2 Room temperature sensor (RTS)

.1 Type: 10 kΩ thermistor. (NTC)

.2 Sensitivity accuracy (RTD): + 0.2°C

.3 Display accuracy: 0.1°C

.4 Local temperature adjustment buttons with adjustable limit of +1°C of the setpoint

.5 Programmable "occupied/unoccupied" control buttons

.3 Outdoor temperature transmitter (OTT)

.1 Output: 4 to 20 mA

.2 Range: -40°C to 40°C

.3 Rod: minimum length of 200 mm

.4 Accuracy: ± 0.5°C (combined probe and transmitter maximum)

.5 Stability: ± 0.25°C/year (combined probe and transmitter maximum)

.6 Mounted in weatherproof case

.4 Return air temperature transmitter (RTT)

.1 Output: 4 to 20 mA

.2 Range: appropriate

.3 Accuracy: ± 0.5°C (combined probe and transmitter maximum)

.4 Stability: ± 0.25 °C/year (combined probe and transmitter maximum)

.5 Mounted in a box

2.3 DIGITAL ROOM HUMIDITY TRANSMITTER (RHT)

.1 Relative humidity transmitter for room installations

.2 Output signal from 4 to 20 mA, powered at 24 V.D.C.

.3 Accuracy of ± 2 % RH on a full scale reading (0 to 100% R.H.)

2.4 LOWEST LIMIT (LL)

.1 A low temperature electric thermostat (highly sensitive to the temperature of the contact point)

.2 Thermostats connected in series to activate the alarm and stop a fan

.3 One setpoint thermostat with automatic reset (with 6 metre capillary or bulb DPDT contact)

2.5 HIGH-LIMIT HUMIDISTAT (HLH)

.1 High limit relative humidity conduit with 15% to 95% setting

.2 Maintenance-free synthetic nylon fibre sensor unit

.3 SPDT contact (8A)

.4 Operating range of 0 to 100% R.H. with sealed box

2.6 CURRENT SENSOR (CS)

.1 Current sensor with 4 to 20 mA output signal

.2 Range: as per application

2.7 LIMIT SWITCH (LS)

.1 Switch to indicate open or closed flap position

.2 SPDT switch

2.8 ELECTRONIC DAMPER MOTORS (EDM)

.1 Motors shall be equipped with return springs that, in the event of a power outage, shall return dampers to the normally open or closed position for applications with dampers installed in outdoor air intakes, exhaust air outlets or excess air units.

.2 Motor torque shall be based on the maximum pressure or dynamic closing pressure, whichever is greater.

.3 Rotary motors shall have adjustable springs and strokes. Installation shall consist of direct coupling to the damper shaft without a lever arm or ball joint.

.4 Motor shall be equipped with electronic overload protection or a series of digital rotation sensors to prevent damage during rotation. Limit switches shall disable motor when the rotation is completed and no magnetic clutches shall be acceptable.

.5 Electronic actuators shall be directly coupled to the damper shaft. Actuators with drive flange shall be fitted with a V-button and V-toothed bracket mounted to the shaft to add strength and eliminate slippage. For dampers with a master shaft up to 1.05", the spring return actuator shall be fitted with a V-shaped drive flange large enough to couple the actuator to the shaft. Single bolt or set screw couplings shall not be acceptable.

.6 In the case of a power failure, the spring energy shall automatically return the damper to the fail-safe position. Only spring return actuators shall be acceptable.

.7 Proportional action actuators shall be capable of receiving a control signal of 0 to 10 VDC or 0 to 20 mA with an operating range of 2 to 10 VDC or 4 to 20 mA. Actuators that can receive a pulse width modulation signal and provide proportional operation of the damper shall be acceptable. The servo signal for the actuators must be 2 to 10 VDC.

.8 All 24V AC/DC actuators shall be operated with class 2 wiring and shall not require more than 10 VA AC or 8 watts DC. 120 VAC servo motors shall require no more than 10 VA. 230 VAC servo motors shall not require more than 11 VA.

.9 External manual overrides shall be fitted to all actuators to simplify installation and allow manual adjustments when the actuator is de-energized. Spring return actuators greater than 7 Nm (60 in. lbs.) shall be equipped with a manual override.

.10 Factory installed 3' power cables and conduits shall be fitted to all actuators to eliminate the need to open the enclosure during installation.

.11 All actuators shall be UL Standard 873 and Canadian Standards Association (CSA) Class 4813.02 certified and shall meet industry recognized safety standards.

.12 A minimum cycle of 60,000 full strokes at rated torque shall be applied to each actuator. All actuators shall have a two-year warranty from the date of installation. All actuators shall comply with applicable ISO standards.

.13 The number of required motors shall be the responsibility of the Automatic Control Contractor in accordance with the area and type of application.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install systems and appropriate controls in accordance with approved shop drawings and manufacturer's recommendations, by qualified tradespeople licensed by the Province of Quebec.

.2 Temperature & humidity sensor

.1 Sensors and transmitters shall be easily accessible and adaptable to each type of application to ensure that replacements, maintenance and repairs can be done quickly and easily without the need for special tools.

.2 Conduit transmitters shall be mounted in locations suitable for sensing air temperature only and shall not be located in areas where air is stagnant. When increased sensor area is a requirement for proper average temperature detection, the sensor shall be securely mounted within the conduit to provide the best average temperature reading. The units shall be thermally insulated from the mounting brackets to respond only to air temperature. The units shall be supported separately and shall not be fastened to coils, filters or other devices.

.3 Thermowells shall be fitted to piping at all elbows where the piping is smaller than the length of the well to ensure proper fluid flow over the entire well area. Wells shall not restrict the free fluid flow area to no less than 70% of the normal free area of the pipe.

.4 Remote transmitters and sensors shall be adequately secured to pipe supports or steel channel brackets. All wall mounted devices shall be mounted on plywood sheets securely fastened to the wall.

.5 Position temperature sensors, thermostats and transmitters 1,524 mm from finished floor in locations shown on drawings. If in doubt, consult with the Engineer before proceeding.

.6 Outdoor applications

.1 Protect collectors from sun and wind with corrosion resistant screens.

.2 Place collectors in NEMA 4 enclosures.

.3 Piping and conduit installation

.1 Piping or ductwork shall run parallel or perpendicular to the building lines and shall be adequately supported or fastened so as to result in a clean and presentable installation. Piping or ductwork shall be fastened directly to building surfaces with suitable fasteners or shall be suspended directly from the building structure, independent of any ductwork or other piping.

.2 Use 300mm flexible polyethylene connections to valves and motorized dampers.

.3 Whenever lines pass through concrete, the cables shall be installed in protective metal conduits. No piping shall run through exterior walls, fresh air ducts or other cold areas.

.4 Adequate size drain lines shall be fitted at all low points wherever necessary to eliminate condensation.

.5 Except where otherwise shown on the drawings, all piping or control lines in finished areas of the building shall be concealed from view.

.4 Ductwork systems

.1 Do not mount sensors in locations where airflow is not sufficiently strong in a duct.

.2 Do not mount in locations where vibrations or air flow velocity exceeds the tolerance limits of the sensors.

.3 Thermally isolate sensors from their mounts to measure air temperature only.

.4 Secure sensors to separate mounts from heating or cooling coils or filters.

END OF SECTION

PART 1 GENERAL

1.1 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 all specified equipment and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit for review single line electrical diagrams and locate as indicated.

.1 Electrical distribution system in main electrical room.

.2 Electrical power generation and distribution systems in power plant rooms.

.4 Shop drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in 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 2 number of copies of 600 x 600 mm minimum size drawings and product data to authority having jurisdiction.

.6 If changes are required, notify Consultant of these changes before they are made.

.5 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 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

.6 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.3 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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect all material and equipment 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.

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 in English and French.

.4 Use one [label for both languages.

2.2 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment is are not available, obtain special approval from authority having jurisdiction inspection authorities before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

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

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: plastic laminate lamicoid 3 mm thick plastic engraving sheet melamine, matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.

.2 Sizes as follows:

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

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Consultant prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate and label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered 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.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

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

2.8 FINISHES

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

.1 Paint outdoor electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light gray.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for equipment and 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 from Departmental Representative.

3.2 INSTALLATION

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

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

3.3 NAMEPLATES AND LABELS

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

3.4 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: 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 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: 1400 mm.

.2 Wall receptacles:

.1 General: 300 mm.

.2 Above top of continuous baseboard heater: 200 mm.

.3 Above top of counters or counter splash backs: 175 mm.

.4 In mechanical rooms: 1400 mm.

.3 Panelboards: as required by Code or as indicated.

.4 Telephone and interphone outlets: 300 mm.

.5 Wall mounted telephone and interphone outlets: 1500 mm.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.8 FIELD QUALITY CONTROL

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00 - 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 Systems: fire alarm communications.

.6 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 Départmental representative.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services:

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

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.9 SYSTEM STARTUP

.1 Instruct Departmental Representative Consultant 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.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 – Construction/demolition waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 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.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.2 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.

1.3 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 and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wire and box connectors from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

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 cablenon-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

PART 3 EXECUTION

3.1 EXAMINATION

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

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative and Consultant 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 00 - 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 Construction/demolition 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 PRODUCT DATA

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

PART 2 PRODUCT

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE RWU90 XLPE, Jacketted.

.3 Copper conductors: size as indicated, with thermoplastic insulation type TWU TWH rated at 600 V.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Cross-linked polyethylene XLPE.

.2 Rating: 1000 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: aluminum.

.6 Overall covering thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.

.7 Fastenings:

.1 One hole aluminum straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 1500 mm centers.

.3 Threaded rods: 6 mm diameter to support suspended channels.

.8 Connectors:

.1 Watertight, approved for TECK cable.

2.3 CONTROL CABLES

.1 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT, sized as indicated:

.1 Insulation: PVCTWH.

.2 Shielding: wire over each conductor.

.3 Overall covering: aluminum strip.

.2 Type: 600 V stranded annealed copper conductors; sizes as indicated:

.1 Insulation: PVC TWH.

.2 Shielding: non-magnetic tape wire over each pair of conductors.

.3 Overall covering: with sheath of aluminum.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

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

.2 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable exposed, securely supported by hangers.

3.5 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

3.6 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

END OF SECTION

PART 1 GENERAL

1.1 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.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Planhighlighting recycling and salvage requirements.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.3 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 and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect connectors and terminations 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.

PART 2 PRODUCTS

2.1 CONNECTORS AND TERMINATIONS

.1 cooper long barrel short barrel compression connectors to CSA C22.2 No.65 as required sized for conductors.

.2 If necessary, provisions to ensure the reliability of the contact in the case of copper conductors

.3 .Splicing connectors for lighting fixtures conform to CSA C22.2 No. 65, copper current-carrying elements, sized appropriate for copper conductors 10 AWG or less.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2No.41.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 - Construction/demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 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.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittal.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect grounding equipment from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse in accordance with Section 01 74 19 - Construction/demolition 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, tinned, size as indicated.

.3 Insulated grounding conductors: green, copper conductors, size [as indicated].

.4 Ground bus: 98% pure copper, size as indicated, complete with insulated supports, fastenings, connectors.

.5 Ground electrode box or grounding inspection pit 254 mm (10 ") diameter by 254 mm (10") deep.

PART 3 EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. [Where EMT is used, run ground wire in conduit.]

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, usingcopper welding by thermit process permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at [both] [one] end[s] to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Install a green insulated wire (caliber on the plans or according to the standards of the Electricity Code), in all the conduits.

.10 EMT conduits cannot be used for grounding.

.11 Install grounding transformers connected in zigzag, on supply side of main switch, as indicated.

3.3 MAINTENANCE HOLES

.1 Install conveniently located grounding stud, electrode, size [as indicated] stranded copper conductor in each maintenance hole.

.2 Install ground rod in each maintenance hole so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made. Confirm ground resistance meets or exceeds Canadian Electrical Code minimum requirements.

3.4 ELECTRODES

.1 Install rodelectrodes and make grounding connections as indicated.

.2 Bond separate, multiple electrodes together.

.3 Use size 2/0AWG copper conductors for connections to electrodes.

.4 Make special provision for installing electrodes that will give [acceptable] resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.5 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.

3.6 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room and communication equipment room.

.2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0AWG.

3.7 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, sound, fire alarm, security systems, intercommunication systems as follows:

.1 Telephones: make telephone grounding system in accordance with telephone company's requirements.

.2 Sound, fire alarm, security systems, intercommunication systems as indicated.

3.8 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.

3.9 GROUNDING NETWORK CONTINUITY TESTS

.1 Carry out continuity tests and measure the resistance of the grounding network. The results of the earth electrode resistance measurement should be a maximum of 25 ohms. Notify the Departmental representative if the values obtained exceed 25 ohms, add another ground connection and redo the measurement.

.2 The tests must be carried out by a specialized subcontractor and the grounding results must be obtained by one of the recognized methods, i.e. the three-point method ("Three-point method"), the voltage drop ("Fall-of-potential method") or by the ratio method ("Ratio method").

3.10 The results must be submitted to the Departmental Representative in the form of a test report in three copies, and the method of measurement must be described therein.

3.11 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 - Construction/demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 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 Province, Canada.

1.2 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

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

PART 2 PRODUCTS

2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 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.

2.3 CABINETS

.1 Construction: welded as indicated hinged door, handle, latch lock 2 keys and catch

.2 Type E Empty: as indicated.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1

3.3 IDENTIFICATION

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

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

END OF SECTION

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures.

1.2 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:

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

PART 2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1

.2 102 mm square or larger 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 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 EMT conduit, minimum size 102 x 54 x 48 mm.

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

2.3 CONCRETE BOXES

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

2.4 FLOOR BOXES

.1 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16-, 21- and 27-mm conduit. Minimum size: 73 mm deep.

2.5 CONDUIT BOXES

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

2.6 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 GENERAL

1.1 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.

1.2 WASTE MANAGEMENT AND DISPOSAL

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

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 PRODUCTS

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.

.1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

.3 Identify cables for exclusively dc applications.

.4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.3 Rigid pvc conduit: to CSA C22.2 No. 211.2

.4 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller.

.1 Two-hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18 manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.

.1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

.1 Polypropylene.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms in unfinished areas.

.3 Use rigid galvanized steel threaded conduit except where specified otherwise.

.4 Use electrical metallic tubing (EMT) [except in cast concrete.

.5 Use rigid pvc conduit underground.

.6 Use flexible metal conduit for connection to motors in dry areas] [connection to recessed incandescent fixtures without prewired outlet box connection to surface or recessed fluorescent fixtures work in movable metal partitions.

.7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.8 Use explosion proof flexible connection for connection to explosion proof motors.

.9 Install conduit sealing fittings in hazardous areas.

.1 Fill with compound.

.10 Minimum conduit size for lighting and power circuits: 19 mm.

.11 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.12 Mechanically bend steel conduit over 19 mm diameter.

.13 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.14 Install fish cord in empty conduits.

.15 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.16 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel.

.1 Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.

.1 Use cold mastic between sleeve and conduit.

.5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.

.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits 25 mm and larger below slab and encase in 75 mm concrete envelope.

.1 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 00 - 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 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit [two] copies of Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) in accordance with Section [01 33 00 - Submittal Procedures]. Indicate VOC content.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings: Submit drawings stamped and signed by professional engineer registered or licensed in Canada.

.3 Closeout Submittals:

.1 Submit maintenance data in accordance with Section 01 78 00 - Closeout Submittals.

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Test reports:

.1 Submit certified test reports indicating compliance with specifications for specified performance characteristics and physical properties.

.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.

.4 Manufacturer's Field Reports: manufacturer's field reports specified.

1.2 QUALITY ASSURANCE

.1 Health and Safety:

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

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/demolition Waste Management and Disposal.

1.4 DESCRIPTION OF WORK

.1 Provide a complete low voltage lighting control system designed to turn lighting on or off, all as shown on the plans and specified in these specifications.

.2 The work described in these specifications consists of the following works, but not limited to:

.1 The supply, installation and connection of all equipment shown on the plan to provide a complete system.

.2 The supply and complete installation of a new network of conduits and boxes for the connection of all the equipment of the low voltage lighting control system.

.3 Complete configuration and programming of the new low voltage control network and commissioning of the system.

.4 The complete inspection and verification of the new low voltage lighting control network by the system manufacturer in accordance with the codes and standards in force.

PART 2 PRODUCTS

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

2.2 APPARATUS

.1 Control system: made up of compatible elements supplied by a single manufacturer.

2.3 LIGHTING CONTROLLER (C1)

.1 DMX/RDM architectural lighting controller distributing a DMX and eDMX universe consisting of a fully configurable touch interface, as well as a separate module with 08 contact/dry inputs individually configurable as analog or digital signal inputs, inputs/ RS232/RS485 outputs, DIN rail mounting and POE power supply.

.2 Must meet ETL/cETL listed certifications. California Title 20/24.

.3 5 year warranty.

2.4 OPTO-ISOLATED CHANNEL DMX SPLITTER (C2)

.1 DMX/RDM opto-splitter with opto-isolation on 04 amplified DMX outputs and on the DMX/RDM through output as well. DIN rail mounting, must be able to be powered from 9Vdc to 30Vdc. It must also have activity status indicator lights.

.2 Must meet ETL/cETL listed certifications; California Title 20/24.

.3 3 years warranty.

2.5 CONTROL RELAY (C3)

.1 20A relay with one DMX/RDM input and two individually addressable 0/10V outputs.

2.6 CABINET FOR CONTROL COMPONENTS (C4)

.1 508mmx406mmx219mm NEMA 1 enclosure with door, including all mounting accessories for control equipment.

2.7 POWER AND CONTROL BOX (C5)

.1 Aluminum vertical control box acting as amplifier and splitter (6 outputs) of DMX/RDM signals.

2.8 POWER AND CONTROL BOX (C6)

.1 Aluminum control box acting as amplifier and splitter (6 outputs) of DMX/RDM signals. Silver polyester powder coating in electrostatic application.

.2 Must meet cUL, IP66, RoHS certifications.

.3 5 years warranty.

2.9 POWER AND CONTROL BOX (C7)

.1 Marine grade die-cast aluminum control box acting as amplifier and splitter of DMX/RDM signals and power supply to type L1, L3 and L4 fixtures using control wiring and power supply compatible with light fixtures.

.2 UL, CE, RCM Certifications.

.3 Dimensions: 145mmx260mmx95mm.

.4 Must meet cUL, IP66, RoHS certifications. 5 year warranty.

.5 Ambient operating temperature -40°F to 122°F (-40°C to 50°C).

2.10 TOUCH STATION (C8)

.1 4.3″ vivid color capacitive touch screen with customizable user interface and compatible with lighting controller.

.2 Power: PoE (IEEE802.3af, Class 2) 4W typical

.3 Dimensions: 86mmx146mm.

.4 Include back box for wall mounting.

.5 5 year warranty.

2.11 SWITCH POE (C9)

.1 Unmanaged switch with 8 10/100 Mbps ports that requires no configuration and provides 4 PoE (Power over Ethernet) ports. It can automatically detect and supply power to all IEEE 802.3af compliant powered devices (PDs).

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 datasheet.

3.2 INSTALLATION

.1 Locate and install equipment in accordance with manufacturer's recommendations and as indicated.

3.3 FIELD QUALITY CONTROL

.1 Site Tests:

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

.2 Actuate control units in presence of Departmental Representative to demonstrate lighting circuits are controlled as designated.

.3 Manufacturer's Field Services:

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

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

.4 Verification requirements in accordance with Section 01 33 29 - Sustainable Design Reporting, include:

.1 Materials and resources.

.2 Storage and collection of recyclables.

.3 Construction waste management.

.4 Resource reuse.

.5 Recycled content.

.6 Local/regional materials.

.7 Low-emitting materials.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 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 transformers and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Factory Test Submittals:submit standard factory test certificates of each transformer and type test of each transformer in accordance with CSA C9.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for [dry type transformers] for incorporation into manual.

.3 Operation and maintenance instructions to include:

.1 Tap changing.

.2 Recommended environmental conditions.

.3 Recommended periodic inspection and maintenance.

.4 Bushing replacement.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect transformers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Construction/demolition Waste Management and Disposal.

1.4 EXTRA MATERIALS

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

PART 2 PRODUCTS

2.1 MATERIALS

.1 Dry-type transformers acording to CSA C9-17,

.2 Minimum efficiency values for dry-type transformers, according to CAN/CSA-C802.2-F18 standard,

.3 Air-cooled transformers (dry type), according to CAN/CSA-C22.2 number 47-(R2018).

2.2 TRANSFORMER CHARACTERISTICS

.1 Type: ANN.

.2 Three phase, power as indicated.

.3 Taps: four (4) 2.5% taps including two (2) FCAN, two (2) FCBN.

.4 Insulation: 220°C insulation class able to withstand a temperature rise of 150°C.

.5 Impulse withstand voltage: 10 kV B.I.L.

.6 Dielectric strength: Dielectric insulation capable of withstanding a voltage of 1.2 kV.

.7 Average sound level: acording to CSA C9.

.8 Impedance at 17 degrees Celsius: between 4 to 6.5% or as indicated.

.9 Enclosure: vented NEMA 1 type or as indicated with removable metal front panel.

.10 Installation: as indicated.

.11 Finish: in accordance with section 26 05 00 - Electricity - General requirements concerning the results of the work.

.12 Copper windings.

.13 The windings must have the configuration noted on the drawings.

.14 Harmonic reducing phase shifters to be as shown on drawings.

.15 KL series transformers to be as shown on drawings.

.16 Voltage regulation to be 4% or better.

.17 No-load or full-load losses shall not exceed those prescribed by CAN/CSA-C802.2.

2.3 EQUIPMENT IDENTIFICATION

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

.2 Equipment labels: nameplate size 7.

PART 3 EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION

.1 Install as indicated power dry transformers up to 75 kVA.

.2 Leave sufficient free space around transformers to allow air circulation.

.3 Install level transformers upright.

.4 Remove the protective supports used during transport only after the installation of the transformer, but just before its commissioning.

.5 Loosen the bolts of the anti-vibration mounts until the latter no longer show any signs of compression.

.6 Make primary and secondary connections as indicated on the wiring diagram.

.7 If possible, energize transformers immediately after installation is complete.

.8 Locate conduit entry in lower third of transformer enclosure.

3.3 TESTS OF TRANSFORMERS

.1 Perform tests before energizing:

- .1 High voltage megger to ground (infinite);
- .2 Low voltage megger to ground (infinite);
- .3 Megger high voltage to low voltage (infinite);
- .4 High voltage high voltage megger (continuity);
- .5 Low voltage low voltage megger (continuity).
- .6 At the end of the work, check the voltage level and change the adjustment taps if required on the transformers.
- .7 Submit signed and dated report of test results to Departmental Representative.

3.4 FIELD QUALITY CONTROL

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

.2 Energize transformers and apply incremental loads:

.1 0% for 4 hours.

.2 10% for next 1 hour.

.3 25% for next 2 hours.

.4 50% for next 3 hours.

.5 Full load.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 - Construction/demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by transformers installation.

END OF SECTION

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province, Canada.

.2 Include on drawings:

.1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

.4 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in 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 and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect panelboards 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.

PART 2 PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand

.2 120/208V panelboards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity or as indicated.

.3 347/600V panelboards: bus and breakers rated for 25 kA (symmetrical) interrupting capacity or as indicated.

.4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.6 Minimum of 2 flush locks for each panel board.

.7 Two keys for each panelboard and key panelboards alike.

.8 Copper bus with neutral of same ampere rating of mains.

.9 Mains: suitable for bolt-on breakers.

.10 Trim with concealed front bolts and hinges.

.11 Trim and door finish: as per colour schedule.

.12 Isolated ground bus.

.13 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Departmental Representative.

.5 Lock-on devices for receptacles, fire alarm clock outlet, emergency, door supervisory, intercom, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

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

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

.5 Circuits supplying Patient Care Areas must be entered in circuit directory with Bold Font.

PART 3 EXECUTION

3.1 EXAMINATION

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

.1 Inform Departmental Representative and Consultant of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

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

.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

.6 Where panels of different systems (i.e. Standard and Vital Power) supply a common patient care area, ground busses in panels to be interconnect with a minimum #6 AWG ground conductor.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 - Construction/demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

PART 1 GENERAL

1.1 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 wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province, Canada.

.4 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Planhighlighting recycling and salvage requirements.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in 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 and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wiring devices 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.

PART 2 PRODUCTS

2.1 SWITCHES

.1 15A, 120 V, single pole switches to: CSA C22.2 No.55 and CSA C22.2 No.111.

.2 Manually-operated general purpose AC switches with following features:

.1 Terminal holes approved for No. 10 AWG wire.

.2 Silver alloy contacts.

.3 Urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.5 Ivory toggle.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads and or heating loads.

.4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptaclesCSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42with following features:

.1 Ivoryurea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.2 Other receptacles with ampacity and voltage as indicated.

.3 Receptacles of one manufacturer throughout project.

2.3 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height [in accordance with Section as indicated.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height as indicated].

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.4 Install GFI type receptacles [as indicated].

.3 Cover plates:

.1 Install suitable common cover plates where wiring devices are grouped.

.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 - Construction/demolition Waste Management and Disposal

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide fuse performance data characteristics for each fuse type. Performance data to include: average melting time-current characteristics.

.3 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, Canada.

1.2 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 recycling in accordance with Section 01 74 19 - Construction/demolition Waste Management and Disposal.

1.3 EXTRA MATERIALS

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

.2 Three spare fuses of each type and size installed above 600 A.

.3 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 ULClass 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

.5 Install spare fuses in fuse storage cabinet.

END OF SECTION

PART 1 GENERAL

1.1 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 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 Consultant 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 Consultant. Unless complying with this requirement, Consultant 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:

.5 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.2 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 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.

.4 Develop Construction Waste Management Plan related to Work of this Section.

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers and ground-fault circuit-interrupters and accessory high-fault protectors: 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 degrees 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 10kA symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.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.

2.3 MAGNETIC BREAKERS (DESIGN B)

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 CURRENT LIMITING AND SERIES RATED THERMAL MAGNETIC BREAKERS (DESIGN C)

.1 Thermal magnetic breakers with current limiters.

.1 Time current limiting characteristics of fuses limiters coordinated with time current tripping characteristics of circuit breaker.

.2 Co-ordination to result in interruption by breaker of fault-level currents up to interrupting capacity of breaker.

.2 Series rated breakers to be manufacturer tested and listed. Breakers to be applied following manufacturer's guidelines and accepted best practice.

.1 Breakers applied following manufacturer's guidelines and accepted best practice.

2.5 OPTIONAL FEATURES

.1 Include:

.1 Shunt trip.

.2 Auxiliary switch.

.3 Motor-operated mechanism [c/w time delay unit].

.4 Under-voltage release.

.5 On-off locking device.

.6 Handle mechanism.

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 Inform Departmental Representative unacceptable conditions immediately upon discovery.

.2 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 as indicated.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 - Construction/demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 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 disconnect switches - fused and non-fused and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.2 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 and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect disconnect switches - fused and non-fused 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.

PART 2 PRODUCT

2.1 DISCONNECT SWITCHES

.1 Fusible, non-fusible, disconnect switch in CSA enclosure, NEMA 3R type for outdoor installation or wet location.

.2 Provision for padlocking in on-off switch position by 3 locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position. Plastic handle operation are prohibited.

.4 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.

.5 Fuse holders: CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

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

.2 Indicate name of load controlled on size 4 nameplate.

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 disconnect switches - fused and non-fused installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative and Consultant 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 disconnect switches complete with fuses if applicable.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 - Construction/demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for contactors and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Planhighlighting recycling and salvage requirements.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for contactors for incorporation into manual.

.3 Include operating information required for start-up, synchronizing and shut-down of generating units.

1.3 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 and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect contactors 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.

PART 2 PRODUCTS

2.1 CONTACTORS

.1 Contactors: to CSA C22.2 No.14.

.2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.

.3 Breaker combination contactor as indicated.

.4 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.

.5 Mount in NEMA Enclosure unless otherwise indicated.

.6 Include following options in cover:

.1 [Hand-Off-Auto] selector switch.

2.2 EQUIPMENT IDENTIFICATION

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

.2 Size 4 nameplate indicating as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install contactors and connect power wires and auxiliary control devices.

.2 Identify contactors with nameplates or labels indicating panel and circuit number.

.3 Test contactors in accordance with 26 05 00 - Common Work Results for Electrical.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 - Construction/demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by contactor installation.

END OF SECTION

PART 1 GENERAL

1.1 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 Shop Drawings:

.1 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 [Province] [Territory], Canada.

.2 Provide shop drawings for each type of starter to indicate:

1.2 CLOSEOUT SUBMITTALS

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

.2 Submit operation and maintenance data for each type and style of motorstarter for incorporation into maintenance manual.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse] in accordance with Section 01 74 19 - Construction/demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Starters: to IEC 947-4 with AC4 utilization category

2.2 MANUAL MOTOR STARTERS

.1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:

.1 Switching mechanism, quick make and break.

.2 One overload heater, manual reset, trip indicating handle.

.2 Accessories:

.1 switch labelled as indicated.

.2 Indicating light: standard type and color as indicated.

.3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 [Magnetic] [and] [combination magnetic starters] of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Motor overload protective device in each phase, manually reset from outside enclosure.

.3 Wiring and schematic diagram inside starter enclosure in visible location.

.4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include fused disconnect switch with operating lever on outside of enclosure to control and provision for:

.1 Locking in "OFF" position with up to 3 padlocks.

.2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:

.1 Standard indicator lights, type and color as indicated.

.2 .Unless otherwise indicated, two (2) normally open contacts and two (2) reserve auxiliary contacts, normally closed.

.3 Manual-Stop-Automatic selector;

.4 Heavy-duty LED pilot lights, Green-On color or as indicated;

.5 Start push button;

.6 Unless otherwise indicated, four spare auxiliary contacts; two open at rest and two closed at rest;

.7 All accessories and relays as indicated.

2.4 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

2.5 ACCESSORIES

.1 Pushbutton: heavy duty, oil tight as required.

.2 Selector switches: heavy duty, oil tight as required.

.3 Indicating lights: heavy duty, oil tight, type and color as indicated.

2.6 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.7 EQUIPMENT IDENTIFICATION

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

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

.3 Magnetic starter designation label, white plate, black letters, size 4 engraved as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install starters and control devices in accordance with manufacturer's instructions.

.2 Install and wire, starters and controls as indicated.

.3 Ensure correct fuses installed.

.4 Confirm motor nameplate and adjust overload device to suit.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and manufacturer's instructions.

.2 Operate switches and contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

3.3 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/demolitionWaste Management and Disposal.

END OF SECTION

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data: include information as follows:

- .1 Catalogue information.
- .2 Shipping weight.
- .3 Schematic diagram showing interconnection of rectifier, inverter, battery, bypass switch, meters, controls and indicating lamps.
- .4 Description of system operation, referenced to schematic diagram, for:
  - .1 Manual control during initial start-up and load transfer to bypass and back to inverter output.
  - .2 Inverter.
  - .3 Bypass.
- .5 Estimate with supporting data for Mean Time to Repair factor (MTTR).
- .6 Full load kVA output at 1% lagging power factor.
- .7 Efficiency of system at 25%, 50%, 75% and 100% rated load.
- .8 Type of ventilation: natural or forced.
- .9 Battery:
  - .1 Number of batteries.
  - .2 Maximum and minimum voltages.
  - .3 Type of battery.
  - .4 Catalogue data with battery trade name and type.
  - .5 Size and weight of each battery.
  - .6 Battery charge and discharge curves of voltage, current, time and capacity.
  - .7 Derating factor for specified temperature range.
  - .8 Nominal ampere hour capacity of each battery.
  - .9 Maximum short circuit current.
  - .10 Maximum charging current expected for fully discharged condition.
  - .11 Recommended low voltage limit for fully discharged condition.
  - .12 Expected life.
- .10 Inverter:
  - .1 Type and catalogue number.
  - .2 DC current at minimum battery voltage to produce full load AC output.

.11 Rectifier:

.1 Type and capacity, with catalogue number.

.2 Battery charging sequence.

.3 Current-time data for Silicon Controlled Rectifier (SCR) protective devices.

.4 Guaranteed noise level.

.5 Estimated life.

.6 Metering.

.7 Alarms.

.12 Manufacturer's field experience with UPS of similar ratings including engineering expertise, manufacturing facilities and listing of UPS units manufactured and installed during last 5 years including model, customer, location and installation dates.

.13 Evaluation of Canadian content.

.14 Heat losses at no load, 25%, 50%, 75% and 100% of rated output, in kW.

.15 Cooling air required in m^3/s.

.16 List of recommended spare parts, tools and instruments with catalogue numbers and current prices.

.17 Typical operation and maintenance manual.

.18 Description of factory test facilities.

.19 Manufacturer's maintenance capabilities including:

.1 Willingness to undertake maintenance contract.

.2 Number of trained personnel available.

.3 Location of trained personnel and repair facilities.

.20 Manufacturer's written installation recommendations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Canada.

.2 Include outline schematics showing arrangement of cubicles, meters, controls, recommended aisle spaces, battery rack, battery arrangement and dimensions.

1.2 PROTECTION OF SYSTEMS

.1 Circuit breakers in system used to isolate it from load and from mains for safe working on equipment, and for manual blocking of bypass automatic control to prevent inadvertent operation of bypass during Work on inverter.

.2 Automatic circuit breakers and protection included in:

.1 AC input to rectifier.

.2 Battery input.

.3 Bypass circuit input.

.4 Inverter output.

.3 Surge suppressors:

.1 To protect system against supply voltage switching transients.

.2 To protect internal circuits where necessary against voltage transients.

.4 Current limiting devices, with panel front indication of device operation, to protect inverter SCR's.

.5 Suitable devices, with panel front indication of device operation, to protect rectifier diodes.

.6 Failure of circuit or component not to cause equipment to operate in dangerous or uncontrolled mode.

1.3 QUALITY ASSURANCE

.1 Submit for approval records, indicating and recording instruments calibration certificates, including meters installed as part of system, in accordance with Section 01 33 00 - Submittal Procedures. The manufacturer must be ISO 9001:2015 certified.

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 uninterruptible power systems static (UPS) for incorporation into manual.

.3 Submit interim, draft final, and final Operation and Maintenance (OM) Manual. Final manual approved by Departmental Representative. Submit interim copies before notification of factory test date.

.4 Operation and Maintenance Manual to include:

.1 Operation and maintenance instructions concerning design elements, construction features, component functions and maintenance requirements to permit effective operations maintenance and repair.

.2 Technical data:

.1 Approved shop drawings.

.2 Characteristic curves for automatic circuit breakers and protective devices.

.3 Project data.

.4 Technical description of components.

.5 Parts lists with names and addresses of suppliers.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements: Crating:

- .1 Adequately enclosed and protected from weather and shipping damage by use of minimum 12 mm plywood with vapour barrier inside.
- .2 For rail or sea shipment use double layer of vapour barrier and 19 mm plywood covering.
- .3 Subassemblies may be packed separately.
- .4 Label crates:
  - .1 Shipping address.
  - .2 Weight and dimensions.
  - .3 Serial number of unit and brief description of contents.
  - .4 Stencilled with durable paint on at least two sides of each crate.
- .5 List of contents:
  - .1 In weatherproof envelope stapled on outside of each crate.
  - .2 Copy placed inside each crate.
- .6 Store materials off ground and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.6 WARRANTY

.1 For the Work of this Section [26 33 53 - Uninterruptible Power Systems Static], 12 months warranty period is extended to [24] [60] months.

.2 Contractor hereby warrants battery against defects in material and workmanship in accordance with GC 24, but for [20] years. This warranty is for 100% replacement for first year and prorated in equal yearly decreasing increments for remaining [19] years until expiration of warranty at end of [20] years from date of Certificate of Substantial Performance.

.3 The UPS manufacturer shall warrant the UPS against defects in materials and workmanship for one (1) year. The manufacturer’s standard warranty shall cover labor and all parts, including the battery.

PART 2 PRODUCTS

2.1 STANDARDS

.1 The UPS shall be designed in accordance with applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

.1 Listed to UL Standard 1778, 5th Edition; CSA 22.2 No. 107.3 and shall be cULus labeled

.2 ANSI C62.41, Category B, Level 3

.3 IEC 62040-1+ A1:2013

.4 IEC 62040-3

.5 FCC Part 15, Class A

.6 ISTA Procedure 1A/1E/3B

.7 RoHS2 (6 by 6) Compliant

.8 REACH and WEEE Compliant

.9 Energy Star program requirements for Uninterruptible Power Supplies (UPSs) – eligibilitycriteria, version 2.0.

2.2 SYSTEM DESCRIPTION

.1 Modes of Operation: The UPS shall be designed to operate as a true on-line double conversion system in the following modes:

.1 Normal - In normal operation, incoming AC power shall be fed to the input power factor-corrected (PFC) rectifier that converts the AC power to DC power for the inverter. In this mode, power shall also be derived from utility power for the battery charger. The inverter shall derive DC power from the PFC rectifier to regenerate filtered and regulated AC sinewave power for the connected load. The unit shall begin charging the battery once the UPS is connected to utility power, regardless of whether the UPS is On or Off. In the event of a utility outage or severe abnormality (sag or swell), the inverter shall support the connected load from battery power until the battery is discharged or until the utility power returns, whichever occurs first.

.2 Battery - Upon failure of utility / mains AC power, the critical AC load shall be supplied by the inverter, which obtains power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the utility / mains AC source.

.3 Recharge - Upon restoration of utility / mains AC power, after a utility / mains AC power outage, the input converter shall automatically restart and resume supplying power to the inverter and the battery charger to recharge the battery.

.4 Automatic Restart - Upon restoration of utility / mains AC power, after a utility / mains AC power outage and complete battery discharge, the UPS shall automatically restart and resume supplying power to the critical load and the battery charger automatically recharges the battery. This feature shall be capable of being disabled by the user.

.5 Bypass - The integral bypass shall perform an automatic transfer of the critical AC load from the inverter to the bypass source in the event of an overload, PFC failure, internal overtemperature, DC bus overvoltage or inverter failure.

.6 ECO - The UPS shall allow the user to enable and place the UPS in Eco mode of operation to reduce electrical consumption. Eco mode operation shall be an active type, wherein the UPS will power the connected equipment through the bypass path and the UPS inverter shall be On and operating at no load to stay synchronized to the bypass to ensure rapid and uninterrupted transfers to inverter power when input power falls outside of the user-customizable parameters. The UPS shall also have a user-customizable requalification time that input power must remain within the Eco mode parameters before transferring back to Eco mode operation. This is to minimize the number of transfers between bypass and inverter.

2.3 DESIGN REQUIREMENTS

.1 Voltage - Input/output voltage specifications of the UPS shall be:

.2 Input

.1 208V unit: 0 - 280VAC, 50/60Hz, three-phase, 4-wire-plus-ground.

.2 220V unit: 0 - 280VAC, 50/60Hz, three-phase, 4-wire-plus-ground.

.3 Output

.1 208V units: 208VAC (user configurable: 208V, 220V) ±2%, 50/60Hz, three-phase, 4 wire plus-ground.

.2 220V units: 220VAC (user configurable: 208V, 220V) ±2%, 50/60Hz, three-phase, 4 wire plus ground.

.3 Output Load Capacity - Specified output load capacity of the UPS shall be rated at 30 kVA/30 kW at 1.0 (unity) power factor.

.4 Internal Battery - The UPS shall utilize valve-regulated, non-spillable, lead acid cells with a design life of 6-8 years.

.5 Reserve Time - The UPS enclosure shall be capable of housing up to 2 battery strings and have a matching battery cabinet that shall house 2 battery strings. The battery run time shall be based upon full rated resistive load with an ambient temperature of 77°F (25°C). The battery run times shall be 18 minutes full load and 3 hours for a 4750W load.

.6 Battery Recharge - The UPS shall contain a temperature compensated, three-stage battery charger designed to prolong battery life. Default recharge time for UPS units with 1 string shall be 6 hours to 90% capacity after a complete discharge with full load connected.

.2 Performance Requirements

.1 AC Input to UPS

.1 Voltage Configuration - The UPS shall require three-phase, four-wire plus ground input wiring. The input voltage range without drawing power from the batteries shall be 166 VAC – 256VAC for 100% to 0% load levels

.2 Frequency – The UPS shall auto-sense input frequency when first powered up and shall operate within the following frequency specifications. The UPS shall be capable of cold start with default frequency of 60Hz. Once started the input frequency operating window shall be 40-70Hz.

.3 Input Power Factor - >0.99 lagging at rated load.

.4 Input Current reflected distortion - 3% THDi typical.

.5 Input Current Ratings – maximum input current shall be 105A at 208V nominal input

.6 Inrush Current (initial startup, no load) - The UPS shall have a maximum inrush current of six times the full load peak input current.

.7 Input Line Transient Immunity – The UPS shall conform to an input line transient conforming to IEEE C62.41, Category A, Level 3 tests for 208VAC models.

.8 Surge Protection - MOV ratings shall be 385V, 80 Joules minimum connected L1-L2-L3, L1-G, L2-G and L3-G.

.9 Dual Input - The UPS shall be capable of conversion from a single-input design to a dual-input design to provide separate feeds for the rectifier and bypass circuits. Conversion shall be designed to take 5 minutes or less by the installing contractor; use of manufacturer's service personnel shall not be required.

.2 AC Output, UPS Inverter

.1 Voltage Configuration

1. 208V units: 208VAC, 50/60Hz, three-phase, four-wire-plus-ground

2. 220V units: 220VAC, 50/60Hz, three-phase, four -wire-plus-ground

.2 Voltage Regulation - ± 1% steady state for balanced loading; ± 4% for 100% unbalanced loading.

.3 Frequency Regulation - ±5% synchronized to utility / mains. ±0.25Hz free running or on-battery operation.

.4 Frequency Slew Rate - 0.5Hz per second default; user selectable for 0.2, 0.5 or 1.0Hz per second

.5 Voltage Distortion - 2% total harmonic distortion (THD) typical into a 100% linear load; 5% THD typical into a 100% non-linear load with crest factor ratio of 3:1.

.6 Load Power Factor Range - The load power factor range shall be 0.5 lagging to 0.80 leading.

.7 Output Power Rating – 30kVA/30kW at unity (1.0) power factor

.8 Inverter Overload Capability

1. Inverter overload capability while operating on utility/mains power shall be 0%-105% continuous, 105%-125% for 10 min, 125%-150% for 5 min, 150%-200% for 5 secs, 200% or greater for 200ms.

.9 Voltage Transient Response

1. ±5% in line mode 0-100-0 % loading of the UPS rating

2. ±5% in battery mode for 0-100-0% loading of the UPS rating

.10 Transient Recovery Time - To nominal voltage within 60 milliseconds.

.11 AC-AC Efficiency: The UPS model AC-AC efficiency shall be up to 93.2% AC –AC in double- conversion mode; 99% AC-AC at full rated load in ECO mode.

.12 Parallel Operation - Parallel operation shall provide the ability of the UPS system to increase system capacity or redundancy or both. Paralleled units shall power the connected equipment in all modes of operation and have current sharing to maintain <5% difference maximum.

.3 AC-AC Efficiency: The UPS model AC-AC efficiency shall be up to 93.2% AC – AC in double- conversion mode; 99% AC-AC at full rated load in ECO mode

.4 Parallel Operation - Parallel operation shall provide the ability of the UPS system to increase system capacity or redundancy or both. Paralleled units shall power the connected equipment in all modes of operation and have current sharing to maintain <5% difference maximum.System operates on mains power when mains voltage is within +/-[10] % of nominal value and mains frequency is between 59.5 and 60.5 Hz.

.3 Environmental Conditions

.1 Ambient Temperature

.1 Operating: 32°F to 104°F (0°C to 40°C). For optimum battery performance and battery life operating temperature shall be 68°F to 77°F (20°C to 25°C).

.2 Storage: 5°F to 131°F (-25°C to 55°C).

.2 Relative Humidity

.1 Operating: 0 to 95% non-condensing.

.2 Storage:0 to 95% non-condensing.

.3 Altitude: Sea level to 4,920 ft. (1,500m) maximum without power derating when operated within the temperature specified in Section 1.4, Item 1 . For altitudes above 4,920 ft up to 10,000 ft (1,500m up to 3,000m) power derating of 1% of both kVA/kW rating is required for every 328 ft (100m). Ambient temperature shall be derated 9°F (5°C) for each additional 1600 ft. (500m) above 10,000 ft. (3,000m).

.4 Audible Noise: <60dBA maximum measured at 1 meter from front, sides, and rear

.5 Electrostatic Discharge: The UPS shall be able to withstand an electrostatic discharge compliant to ENC61000-4-2.

2.4 WIRING

.1 Wiring practices, materials and coding shall be in accordance with the requirements the standards listed in Section 1.2 and other applicable codes and standards. All wiring shall be copper.

2.5 CABINET UPS

.1 The UPS unit shall be composed of: input rectifier/PFC converter, IGBT inverter, battery charger, sealed valve-regulated lead acid battery, input filter, internal static bypass circuit, optional integral output distribution port, and electrically isolated maintenance bypass breaker; shall be housed in a tower NEMA Type 1 enclosure and shall meet the requirements of IP20. The UPS cabinet shall be cleaned, primed and painted the manufacturer’s standard color (RAL 7021 Gray- Black).

.2 The UPS unit shall have 2 battery strings

.3 Front access only, or both front and rear.

.4 Dimensions: 600mmx850mmx1600mm (Width x Depth x Height) maximum.

.5 Cabinet weight: 1,650 lbs (748.4 kg).

2.6 COOLING

.1 The UPS shall be forced-air cooled by internally mounted, continuously operating fans. Fan power shall be provided from the internal DC supply. Air intake shall be through the front of the unit and exhaust shall be out the rear of the unit.

2.7 INPUT CONVERTER (RECTIFIER)

.1 Incoming AC power shall be converted to a regulated DC output by the input converter supplying DC power to the inverter. The input converter shall provide input power factor-correction (PFC) and input current distortion reduction.

.2 The input converter shall be provided with AC input current limiting whereby the maximum input current is limited to 125% of the full load input current rating.

.3 The UPS shall have built-in protection against undervoltage, overcurrent and overvoltage conditions including low-energy lightning surges introduced on the primary AC source. The UPS models shall be able to sustain input surges without damage per criteria listed in ANSI C62.41, Category A, Level 3.

.4 The UPS shall contain a three-stage battery charger designed to prolong battery life and shall incorporate temperature compensation as standard. Recharge time for the internal UPS batteries shall be 6 hours to 90% capacity (full load discharge rate). There shall be DC overvoltage protection so that if the DC voltage exceeds the pre-set limit, the UPS will shut down automatically and the critical load will be transferred to bypass.

2.8 INVERTER

.1 The UPS inverter shall be a pulse-width-modulated (PWM) design capable of providing the specified AC output. The inverter shall convert DC power from the input converter output or the battery into precise sinewave AC power for supporting the critical AC load.

.2 The inverter shall be capable of supplying current and voltage for overloads exceeding 100% and up to 150% of full load current. A visual indicator and audible alarm shall indicate overload operation. For greater currents or longer duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective devices

.3 The inverter shall be protected by the following DC shutdown levels:

.1 DC Overvoltage Shutdown

.2 DC Undervoltage Shutdown (End of Discharge)

.3 DC Undervoltage Warning (Low Battery Reserve); factory default set at 5 minutes (user- configurable 3 to 30 minutes).

.4 An oscillator shall control the output frequency of the UPS. The inverter shall maintain the output frequency to ±0.25Hz of nominal frequency during Battery mode, Frequency Converter mode or when otherwise not synchronized to the utility/mains source.

.5 The UPS inverter shall employ electronic current limiting circuitry.

.6 To prevent battery damage from over discharging, the UPS control logic shall automatically raise the battery shutdown voltage setpoint; depending on output load and connected battery system at the onset of battery operation.

2.9 DISPLAY AND CONTROLS

.1 The UPS shall be provided with a microprocessor-based unit status display and controls section designed for convenient and reliable user operation. The monitoring functions such as voltages, currents, UPS status and alarm indicators shall be displayed on a liquid crystal display (LCD). The LCD shall present text in any of thirteen (13) languages (English, French, Portu guese, Spanish, Chinese, Czech, Dutch, German, Italian, Polish, Russian, Swedish, and Turkish) for user selection.

.2 The UPS display shall also include two LED-based system indicators. The system level indicators shall be: fault indicator and UPS operating status

.3 UPS startup and shutdown operations shall be accomplished by using push buttons on the front panel of the UPS. The display shall be menu driven and shall use four control buttons for ease of navigation and selection of the configurable parameters.

.1 Control Buttons - The UPS display control button functionality shall be:

.1 ESC button: This button shall return to the previous menu or abort any change before confirming the change.

.2 UP arrow button: This button shall move the cursor up or increase the value displayed when changing parameters. This button shall also be used to scroll up for navigating the screens.

.3 DOWN arrow button: This button shall move the cursor down or decrease the value displayed when changing parameters. This button shall also be used to scroll down for navigating the screens.

.4 ENTER button: This button shall enter the next level menu or confirm the parameter changes

.2 System Status (Default screen) - The system status screen shall be the default screen to display a mimic diagram and shall include the input voltage and frequency; bypass voltage and frequency; output voltage, frequency, and load percentage; battery charge state, voltage, capacity and estimated battery time remaining. To prolong display life, the UPS display shall go into “sleep” mode after two minutes of no user interaction. Pressing any of the four functional buttons shall wake up the display and this action shall not perform any operation.

.3 Main Menu - The main menu shall list the submenu selections:

.1 UPS Status Screens

.2 Configuration Settings Screens

.3 Control Settings Screens

.4 Event Log Screens

.5 About Screens

.6 Maintenance Screens

.4 UPS Status - The UPS status screens shall provide the following information:

.1 Input

1. Voltage
2. Frequency
3. Amperage
4. Power Factor

.2 Bypass

1. Voltage
2. Frequency
3. Battery
4. Charge Status
5. Capacity
6. Runtime (minutes)
7. Voltage
8. Current
9. Temperature

.3 Output

.1 Voltage

.2 Frequency

.3 Amperage

.4 Load

.1 Capacity Percentage

.2 Wattage

.3 Volt-Amperes

.4 Power Factor

.5 Crest Factor

.5 Configuration Settings - The UPS Configuration settings screens shall provide the following customizable parameters (default values are listed first):

.1 Monitor

1. Language (English, Chinese, French, Portuguese, Spanish)
2. Date (Year/Month/Day)
3. Time (Hour/Minutes/Seconds)
4. Audible Alarm (Enable, Disable)
5. Serial Port 1 Baud Rate
6. Serial Port 2 Baud Rate
7. Modbus address (1, 1-128)
8. Change Settings Password (000000, up to six numbers, 0-9)

.2 System

1. Battery Auto Equalize (Disable, Enable)
2. ECO Mode (Disable, Enable)

.6 Control Settings - The UPS display shall have the following controls:

.1 Clear Faults

.7 Event Log - The UPS shall have an event log to record 1024 events and shall be viewable from the display. The event log, once full, shall begin to replace the first event logged to provide a FIFO process for maintaining event history. The event history shall record and display the number of events out of the 1024 (xxx/1024) as well as the event description, time (date/time when the event that occurred), event code.

.1 Current - Navigate the event log to view the last 1024 events.

.2 History - Navigate the event log to view the last 1024 events.

.8 About - The UPS shall have an About screen to display the UPS model number, serial number, hardware version, and firmware version. Additionally, if fitted with a network monitoring card (SNMP) and connected to a network, the network information provided shall be at least the MAC address and IP address.

.9 Maintain - The UPS cabinet shall include a make-before-break maintenance bypass with mechanical interlock.

.10 Automatic Battery Test, the UPS shall feature an automatic battery test. The battery test shall ensure the capability of the battery to supply power to the inverter while loaded. If the battery fails the test, the UPS shall display a warning message to indicate that the internal batteries need replaced. The battery test feature shall be user- accessible with communication software. The automatic battery test feature shall be capable of being disabled or configured from the LCD to operate every 8, 12, 16, 20 or 26 weeks.

2.10 BYPASS

.1 A static bypass circuit shall be provided as an integral part of the UPS. Bypass control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarms conditions. This control circuit shall provide a transfer of the load to the bypass source if available and if the inverter is incapable of powering the load (i.e., if there is an overload condition, if the unit is in Manual Bypass mode or if the voltage or frequency is out of tolerance).

.2 The transfer control logic shall activate the bypass automatically, transferring the critical AC load to the bypass source, after the transfer logic senses one of the following conditions:

.1 UPS overload

.2 UPS overtemperature

.3 PFC failure

.4 Inverter failure

.5 DC bus overvoltage

.3 Once the overload condition is reduced, the load shall be automatically transferred back to inverter power.

2.11 BATTERY SYSTEM

.1 Valve-regulated, non-spillable, lead acid cells (VRLA) shall be used as a stored-energy source for the specified UPS system. The UPS enclosure shall allow up to two (2) battery strings wired in parallel to provide extended run time capability. The battery shall be sized to support the inverter at rated load and power factor, with ambient temperature of 25°C (77°F) for a minimum of 5 minutes of reserve time. The battery's expected life shall be 6-8 years or a minimum 260 complete discharge cycles.

2.12 MAINTENANCE BYPASS

.1 The UPS system shall include an internal maintenance bypass breaker. The maintenance bypass shall be housed in an electrically isolated section inside the UPS cabinet. The maintenance bypass shall be a make-before-break type with integrated interlock to prevent mis-operation.

2.13 TERMINAL BLOCK CONNECTIONS

.1 The UPS shall contain on the front panel terminal block connections to provide two (2) sets of dry contact output signals and five (5) sets of dry contact input signals. All dry input and output contact signals shall be configurable

.1 Dry Contact Output Signals

The dry contact output signals available for configuration shall be: Summary Alarm, On Battery, Low Battery, UPS Fault, On Bypass, On UPS, Remote EPO, Main Input Abnormal, On Maintenance Bypass, Load Shed Signal 1, Load Shed Signal 2, Internal MBB Closed

.1 Output Contact Port 1 - On Battery signal shall be the default setting for this port and shall be a Normally Open (NO) dry contact.

.2 Output Contact Port 2 – Summary Alarm signal shall be the default setting for this port and shall be a Normally Open (NO) dry contact.

The dry output contacts shall be rated for 24 VDC, 0.5A maximum

.2 Dry Contact imput Signals
The dry contact input signals available for configuration shall be: On Generator, Transfer to Inverter Inhibit, External MIB Status, External MBB Status, Module Output Breaker Status, Battery Ground Fault Detected, Charger Shutdown, ECO Mode Inhibit, Start Battery Maintenance Self-Test, Stop Battery Maintenance Self-Test, Alarm Cleared

.1 Input Contact Port 1 – External MIB Status is the default setting for this port and shall be a normally Open (NO) dry contact.

.2 Input Contact Port 2 – Module Output Breaker Status shall be the default setting for this port and shall be a Normally Open (NO) dry contact.

.3 Input Contact Port 3 – External MBB Status shall be the default setting for this port and shall be a Normally Open (NO) dry contact.

.4 Input Contact Port 4 – On Generator shall be the default setting for this port and shall be a Normally Open (NO) dry contact.

.5 Input Contact Port 5 – Transfer to Inverter Inhibit shall be the default setting for this port and shall be a Normally Open (NO) dry contact.

The dry input contacts shall be rated at 12VDC, 20mA maximum.

2.14 FABRICATION

.1 Shop assemble:

.1 Rectifier unit.

.2 Inverter unit.

.3 Bypass switch unit.

.4 Battery rack and battery.

.2 Interconnect units, and add remote mode lights, alarms and controls to produce complete uninterruptible power system before requesting Departmental Representative to witness factory tests.

2.15 FINISHES

.1 Apply finishes in accordance with Section [26 05 00 - Common Work Results for Electrical].

.2 Cubicles:

.1 Inside finish: white.

.2 Exterior finish: color RAL 7021 Gray- Black.

.3 Exterior hardware and trim: corrosion resistant and not requiring painting such as stainless steel or aluminum.

2.16 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical]

.2 For major components such as AC input breaker, inverter breakers, bypass switch: size 4 nameplates.

.3 For mode lights, alarms, meters: size 2 nameplates.

2.17 SOURCE QUALITY CONTROL

.1 Complete system including rectifier, inverter, bypass switch, remote annunciator panel, controls and battery factory tested in presence of Departmental Representative.

.2 Notify Departmental Representative:

.1 One week in advance of date of factory test.

.2 That system has had preliminary testing and has met design requirements satisfactorily.

.3 Test procedures:

.1 Prepare blank forms and check sheet with spaces for recording data.

.2 Mark check sheet and record test data on forms in duplicate as test proceeds. Attach metre recordings.

.3 Collect Departmental Representative's signature on form to indicate concurrence in results reported.

.4 Deliver duplicate of test results to Departmental Representative at end of test.

.5 Include information from original test as part of Operations and Maintenance Manual.

.4 Test equipment:

.1 Instruments used during test, including indicating meters installed as part of system to have recent calibration certificate.

.2 Dummy load for testing, adjustable to 150% of system rated output at 1 power factor lagging. Load on each phase adjustable from zero to 100% so that unbalanced output maybe tested for 3 phase systems.

.5 Tests:

.1 Visual inspection to determine:

.1 Materials, workmanship, and assembly conform with design requirements.

.2 Parts are new and free of defects.

.3 Battery and components are not damaged.

.4 Battery cells are of identical construction.

.5 Electrolyte in each cell is at manufacturer's recommended full level.

.6 Each battery cell polarity and polarity of connections to inverter are correct.

.7 Proper size fuses are installed.

.8 Metres have suitable range.

.9 Accessories are present.

.10 Portable metres for acceptance tests are suitable and instrument transformers connected correctly.

.2 Demonstrate:

.1 System start-up and shut down.

.2 Operation during mains power failure, recording output during failure and return of mains power, using oscilloscope and camera attachment. Repeat several times.

.3 Adjustable settings.

.4 Record values measured at test points using oscilloscope, digital multimetre, visicorder and camera attachment.

.5 Protective devices and indications function as designed. Record actual settings, and note operation of remote indications and transfer to bypass. Tests to include:

.6 Simulate over temperature by applying heat to sensor with hot air blower.

.7 Simulate fuse blowing to test indication response.

.8 Simulate fan failure.

.9 Bypass switch automatic operations. Record with camera/oscilloscope absence of load disturbance during automatic bypass switching.

.10 Over voltage of rectifier DC output

.3 Harmonic test:

.1 With system fully loaded, one-half loaded, and at no load, determine total harmonic content with harmonic distortion metre at output terminals.

.2 Determine each harmonic magnitude with harmonic wave analyzer.

.3 Measure phase to neutral at 0.8 lagging power factor.

.4 Transients:

.1 With normal power input, apply full load to system.

.2 Remove one half load [from each phase].

.3 Reapply one half load instantly.

.4 Record voltages and currents using visicorder.

.5 Steady load:

.1 Switch system onto AC mains, start inverter and connect dummy 1 power factor load.

.2 Operate system at full rated load for 24 hours and at 125% load for 10 minutes in ambient temperature of 40 degrees C.

.3 Record data at start of test and at half hour intervals thereafter; including:

.6 Varying loads:

.1 Take one set of readings as above of no load, 25% load, 50% load, 75% load and 125% load.

.2 Calculate efficiencies of rectifier, inverter, and complete system.

.7 Unbalanced loads:

.1 Adjust loads on inverter to full load on two phases, 80% load on third phase.

.2 Adjust loads on inverter to zero load on two phases, 20% load on third phase.

.3 For both cases, record phase and line voltages and currents with phase angles to prove that phase relation remains unchanged with unbalanced loads.

.8 Battery:

.1 Charge battery to ensure cells fully charged. When voltage reaches steady value at end of charge, record:

.2 Discharge battery by operating uninterruptible power system with AC mains open, at full rated output for duration quoted in design requirements. Record, at 5 minutes intervals:

.3 Recharge battery automatically by closing AC mains supply to system for 4 hours period, with dummy load connected. Record at 15 minutes intervals.

.4 At start and finish of charge record ambient and battery temperatures, and specific gravity of each cell (lead acid only).

.5 Repeat discharge test and readings to prove battery was at least 95% recharged in 4 hours charge period.

.6 Recharge battery.

.9 Operating sound level:

.1 Operator to take reading by placing metre in front of him with microphone pointed at right angles to path of travel of generated sound, positioned at height of 1.5 m and distance of 1 m from equipment to be tested.

.2 Measure sound level during low ambient sound level.

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 uninterruptible power systems static (UPS) 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 Locate UPS cubicles, battery rack and battery as indicated.

.2 Locate and install remote mode lights and alarm cabinet[s] as indicated.

.3 Assemble and interconnect components to provide complete UPS as specified.

.4 Connect AC mains to main input terminal.

.5 Connect UPS output to load.

.6 Start-up UPS and make preliminary tests to ensure satisfactory performance.

3.3 TESTING

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical] and CAN/CSA-C813.1.

.2 Provide:

.1 Competent field personnel to perform test, adjustments and instruction on UPS equipment.

.2 Dummy load adjustable to 150% of system rated output.

.3 Notify Departmental Representative 10 working days in advance of test date.

.4 Tests:

.1 Inspection of cubicles, battery rack and battery.

.2 Inspection of electrical connections.

.3 Inspection of installation of remote mode lights and alarms.

.4 Demonstration of system start-up and shut-down.

.5 Run UPS for minimum period of 4 hours at full rated load to demonstrate proper operation with AC mains input, emergency generator input, no AC input.

.6 Discharge battery by operating UPS with AC mains open for specified duration of full load. Record readings of temperature of each cell.

.7 Recharge battery automatically with full rated load on UPS for [4] hours and record readings of voltage of each cell.

3.4 START-UP

.1 Arrange with Departmental Representative:

.1 For factory service engineer to supervise start-up of system, checking, adjusting and testing on site.

.2 For instruction of personnel on theory, construction, installation, operation and maintenance of system:

.1 After installation and during site testing.

.2 At factory during shop testing.

.2 Advise on:

.1 Expected failure rate of equipment.

.2 Type of expected failures.

.3 Estimated time between major overhauls based on 20 year equipment life.

.4 Estimated cost of major overhaul based on current costs and excluding travelling expenses.

.5 Type and cost of test equipment needed for fault isolating and performing preventive maintenance.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 - DE CONSTRUCTION/DÉMOLITION Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by UPS installation.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.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 Quality assurance submittals: provide following in accordance with Section01 45 00 - Quality Control.

.1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.2 QUALITY ASSURANCE

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

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Divert unused metal materials from landfill to metal recycling facility.

.4 Disposal and recycling of fluorescent lamps as per local regulations.

.5 Disposal of old PCB filled ballasts.

PART 2 PRODUCTS

2.1 DEL LIGHTING (NEED TO BE TRANSLATE)

.1 Lighting fixtures must be designed to operate with a light source based on the use of light emitting diodes (LEDs). Unless specified, modification kits or incandescent, fluorescent and HIS lamp replacement by a LED lamp are not permitted.

.2 LED must be designed by a renowned company.

.3 Drivers must be designated by a renowned company. Drivers designated by the same lighting fixture company are accepted.

.4 LEDs must be assembled on mounting plates allowing replacement without specialized tools.

.5 Drivers must be ready for use with 0-10V dimming.

.6 Heating dissipation must be ensuring by natural convection without using mechanical system with moving pieces.

.7 LED life must be at least 50,000 hours at L80 for indoor units and 100,000 hours at L70 for outdoor units, established according to LM-80 and TM-21 standard of Illumination Engineering society.

.8 CRI must be at least 80.

.9 Indoor devices color temperature must be 2700, 3000, 3500, 4000K or as indicated.

.10 Outdoor devices color temperature is 3000 or 4000K, as indicated in device description.

.11 Photometric data must be measured LM-79 standard of Illumination Engineering society and established by an independent laboratory or NVLAP accredited.

.12 120-, 208-, 240- or 347-Volts power supply, as indicated. Devices can accept ± 10 % tension variation.

.13 LED and drivers must be guaranteed for a minimum period of five (05) years.

.14 Light-emitting diode (LED) devices must be conforming to CSA C22.2 No. 250.13-F14

2.2 FINISHES

.1 Light fixture finish and construction to meet ULC listing[s] and CSA certification[s] related to intended installation.

2.3 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule.

2.4 LIGHTING FIXTURES LIST

.1 Type P1

.1 Projector type round LED lighting fixture with a die-cast aluminum housing of +-10” in diameter.

.2 Power of 50W, color temperature 3000k, CRI80+ for an intensity of 3241 lumens and 3932 candelas.

.3 60° light distribution.

.4 Voltage of 208V

.5 RAL 9005 MAST in polyester powder in electrostatic application.

.6 Stainless steel hardware and tempered clear glass lens.

.7 Design of the chamber in two compartments allowing the replacement of the power pilot.

.8 The device must be supplied with an anti-glare visor

.9 Must meet cUL, IP66, IK10, and RoHS certifications.

.10 Lifetime of 250,000 hours [L70 @ 25°C], certified LM - 79 –08.

.11 Device responding to bidirectional DMX/RDM communication protocol.

.12 5 years warranty.

.2 Type P2

.1 Round LED gobo projector type fixture with a die-cast aluminum housing of +7.28” in diameter and 28.07” in length, with internal gobo holder.

.2 Power of 200W, color temperature 3200k, CRI80+.

.3 Intensity of 7854 lumens and 16894 candela for 14°.

.4 Intensity of 7973 lumens and 32367 candela for 35°.

.5 Light distribution from 14° to 35°.

.6 208V voltage, supplied with 12m power and control cable.

.7 4 blade framing system.

.8 Must meet cUL, IP65, IK10, and RoHS certifications.

.9 Lifetime of 50,000 hours [L80].

.10 Device responding to the DMX communication protocol. as indicated in luminaire schedule.

.3 Type L1

.1 Projector-type round LED lighting fixture of +-10” in diameter for recessed installation in the ground.

.2 Power of 25W, color temperature of 3000k, CRI80+ for an intensity of 1992 lumens.

.3 Light distribution type 40°x10°, inclination: -20° /+20° degrees. Rotation: 360°.

.4 Voltage of 208V.

.5 Power supply entry from below.

.6 MicroAntil Leach Cable.

.7 11" (280 mm) pre-installation blocking.

.8 Marine grade 316 stainless steel housing, high strength glass, Teflon coated cover, marine grade 316 stainless steel screws and cover (polished or brushed finish).

.9 Polished stainless steel cover.

.10 Support of static loads up to 9,259 lb (4,200 kg).

.11 All fully sealed for complete IP68 waterproofing.

.12 Must meet ETL, IP68 and IK10 certifications.

.13 Easyglow, cooldrive, humantouch, Opticlear, Gripglass and Electropolish+ technologies.

.14 Lifetime of more than 60,000 hrs [L70 @ 25°C], certified LM - 79 –08.

.15 Device controllable via DMX and Powersyn protocol.

.16 5 year warranty under normal operation between temperatures of -20° C to 50° C [-4F to 122F].

.4 Type L2

.1 36” architectural linear LED light fixture for recessed in-ground installation.

.2 Power of 61W, color temperature of 3000k, CRI80+ for an intensity of 1639 lumens and 2725 candelas at nadir.

.3 30x60 type light distribution, 10° inclination.

.4 Voltage of 208V

.5 Rugged aluminum construction, recycled PVC housing reinforced with stainless steel frame.

.6 Stainless steel hardware and a very robust non-slip tempered clear glass lens to meet impact resistance (IK10) and support ("walk over") certifications.

.7 Design of the chamber in two compartments allowing the replacement of the power pilot.

.8 Appliance equipped with an internal scrolling grille.

.9 All fully sealed for complete IP68 waterproofing.

.10 Must meet cUL, IP68, IK10 and RoHS certifications.

.11 Lifetime of 280,000 hrs [L70 @ 25°C], certified LM - 79 –08.

.12 Device controllable via bidirectional DMX/RDM communication protocol.

.13 5 years warranty under normal operation between temperatures of --- 20° C to 50° C [-4F to 122F].

.5 Type L3

.1 Projector-type round LED lighting fixture of +-8.3’’ in diameter for recessed installation in the ground.

.2 Power of 16W, color temperature of 3000k, CRI80+ for an intensity of 1740 lumens.

.3 20° light distribution, tilt: -5° /+20° degrees. Rotation: 360°.

.4 Voltage of 208V.

.5 Power supply entry from below.

.6 MicroAntil Leach Cable.

.7 12.8" (325 mm) pre-installation blocking.

.8 Marine grade 316 stainless steel housing, high strength glass, Teflon coated cover, marine grade 316 stainless steel screws and cover (polished or brushed finish).

.9 Polished stainless steel cover.

.10 Support of static loads up to 9,259 lb (4,200 kg).

.11 All fully sealed for complete IP68 waterproofing.

.12 Must meet ETL, IP68 and IK10 certifications.

.13 Easyglow, cooldrive, humantouch, Opticlear, Gripglass and Electropolish+ technology.

.14 Lifetime of more than 60,000 hrs [L70 @ 25°C], certified LM - 79 –08.

.15 Device controllable via DMX and Powersyn protocol.

.16 5 years warranty under normal operation between temperatures of -20° C to 50° C [-4F to 122F].

.6 Type L4

.1 Projector-type round LED lighting fixture of +-8.3’’ in diameter for recessed installation in the ground.

.2 Power of 16W, color temperature of 3000k, CRI80+ for an intensity of 1740 lumens.

.3 20° light distribution, tilt: -5° /+20° degrees. Rotation: 360°.

.4 Voltage of 208V.

.5 Power supply entry from below.

.6 MicroAntil Leach Cable.

.7 12.8" (325 mm) pre-installation blocking.

.8 Marine grade 316 stainless steel housing, high strength glass, Teflon coated cover, marine grade 316 stainless steel screws and cover (polished or brushed finish).

.9 Polished stainless steel cover.

.10 Support of static loads up to 9,259 lb (4,200 kg).

.11 All fully sealed for complete IP68 waterproofing.

.12 Must meet ETL, IP68 and IK10 certifications.

.13 Easyglow, cooldrive, humantouch, Opticlear, Gripglass and Electropolish+ technologies.

.14 Lifetime of more than 60,000 hrs [L70 @ 25°C], certified LM - 79 –08.

.15 Device controllable via DMX and Powersyn protocol.

.16 5 year warranty under normal operation between temperatures of -20° C to 50° C [-4F to 122F].

.7 Type L5

.1 48” linear, architectural LED light fixture for recessed in-ground installation.

.2 Power of 20W, color temperature of 3000k, CRI80+ for an intensity of 656 lumens and 1090 candelas at nadir

.3 Light distribution type 30x60 adjusted with 20 degree angle.

.4 Voltage of 208V

.5 Rugged aluminum construction, recycled PVC housing reinforced with stainless steel frame.

.6 Stainless steel hardware and a very robust non-slip tempered clear glass lens to meet impact resistance (IK10) and support ("walk over") certifications.

.7 Design of the chamber in two compartments allowing the replacement of the power pilot.

.8 Appliance equipped with an internal scrolling grille.

.9 All fully sealed for complete IP68 waterproofing.

.10 Must meet cUL, IP68M, IK10 and RoHS certifications.

.11 Lifetime of 280,000 hrs [L70 @ 25°C], certified LM - 79 –08.

.12 Device controllable via bidirectional DMX/RDM communication protocol.

.13 5 year warranty under normal operation between temperatures of -40° C to 50° C [-40F to 122F].

.8 Type L6

.1 8m LED light column.

.2 77x177mm square section mast in aluminum profile, including base plate cover.

.3 Openwork on 4 sides ("ART DECO" type pattern)

.4 Lighting above open area and access door:

.5 Kareo 33W LED module (30x60/3000°K optics/DMX control), 208V.

.6 Access door 500x110mm at 600mm from the base

.7 Extra flat foundry plate, dimensions 400x400mm, center distance 300x300mm equipped with insulating rings in line with the 4 anchoring oblongs to avoid any contact with the galvanized steel rods.

.8 Cast aluminum base 400x400mm - equipped with insulating rings in line with the 4 anchoring oblongs to avoid any contact with the galvanized steel rods

.9 Flush top cap.

.10 Pre-wired assembly.

.11 Anchor bolts included.

.12 At the top of the mast, 2 open niches for housing 2 LED projectors.

.13 2 x Round LED projectors with the following characteristics: 1500W, 3000lm, 4000°K, IP65, IK08, DMX control, 54°.

.14 24 LEDs.

.15 Cast aluminum body.

.16 Aluminum heat sink.

.17 54°/3000°K optics/DMX control.

.18 Finish: Powder coated, RAL 9005 MAST.

.9 Type L7

.1 1220mm LED strip.

.2 Mounting suspended by chain.

.3 Power of 25W, color temperature of 3000k, CRI80+ for an intensity of 3000 lumens.

.4 Voltage of 120V.

.5 Including protection grid.

.6 Color; White, frosted lens.

.10 Type L8

.1 Outdoor circular luminaire 300mm in diameter.

.2 Fixture for damp locations.

.3 Surface mount.

.4 Power of 16.6W, color temperature of 4000k, CRI80+ for an intensity of 1077 lumens.

.5 Light distribution.

.6 Polycarbonate LED lens/cover protects LEDs.

.7 Voltage of 120V.

.8 Colour: dark bronze.

.9 5 year warranty.

.11 Type L9

.1 Architectural LED exterior wall light fixture.

.2 IP66 luminaire.

.3 Dimensions: 8" high x 9" wide x 5.5" 1st depth and 1.5" 2nd depth.

.4 Surface mount.

.5 Power of 15W, color temperature of 4000k, CRI80+ for an intensity of 2000 lumens.

.6 Polycarbonate LED lens/cover protects LEDs.

.7 Voltage of 120V.

.8 Colour: dark bronze

.9 5 year warranty.

.12 Type M1A, M1B, M1C and M1D

.1 Palino-type candelabra with Aiguille head for 4 projectors.

.2 Total height: 12m00.

.3 Cylindrical-conical mast in "Technalinox" aluminum.

.4 Mast height: 10m00 - Øbase 200mm - Øhead 90mm.

.5 Flush and interchangeable door located 600mm from the base

.6 Cast aluminum base 400x400mm - center distance 300x300mm equipped with insulating rings in line with the 4 anchoring oblongs to avoid any contact with the galvanized steel rods.

.7 Palino extension Ø90mm length 1m00 with technical spiral rail (1 turn = 10cm).

.8 5 mounting wedges for 3 type P1 projectors and two type P2 projectors (projectors not supplied).

.9 Cable outlets by nickel-plated brass cable gland (positioning to be defined).

.10 Masthead Needle with aluminum tip, length 1m50, Ø in base 90.

.11 Assembly without wiring.

.12 Without spotlights.

.13 Without service box.

.14 An outlet for a 120V electrical outlet, installed 1000 mm from the ground.

.15 500mm x 120mm access hatch for control equipment, installed 1600mm from the ground.

.16 Access hatch of 500mm x 120mm for electrical connection, installed 600mm from the ground.

.17 Finish: Thermolaquage RAL 9005 MÂT.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.4 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/demolition Waste Management and Disposal.

END OF SECTION

PART 1 GENERAL

1.1 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 emergency lighting and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect emergency lighting from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse in accordance with Section 01 74 19 - Construction/demolition Waste Management and Disposal.

1.4 WARRANTY

.1 For batteries in this Section 26 52 13.13 - Emergency Lighting, 12 months warranty period is extended to 120] months.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Emergency lighting equipment: to CSA C22.2 No.141

.2 Supply voltage: 120 V, AC.

.3 Output voltage: 12 V DC.

.4 Operating time: 120 minutes.

.5 Battery: sealed, maintenance free.

.6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.

.7 Solid state transfer circuit.

.8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.9 Signal lights: solid state, for ['AC Power ON'] and ['High Charge'].

.10 Lamp heads: [integral on unit] [remote], 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED, 5 W, minimum.

.11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.12 Finish: white color.

.13 Auxiliary equipment:

.1 Test switch.

.2 Time delay relay.

.3 Battery disconnect device.

.4 AC input and DC output terminal blocks inside cabinet.

.5 Shelf.

.6 Cord and plug connection for AC.

.7 RFI suppressors.

2.2 REMOTE LIGHTING HEADS

.1 The headlights remotely connected to the emergency lighting monoblocs will be with wide distribution, ball joint type, equipped with MR16 LED bulb, with a capacity of 5 W at 12 V, with optical unit without reflection and color housing white.

2.3 WIRING OF REMOTE HEADS

.1 Conduit: type EMT, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Conductors: AWG type in accordance with Section 26 05 21 - Wires and Cables (0-1000 V)], sized in accordance with manufacturer's recommendations.

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 emergency lighting 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 unit equipment and remote mounted fixtures.

.2 Direct heads.

.3 Connect exit lights to unit equipment.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 - Construction/demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by emergency lighting installation.

END OF SECTION

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 PRODUCTS

2.1 STANDARD UNITS

.2 Exit lights: to CSA C22.2 No.141.

.3 Graphics: Green pictogram and white graphic symbol and directional arrows, in accordance with ISO 3864-1. Dimensions according to ISO 7010.

.4 Die-cast aluminum housing.

.5 Universal mounting for ceiling or wall installation.

.6 A single lighting module consisting of light-emitting diodes (LEDs) to illuminate the indicator whether it is single or double-sided.

.7 Universal AC supply voltage 120 to 347 V.

.8 DC supply voltage 6 to 24 V.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.

.2 Connect fixtures to exit light circuits.

.3 Connect emergency lamp sockets to emergency circuits.

.4 Lock exit light circuit breaker in on position.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 00 - 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 02 41 13 - Selective Site Demolition.

.2 Section 31 23 33.01 – Excavation, Trenching and Infilling.

.3 Section 32 91 19.13 – Topsoil Placement and Grading.

1.2 MEASUREMENT PROCEDURES

.1 Stripping of topsoil will not be measured for payment. This work is included in each of the items in the schedule, requiring this work.

1.3 REFERENCES

.1 ASTM International

.1 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3) (600 kN-m/m3).

.2 Ministère des Transports du Québec

.1 Cahier des charges et devis généraux (CCDG) : infrastructures routières, most recent edition.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit construction equipment list for major equipment to be used in this section prior to start of Work. The following materials must be submitted for approval prior to the commencement of work:

.1 Provide data sheets for stabilizer and geotextile membrane.

.2 Provide sample of washed round stone 75-100 mm in diameter.

.3 Provide sample of salvaged stone screenings, crushed prior to insertion into mix.

.4 Provide sample of salvaged stone screenings, crushed after mixing with other screenings to provide quantity required to complete the work.

.2 Upon request, advise Departmental Representative of proposed source of supply for materials. Departmental Representative reserves the right to take samples to validate compliance of materials supplied.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Use granite components salvaged from site, as indicated in section 02 41 13 "Selective Demolition of Landscape Works", and have them crushed for incorporation into the mix.

.2 Stone Screening: Mixture of crushed stone (5-0 mm), granitic type stone screenings, grey, matched as closely as possible to grading range in following table:

Sieve modulus	% Passing
10 mm.	100
5 mm.	95 — 100
2.5 mm.	75 — 80
1.25 mm.	55 — 65
0.63 mm.	40 — 50
0.35 mm.	25 — 35
0.16 mm.	20 — 25
0.08 mm.	10 — 17

.3 Washed round stone, locally coloured river pebble, sieved to a draining size of approximately 50 to 75 mm in diameter.

.4 All granular backfill materials must be free of pyrite shale susceptible to swelling and must be DB certified in accordance with CTQ-M200 protocol for petrographic swelling potential index (PSI).

.5 Geotextile membrane: Drainage, separating material layers, approved by Departmental Representative. Reinforcing 100% non-woven needle-punched geocomposite or equivalent, air and water permeable.

.6 Stakes: Geotextile anchors for geotextile membrane.

.7 Colourless and odourless stabilising product, organic powder of stabilising type and suitable for the work to be carried out.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions:

.1 Before commencing work verify locations of buried services on and adjacent to site.

.2 Examination

.1 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.

.2 Not later than 48 hours before backfilling or filling with approved material, notify Departmental Representative to allow compaction tests to be carried out by designated testing agency.

.3 Before commencing work, conduct, with Departmental Representative, condition survey of existing structures, trees and plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

3.2 GENERAL PREPARATIONS

.1 Protection of in-place conditions:

.1 Protect wet stones from freezing.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.4 Protect buried services that are to remain undisturbed.

3.3 EXCAVATION.

.1 Stripping of topsoil in the tree groupings along Rue Grande Allée.

.1 Once the grass has been removed and evacuated from the site, carefully remove, without damaging the outcropping root system, the topsoil covering the areas that will be occupied by a new structure, the areas where changes in level are to be made and the areas where excavated material is to be placed in piles in such a way as to avoid any form of contamination.

.2 Do not disturb the soil around or under the root system.

.3 Deposit topsoil for reuse on site.

.4 Promptly after excavation, place the geotextile membrane over the surface of the exposed roots to protect them from air and sun. Anchor the membrane if it cannot be covered with the rock screen at the same time.

.2 Rough grade to following depths below finish grades:

.1 100 mm for stone screening areas.

.2 500 mm for shrub planting pits.

.3 800 mm for shrub planting pits.

.4 150 mm for the area to be grassed with topsoil.

.5 300 mm for the area to be grassed with structural soil.

3.4 FIELD QUALITY CONTROL

.1 Fill material and spaces to be filled to be inspected and approved by Departmental Representative.

3.5 BACKFILL.

.1 Start backfilling only after inspection and receipt of written approval of fill material and spaces to be filled from Departmental Representative.

3.6 GRADING

.1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative. Grade to be gradual between finished spot elevations as indicated.

3.7 SURFACE COATING WITH STONE SCREENING

.1 Level surface if necessary with thin layer of tree planting soil and fill larger holes with structural soil.

.2 Lay and firmly anchor geotextile membrane to ground above root protection system using stakes every 500 mm cc.

.3 Mix stone screenings with stabilizer according to manufacturer's specifications. Screenings mixture should be mixed with 6.5 kg of organic binder/metric ton.

.4 Saturate granular base with water before applying screenings. Spread screenings wet to allow adequate coverage and to restrict volatility of powder during raking. Allow for 20% differential between expanded and compacted material. One tonne of material covers approximately 9 m² at 50 mm thickness.

.5 Install stone screen on the geotextile membrane. Spread stone screen evenly to achieve compacted thickness shown on drawings.

.6 Water thoroughly to ensure that moisture penetrates entire thickness of mix. Water with low pressure hose to avoid disturbance of levelled work. It is essential that entire thickness of material is saturated. Average amount of water required is about 45 litres per square metre. This amount may vary depending on humidity of air. Check to see if entire thickness is fully wetted.

.7 When the water is drained and surface is still wet (approx. 6 to 24 hours), roll with a minimum of a 1 ton roller. Do not use a vibrating plate or roller. 4 to 5 passes of roller to ensure adequate compaction.

.8 Finished surface should be soft, uniform and solid, with no visible cracks or laminations. After it has dried, compacted material should be firm with no spongy areas. Loose material should not be present on surface before use. Loose material or lack of cohesion of materials on surface is a sign of poor mixing or lack of water. Test the area by adding more water, allowing it to penetrate and re-compacting. If imperfection persists, mix will be rejected. Non-conforming areas must be replaced with a new mix.

.9 Ensure finished surface is even, free of imperfections and following required slopes and profiles for proper surface water drainage. To satisfaction of Departmental Representative.

3.8 SWALES

.1 Install round stone on geotextile membrane that surrounds net stone drainage well. Spread stone screen evenly to achieve compacted thickness shown on drawings. Respect swale width. Direct swales to low points.

.2 Ensure finished surface is even, free of imperfections and following required slopes and profiles for proper surface water drainage.

.3 Avoid contamination of swales with soil. Clean if necessary.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 74 11 — Cleaning.

.2 Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.3 Section 02 41 13 – Selective Site Demolition.

.4 Section 32 32 01 — Tree Preservation.

1.2 REFERENCES

.1 Bureau de normalisation du Québec — NQ 0605-200 — Arboreal and Horticultural Management.

.2 Société internationale d'arboriculture Québec (SIAQ) best practices.

1.3 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground

.2 and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.3 Grubbing consists of excavation and disposal of stumps and roots to not less than specified depth below existing ground surface.

1.4 STORAGE AND PROTECTION

.1 Prevent damage to fencing, existing trees and shrubs to be kept, landscaping, natural features, bench marks, existing pavement, utility lines, site appurtenances, water courses and root systems of trees which are to remain.

.1 Repair damaged items to approval of Departmental Representative.

.2 If trees are damaged during work, the Contractor shall take full responsibility including financial compensation for the loss of value of the damaged trees as described at the article 3.10 of Section 32 01 90 – Tree Preservation.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

.1 Trim limbs and tops, and saw into saleable lengths

.2 Stockpile adjacent to site.

.3 Dispose of sick trees off site and burn. Departmental Representative will determine on site which trees are to be disposed of.

.4 All felled trees must be transported to site mobilization site (service road sector). Contractor shall carry out evacuation site from mobilization site.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

.2 Remove and store soil material for reuse.

PART 3 EXECUTION

3.1 PREPARATION

.1 Inspect site and verify with Departmental Representative, items designated to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

.2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.

.3 Notify utility authorities before starting clearing and grubbing.

.4 Keep roads and walks free of dirt and debris.

3.2 APPLICATION

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

3.3 CLEARING

.1 Clearing includes felling, trimming, cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, rubbish occurring within cleared areas.

.2 Clear as directed by Departmental Representative, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1,000 mm above ground surface.

3.4 ISOLATED TREES

.1 Clear as directed by Departmental Representative, by cutting at height of not more than 300 mm above ground.

3.5 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 300 mm below ground surface.

3.6 REMOVAL AND DISPOSAL

.1 Remove cleared and grubbed materials off site.

.2 Remove cleared and grubbed materials off site.

.3 Chip and mulch cleared and grubbed vegetative material.

Contractor may use wood chips to reduce compaction of roots or to control surface water. Wood chips must be removed once landscaping work is completed.

.4 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative. Apply strict control to the disposal of elms, due to Dutch Elm disease and butternut canker. Remove all parts of elm trees that have been cut, including the trunk, to an authorized disposal facility and provide proof to Departmental Representative.

.5 Apply strict control to the disposal of elms, due to Dutch Elm disease and butternut canker. Remove all parts of elm trees that have been cut, including the trunk, to an authorized disposal facility and provide proof to Departmental Representative.

.1 Ash residues such as branches or logs up to 20 cm in diameter must be chipped immediately on site when pruning or felling. Size of chips resulting from chipping must not exceed 2.5 cm on at least two sides.

.2 Ash residues, such as branches or logs, with a diameter exceeding 20 cm must be:

.1 On days following felling and pruning work, Contractor is obliged to collect all wood, transport it to an authorized site for processing.

Or

.2 Transport to a wood processing company, or hold on site for processing using a compliant process within days of felling and pruning.

.3 In all cases, Contractor must provide proof of use and movement for verification by Departmental Representative.

.4 Fell ash trees between 15 September and 15 April.

3.7 FINISH

.1 Leave ground surface in condition suitable for immediate grading operations, stripping of topsoil, to approval of Departmental Representative.

3.8 CLEAN-UP

.1 Proceed in accordance with Section 01 74 11 — Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL INFORMATION

1.1 RELATED SECTIONS

.1 Section 31 23 33.01– Excavation, trenching and fill.

1.2 SUBMITTAL PROCEDURES

.1 Submit the required documents and samples in accordance with Section 01 33 00 – Submittal procedures.

.2 Two (2) weeks before testing is to commence, submit the selected test method as stipulated and provide detailed drawings of the equipment to be used.

1.3 QUALITY INSURANCE

.1 Submit electronic copies of compression, tension, and horizontal pile loading test reports by recognized independent laboratories, certifying that the products, materials, and equipment meet the stipulated physical characteristics and performance criteria.

1.4 SUBMITTAL PROCEDURES

.1 Not applicable.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Sort and recycle waste as directed by Section 01 74 19—Construction/Demolition Waste Management and Disposal.

.2 Collect and sort waste as required by the waste management plan.

.3 Place substances that meet the definition of toxic or hazardous waste in designated containers.

.4 Ensure that empty containers are sealed and stored securely.

1.6 QUALITY ASSURANCE

.1 Complete the following activities and submit the requested documents:

QUALITY MANAGEMENT CHART					
HP/MP	**ART.**	**PRESCRIPTIONS**	**TIME (FREQUENCY)**	**RECORD**	**RESPONSIBILITY**
		Shop drawings of concrete forms [and temporary elements].	Prior to commencement of work, as required for submitting shop or construction drawings in the request for proposals.	Letters of transmittal. Recording the shop drawing review.	Contractor
		Inspection of concrete form elements [and elements for temporary structures].	For every delivery.	Inspection reports.	Contractor

QUALITY MANAGEMENT CHART					
HP/MP	**ART.**	**PRESCRIPTIONS**	**TIME (FREQUENCY)**	**RECORD**	**RESPONSIBILITY**
		Inspection of concrete formwork [and temporary elements].	Prior to commencement of concrete pouring work.	Inspection reports.	Contractor

HP: HOLD POINT **MP**: MONITORING POINT

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Not applicable.

PART 3 EXECUTION

3.1 PROTECTION MEASURES

.1 As per Section 01 56 00—Temporary Barriers and Enclosures, take all necessary precautions to prevent injury to persons and damage to nearby structures and elements. Install fencing if required by the Departmental Representative, assign guards, and install display signs and sound warning devices prior to rock excavation.

3.2 ROCK EXCAVATION

.1 Coordinate the stipulations of this section with Section 01 35 29.06—Health and Safety Requirements.

.2 Remove rock to alignments, profiles, and cross sections as indicated.

.3 Blasting is not permitted within the limits of the work.

.4 Use rock removal procedures to produce uniform and stable excavation surfaces, minimize overbreak, and to avoid damage to adjacent structures.

.5 Excavate rock to horizontal surfaces with a slope as indicated on the plans.

.6 In places where the rock is shallow under the pavement structure, make a small cut with a slight slope in the rock to allow drainage on the surface of the rock.

.7 Scale, pressure wash, and broom clean rock surfaces to ensure that the concrete poured in an excavation will bond.

.8 Excavate trenches to lines and grades to a minimum of 150 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along the barrel of a pipe.

.9 Cut trenches to the specified widths.

.10 Remove boulders and fragments which may slide or roll into excavated areas.

.11 Correct unauthorized rock removal at no extra cost, as per Section 31 23 33.01—Excavating, Trenching and Backfilling.

3.3 EXCAVATION DISPOSAL

.1 Dispose of surplus removed rock off site as directed by the Departmental Representative.

.2 Do not dispose of removed rock in a landfill. Material must be sent to an appropriate location as approved by the Departmental Representative.

.3 Deposit rock excavations in a designated area for backfilling.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 It is the responsibility of the Contractor to get a copy of all sections of this specification even if they seem irrelevant to his specialty. The Contractor acknowledges implicitly accepts the clauses and requirements of all sections of the specification, even if it fails to refer to certain sections. Refer to the table of contents for a complete list of the sections of the specification.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM) :

.2 ASTM C 131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;

.3 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates;

.4 ASTM C 535-12, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;

.5 ASTM C 837-09, Standard Test Method for Methylene Blue Index of Clay;

.6 ASTM D 422-63(2007), Standard Test Method for Particle-Size Analysis of Soils;

.7 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3);

.8 ASTM D 1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3);

.9 ASTM D 2167-08, Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method;

.10 ASTM D 4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils;

.11 ASTM D 6928-10, Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus;

.12 ASTM D 6938-10, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth);

.13 ASTM D 7428-08e1, Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.

.14 Canadian standards (CSA)/CSA International Association:

.1 CAN/CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 et A3005).

.2 CSA A3001-13, Liants utilisés dans le béton.

.3 CAN/CSA A23.1-F09/A23.2-F09, Concrete: components and implementation of standard practices for concrete and work/test methods.

.15 Bureau de normalisation du Québec (BNQ) :

.1 CAN/BNQ 2501-250, Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage normale (600 kN m/m^3), 2013-12-20;

.2 CAN/BNQ 2501-255, Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2 700 kN m/m³), 2013-12-20;

.3 NQ 2560-114/2014, Travaux de génie civil – Granulats;

.4 BNQ 1809-300/2018 – Travaux de construction – Clauses techniques générales – Conduites d'eau potable et d'égout.

.16 The Canada Green Building Council (CGBC) :

.1 LEED Canada-NC 2009, LEED (Leadership in Energy and Environmental Design) : Green building for new construction and major renovations rating system.

.17 Ministère des Transports du Québec (MTQ) :

.1 Cahier des charges et devis généraux (CCDG), most recent edition;

.2 Méthode d'essai LC 31-228, Évaluation de la teneur en matière organique dans les granulats et les sols;

.3 Norme 1101, Classification des sols, version 2018-12-15;

.4 Norme 2101, Granulats, version 2007-12-15;

.5 Norme 13101 – Géotextiles, version 2018-12-15.

.18 The Canada General Standards Board (CGSB) :

.1 CAN/CGSB 8.1-88, Test sieves of metal, non-metallic canvas;

.2 CAN/CGSB 8.2-M88, Test sieves of metal, metric canvas.

.19 U.S. Environmental Protection Agency (EPA)/Office of Water :

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

.1 Class A borrow material

.1 Complies with NQ 2560-114 standard and the 1101 standard designation of the Ministère des Transports du Québec (MTQ).

.2 These materials are natural granular or non-plastic soils, such as: sand, gravel or stone. The diameter of the granular materials must note exceed one third of the thickness of the layers.

.3 These materials are non-freezing and may be used in backfilling of trenching excavation if indicated.

.2 Class B materials: all soils compactable compliant with the standard 1101 of the MTQ. These materials must be free of stones the largest dimension of which exceeds seventy-five (75) mm, clinker, ashes, turf plates, waste and roots. Organic soil or soils containing organic material, contaminated soil or containing waste and soils containing frozen masses are excluded from this classification. The material must be draining and compactable. The last three hundred millimetres (300 mm) of backfill below the infrastructure line must be free of stones more than seventy-five (75) mm.

.3 Excavation Materials: Unfrozen materials from the excavation, authorized by the Departmental Representative for the proposed use.

.4 Borrow materials: Materials from an external source authorized by the Departmental Representative for the proposed used, such as for backfilling and other parts of the work.

.5 Excavation classes: (two) classes of excavation will be recognized; common excavation (2nd class or mass excavation) and rock excavation (1st class).

.1 Rock: solid material in excess of (1.25) m^3 and which cannot be removed by means of heavy-duty mechanical excavating equipment with 0.95 to 1.15 m^3 bucket, shall be considered as 1st class excavation. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.6 Topsoil

.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 mm (1 inch) in any dimension.

.7 Waste material: excavated material unsuitable for use in works such as debris, concrete, asphalt, brush, weeds, grass, etc.

.8 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 Frost susceptible excavation materials:

.1 Fine-grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradations within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

.2 Table

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

.3 Coarse-grained soils containing more than (20) % by mass passing 0.075 mm sieve.

1.4 DOCUMENTS/SAMPLES TO SUBMIT

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

.2 Quality Control: in accordance with Section 01 45 00 - Quality Control:

.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.

.2 Submit for review by the Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this section.

.3 Submit to the Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.

.4 Submit to the Departmental Representative written notice when bottom of excavation is reached.

.5 Submit to the Departmental Representative testing, inspection, results and reports as described in PART 3 of this section.

.3 Preconstruction Submittals:

.1 Submit construction equipment list of major equipment to be used in this section prior to the beginning of work;

.2 Submit technical product descriptions of backfill material listed in part 2, in accordance with the requirements of section 01 33 00 – Submittal procedures.

.3 Submit records of underground utilities locates, indicating: location plan of existing utilities as found in the field, clearance record from utility authority, location plan of relocated and abandoned services, as required.

.4 Samples:

.1 Submit shoring samples in accordance with Section 01 33 00 - Submittal Procedures.

.1 The drawings must bear the seal and signature of a competent engineer recognized and certified by the 'Ordre des ingénieurs du Québec' (OIQ).

.2 Shop drawings shall indicate, show or understand the method of construction and the timetable, procedures concerning shoring, the bracing and the resumption of underpinning, the materials, and the location of the temporary parts recessed. Comply with the CSA S269.1 standard for temporary shoring works drawings. Comply to the standard CAN/CSA S269.3 drawings of the formwork if required.

.3 When a temporary work uses an existing structural element or structure under construction as support, shop drawings must indicate the transmitted maximum efforts and their direction.

.4 Submit a letter signed by a competent engineer recognized and certified by the 'Ordre des ingénieurs du Québec' (OIQ), stating that the construction of temporary structures is consistent with its plans submitted prior to installing the shoring. The engineer attesting the conformity of the temporary shoring must visit the facilities prior to the production of the letter and attach its report of visit.

.5 If the Contractor does not use shoring, the Departmental Representative may require that it demonstrates that shoring are not necessary through a certificate signed by a qualified engineer member of (OIQ).

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.

1.6 DESIGN OF TEMPORARY WORKS

.1 The Contractor is solely responsible for the design of works by shoring, bracing and recovery in underpinning which are an integral part of the work or which are necessary to achieve these. No review or comment by the Departmental Representative or anyone who can relieve the Contractor of its responsibility for these works.

.2 Comply with the requirements of the section and regulations applicable at a provincial and municipal level to protect existing elements.

.3 Retain the services of an engineer, Member of the 'Ordre des ingénieurs du Québec' (OIQ) for the design and inspection of the cofferdams and works by shoring, bracing and recovery in underpinning required for the work.

.4 At least two (2) weeks prior to beginning the work, submit for verification the design documents and related technical data. Wait for the review of the documents by the Departmental Representative before beginning the work.

.5 Design documents and related technical data submitted must bear the seal and signature of a professional engineer, Member of the Ordre des ingénieurs du Québec (OIQ).

.6 Keep a copy of the calculations and related data on the construction site.

.7 Certificate of qualification: the engineer responsible for the design of the temporary structures must provide proof that he has a policy of professional liability insurance.

.8 If the engineer is an employee of the Contractor, submit a document proving that the Contractor's insurance policy covers the work and the works carried out under the direction of the engineer.

.9 Protect and prevent the work movement or settlement, survey markers, bench marks, underground systems and paved surfaces, trees and landscaping in the immediate vicinity. Install shoring and prevent water infiltration.

.10 Repair any damage and the costs. Also assume responsibility for any accident caused by shoring work, of bracing and recovery in underpinning poorly executed.

.11 Health and safety :

.1 Take the necessary measures on health and safety in construction in accordance with the general requirements.

1.7 EXISTING CONDITIONS

.1 Buried services:

.1 Prior to beginning the work, verify and establish location of buried services on and adjacent to site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with the execution of work: pay costs of relocating services or for temporary works.

.3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.4 Prior to beginning excavation work of the buried lines, notify applicable the Departmental Representative Authorities having jurisdiction establish location and state of use of buried utilities and structures. Make a request to Info-Excavation and to the Departmental Representative Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work. The Contractor is responsible for locating all above and underground utilities.

.5 Confirm locations of buried utilities by careful test excavations and/or soil hydrovac methods.

.6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.

.7 Obtain the appropriate directives from the Departmental Representative before removing a utility pipe or a work identified in the excavation area.

.8 Record location of maintained, rerouted and abandoned underground lines.

.9 Confirm locations of recent excavations adjacent to the area of excavation.

.10 Repair as soon as possible any network utilities that have been damaged during work and bear the costs of the repair work. The Contractor shall, in all cases, notify the Departmental Representative of damage he has thus caused or the danger he created by, or on the occasion of its work.

.11 The alignment and depth of existing lines shown on the plans are approximate. The Contractor is responsible for performing, at his expense, all trial pits required prior to the beginning of work to validate the exact position and depth of existing pipes at the points of connection and crossover points with the projected lines. This activity must be done in the presence of the Departmental Representative. Any situation resulting in a change to the plans and specifications must be noticed in writing to the Departmental Representative as soon as possible. The Departmental Representative will signify to the Contractor, if any, the changes to be made to the elevation and alignment of the projected works. The Contractor shall comply without additional costs.

.2 For all structures or visible structural parts located in the trench, the Contractor must dismantle and dispose of existing structures. A cap should be put in place at the end of the pipe which remains buried (on the edge of the excavation). The location of the pipe caps must appear on the as-built drawing.

.3 Existing buildings and surface features

.1 Conduct, with the Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work.

.2 Protect existing buildings and surface features from damage while work is in progress. In the event of damage, immediately make repairs as directed by the Departmental Representative, and at the expense of the Contractor.

.3 The Contractor shall take all necessary precautions to identify, protect and replace all works necessary and existing structures to preserve (poles, guy, ducts and electrical wires, telephone or otherwise, frames, buffers and manhole and catch basin lid and grate, buildings, bench, signage, signs, posters, fences of all kinds, Fountain (water point), box flowers wood, illuminated bollards, landscaping)(, trees, shrubs, vegetation, etc.) what they whether or not shown on the plans and whether they are on private land or within Street rights-of-way. In short, any existing works for which no particular article was provided must be taken into account.

.4 All costs incurred by the Contractor for the identification, protection and replacement (if damaged by the work) of all these works are deemed included in the bid amount.

1.8 WATER MANAGEMENT

.1 Keep excavations free of water while work is in progress, which includes groundwater, surface waters, from rain, snow, sewers, etc.

.2 The Contractor shall submit for approval, the details of the temporary adjustments it intends to put in place for water management, the period during which these adjustments will be required and an emergency procedure in the event of significant water inflow. In particular, the Contractor must avoid adding sediment to the storm sewer system caused by materials that may be eroded and transported to the site.

.3 The Contractor shall ensure at all times not to alter the quality or block the free flow of water.

1.9 ACCIDENTAL SPILLAGE

.1 In the event of an accidental spill, the Contractor must contact the Departmental Representative and officer of the environment.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Class A borrow material and conform to NQ 2560-114.

.1 MG-112 borrow materials: used for sub-base foundations, filter sand or draining

Sieve Designation	% Passing MG-112
112 mm	100
31.5 mm	-
20 mm	-
14 mm	-
5 mm	12 - 100
1.25 mm	-
0.315 mm	-
0.080 mm	0 - 10

.2 CG-14 borrow materials : used for sub-base foundations or pipe bedding and backfill

Sieve Designation	% Passing CG-14
20 mm	100
14 mm	-
5 mm	35 - 100
1,25 mm	-
0,315 mm	-
0,080 mm	0 - 10

.3 MG-20 borrow materials : clean crushed stone free of shale, clay, powdery material, and plant material used for the bases of concrete structures, and foundations.

Sieve Designation	% Passing MG-20
31,5 mm	100
20 mm	90 - 100
14 mm	68 - 93
5 mm	35 - 60
1,25 mm	15 - 38
0,315 mm	5 - 17
0,080 mm	2 - 7

.2 Class B materials : all compactable soil conforming to MTQ standard 1101 consisting of materials from the excavation or from another source, authorized by the Departmental Representative for the proposed use. These materials must be free of stones whose largest dimension exceeds seventy-five millimeters (75 mm), clinker, ash, patches of grass, waste and roots. Organic soils or soils containing organic matter, contaminated soils or soils containing waste and soils containing frozen masses are excluded from this classification.

.3 Crushed stone :

.1 Crushed stone MG 56 : Natural river granular material or crushed stone clean and free of shale, clay, powdery matter and vegetable matter; the particle size range must respect the following limits (after compaction):

Sieve Designation	% Passing
80 mm	100
56 mm	82 – 100
31,5 mm	55 – 85
5 mm	25 – 50
1,25 mm	11 – 30
0,315 mm	4 – 18
0,080 mm	2 – 7

.4 Borrow materials and those used as crushed stone must have the following physical characteristics (at least 95% of the results):

Test	Criterion	
Los Angeles	Maximum	50
Micro-Deval	Maximum	35
Micro-Deval and Los Angeles	Maximum	80
Fragmentation	Minimum	50 %
Organic materials	Maximum, gravel pits, and sand pits only	0,8 %
Methylene Blue Value	Maximum, gravel pits, and sand pits only	0,20

PART 3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control plans, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Cut pavement or sidewalks neatly along limits of proposed excavation in order that surface may break evenly and cleanly. The saw-cut lines must be made at 300 mm from the upper edge of the excavation.

3.3 PREPARATION/PROTECTION

.1 Protect existing features in accordance with applicable local regulations.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to the Departmental Representative approval.

.4 Protect natural and artificial elements required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

.6 Protect the slope of excavation from the effects of frost, erosion, landslides, rock falls and any other natural or accidental degradation phenomenon of soil.

.7 Protect the bottom excavations against frost.

.8 Take the necessary measures and approved to eliminate dust produced.

.9 Protect levelling guides, route guides, survey limits geodetic terminals.

.10 Protect adequately facilities and existing equipment located on the site, so that they are not damaged during the work.

.11 Protect the bottom excavations against any softening. If this happens, then remove the softened earth and replace it by 20 mm clean stone borrow material according to the guidelines of the Departmental Representative.

.12 Never stack dredged material to a location where they could potentially affect the work or drainage of the land. Follow the regulations and applicable law (including the rules of the CNESST) for storage of materials excavated near the excavated area.

3.4 STOCKPILING

.1 Stockpile borrow materials and excavation materials in areas designated by the Departmental Representative.

.1 Stockpile granular materials in a manner to prevent segregation.

.2 A minimum clearance of one (1) meter from the security fencing must be respected.

.2 Protect borrow materials and excavation materials from contamination.

.1 The Contractor shall install a geotextile under all stockpiled materials. The Contractor shall take all necessary measures to protect the geotextile.

.2 For contaminated materials, the Contractor shall comply with the specifications of the section 01 35 43 – Environmental Procedures

.3 Implement sufficient erosion and sediment control measures to prevent sediment release out of work site limits and into streams/watercourses.

3.5 SURPLUS MATERIALS

.1 All excess excavation material will be removed from the site at the Contractor’s expense.

3.6 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while work is in progress.

.2 Protect open excavations against flooding and damage due to surface run-off.

.3 Dispose of water to approved cumulation areas in accordance with section 01 35 43 – Environmental Procedures, runoff areas and in a manner not detrimental to public and private property, or portion of work completed or under construction:

.1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

.4 Provide for the Departmental Representative's review and approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

3.7 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated on plans.

.2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation. Waste materials must be disposed out of the work site.

.3 Excavation must not interfere with bearing capacity of adjacent foundations. Do not disturb the cone of normal load transfer at 45 degrees under the supporting structures.

.4 Stockpile excavation and borrow materials at a safe distance from the edge of the trenches as directed by the Departmental Representative.

.5 Restrict vehicle operations directly adjacent to open trenches.

.6 Dispose of excavation materials that are waste materials offsite and stockpile surplus excavation materials in the area designated by the Departmental Representative.

.7 Do not obstruct the flow of surface drainage or natural streams/watercourses.

.8 Protect existing lines in the areas of excavation. Ensure that the flow in the pipes is maintained for the duration of the excavation.

.9 Trench bottoms shall be of approved grade and consist of undisturbed soil, level, free from loose, soft or organic matter.

.10 Notify the Departmental Representative when the projected level of excavation bottom is reached.

.11 Obtain the Departmental Representative approval of completed excavation.

.12 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Departmental Representative.

.13 Correct unauthorized over-excavation as follows:

.1 If materials from the bottom of the excavation have been disturbed, compact them to a density at least equal to that of the undisturbed soil;

.14 When required, carefully saw-cut, concrete, along the lines of excavation so that the surface breaks sharply and equal. The saw-cut lines must be vertical.

3.8 STRUCTURES OF CONCRETE AND ASPHALT CUT

.1 Dig the trenches of a width exceed 600 mm on each side the width of concrete structures.

.2 The bottom of trench excavation shall be level, solid and free from pieces of rock or loose rock, mud, earth and other debris.

.3 Equalize the bottom of trench excavation to prevent the formation of water basin.

.4 Compact the soil on the bottom of the work to ninety-five percent (95%) of maximum dry density corrected.

3.9 ASPHALT SURFACE CUT

.1 Before excavation in a street, road, parking or other surface paved, cut paving using a saw designed for this kind of work.

.2 Take account of an area planned for the transition between the new excavation and the existing part.

.3 Remove and transport waste materials containing pieces of surface covers, sidewalks, curbs in a site approved by the Minister of the Environment and Fight Against Climate Change (MELCC).

3.10 FILL - GENERAL

.1 Notify the Departmental Representative following the installation of the elements at bury before beginning the work of backfill to permit inspection.

.2 Do not start before filling before:

.1 The inspection and approval of facilities by the Departmental Representative;

.2 Inspection, testing, approval of underground utilities networks and the recording of their location;

.3 The removal of formwork for concrete;

.4 The removal of the works by shoring and bracing;

.5 Filling the gaps with an approved material.

.3 Areas to backfill must be free of debris, snow, ice, water, and frozen ground.

.4 It is forbidden to use of backfill materials which are frozen or contain snow, ice or debris.

.5 Implement backfill materials in uniform layers not exceeding the prescribed thickness, until the levels indicated. Compact each layer before extending the next layer.

.6 Take necessary measures to maintain the backfill material humidity such that it can be compacted to the required density.

.7 If, during the work, tests show that the borrow materials are not in accordance with the requirements set out in the present specifications, the Contractor shall remove and replace the unacceptable materials at its own expense.

3.11 BACKFILL FOR PAVING

.1 Sub base :

.1 Sub base material : MG-112 borrow material;

.2 Perform the setting up and the compaction of the sub base by successive layers of 300 mm maximum thickness to obtain the total thickness such that requested plans;

.3 Compact up to ninety-five percent (95%) of maximum dry density corrected.

.2 Foundation:

.1 Foundation material: MG-20 borrow material;

.2 Perform the setting up and the compaction of the upper Foundation by successive layers of 200 mm maximum thickness;

.3 Layer thickness : as indicated on drawings;

.4 Compact up to ninety-eight percent (98%) of the maximum dry density corrected.

.3 Spread perfectly implemented and compacted materials on a clean surface, unfrozen, free of snow and ice.

.4 Before you apply the next layer materials, give each layer a uniform profile and compact until the prescribed density.

3.12 CONCRETE STRUCTURE FILL

.1 Do not start filling before structures are inspected and approved by the Departmental Representative.

.2 Install the drainage system in the embankment, according to indications

.3 Implement and compact the backfill layer material in a continuous and uniform manner of no more than 300 mm thickness to the state not compacted. Take care not to move or damage to underground utility lines, drainage systems, water repellent coating and sealant of foundation walls. Repair any damage if necessary.

.4 Backfill foundation drains as required under the relevant sections.

.5 Complete backfill with a class A material (MG-112 borrow material), compacted to ninety five (95%) of the maximum dry density corrected, to the structure of the roadway. For concrete trenches, compact to 95% of the maximum dry density corrected.

.6 Do not implement the material around or above the works of concrete cast-in-place in the twenty-four (24) hours following the casting of concrete.

.7 Place the layers of MG-112 borrow material simultaneously on each side of the structures installed, to balance the load. The difference between the heights of filling shall not exceed 300 mm.

.8 When the ground is likely to temporarily put uneven pressure on the walls or on the other structures:

.1 Let the concrete harden for at least fourteen (14) days, or wait that it is robust enough to withstand the pressure exerted by the backfilling and compaction, and it is approved by the Departmental Representative.

.2 If it is approved by the Departmental Representative, install stays or of wall plates in order to neutralize the uneven pressure and leave it in place until it authorizes the removal.

.3 Under concrete structures, make a base layer of 300 mm thick after compaction, with MG-20 borrow materials. Compact the layer to 95% of maximum dry density corrected.

.4 Under concrete works (curbs, sidewalk) make a base layer of 150 mm thick after compaction, with MG-20 borrow materials. Compact the layer to 98% of maximum dry density corrected.

3.13 EXCAVATION OF UNSTABLE SOIL AND BACKFILLING

.1 If a overburden excavation is required by the Departmental Representative below the theoretical depth of planned excavations (pavement, concrete slabs, pipelines, structures, etc.), this overburden excavation must be backfilled with the backfill material further selected by the Departmental Representative among those listed below:

.1 Class A borrow material - sand;

.2 20 mm clean stone borrow material.

.2 At the time to require the over-excavation, the Departmental Representative will determine and instruct the Contractor the choice of the complementary backfill material and the modalities of its implementation.

3.14 RESTORATION

.1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed the Departmental Representative.

.2 Replace topsoil as indicated the Departmental Representative.

.3 Reinstate lawns to elevation which existed before excavation or according to elevations on plans.

.4 For existing infrastructures to conserve, repair pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

.5 Clean and reinstate areas affected by Work as directed by the Departmental Representative.

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

END OF SECTION

PART 1 GENERAL INFORMATION

1.1 RELATED SECTIONS

.1 Section 31 23 33.01 - Excavation, trenching and backfilling.

.2 Section 33 05 16 - Manholes and catch basins.

.3 Section 33 46 00 - Subdrainage.

.4 Notwithstanding the foregoing, it is the Contractor's responsibility to obtain a copy of all sections of these specifications even if they do not appear to be relevant to his speciality. The Contractor implicitly acknowledges that he accepts the clauses and requirements of all sections of the specifications, even if he fails to review certain sections. Refer to the table of contents for a complete list of the specification sections.

1.2 PAYMENT METERING

.1 No metering will be performed for payment purposes. Include the cost of geotextiles and membranes that act as a barrier to prevent the mixing of different sized granular materials in the overall excavation and backfill costs.

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM D 4491-20, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

.2 ASTM D 4595-17, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

.3 ASTM D 4716/D 4716M-20, Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

.4 ASTM D 4751-20, 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-M89(R2013), Textile Test Methods—Bursting Strength—Ball Burst Test (Reaffirmation of September 1989).

.2 CAN/CGSB 148.1-M(2003), Methods of Testing Geosynthetics—(Complete Set).

1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED

.1 Submit samples in accordance with Section 01 33 00—Submittal procedures

.2 At least four (4) weeks prior to commencement of work, and as per Section 01 33 00—Submittal procedures, submit the required number of copies of mill trial results and certificates to the Engineer.

1.5 TRANSPORTATION, STORAGE, AND HANDLING

.1 While in transit and storage protect geotextiles from direct sunlight, ultraviolet radiation, excessive heat, mud, dust, debris, and rodents.

PART 2 PRODUCTS

2.1 MEMBRANE FOR COATING THE FOUNDATION DRAIN'S NET STONE

.1 Geotextiles: nonwoven synthetic fibre fabric provided in rolls:

.1 Width: no less than 3.5 m.

.2 Length: no less than 150 m.

.2 Physical properties:

.1 Thickness: no less than 0.90 mm, as per ASTM D 5199.

.2 Tensile strength and elongation determined by the pull-out method: as per CAN/CGSB 148.1 No. 7.3.

.1 Breaking force: no less than 550 N

.3 Hydraulic property:

.1 Filtration aperture (FOS): 81—150 micrometres as per CAN/CGSB 148.1 No. 10.

2.2 MEMBRANE AROUND MANHOLES

.1 Nonwoven needled geotextile, laminated with a PVC geomembrane provided in rolls:

.1 Width : no less than 1.83 m.

.2 Length : 15 m or 30 m.

.2 Physical propperty :

.1 Thickness : no less than 5 mm, as per ASTM D5199.

.3 Mechanical properties :

.1 Elongation at break: 80 -140 % as per ASTM D4632.

.2 Tear strength MD : Minimum breaking force of 400 N as per ASTM 4533.

.3 Tear strength MD : Minimum breaking force of 610 N as per ASTM 4533.

.4 CBR puncture resistance : Minimum breaking force of 3065 N as per ASTM D6241.

.4 Hydraulic property :

.1 Transmissivity under 8kPa at a gradient = 1 : 6 x 10^{-5} m^2/s as per ASTM D4716.

PART 3 EXECUTION

3.1 OVERVIEW

.1 Check Conditions: Before installing geotextiles, ensure that the condition of previously installed surfaces/substrates under other sections or contracts is acceptable and allows the work to be performed according to the manufacturer's written instructions.

.1 Visually inspect surfaces/substrates in the presence of the Departmental Representative.

.2 Immediately notify the Departmental Representative of any observed unacceptable condition.

.3 Commence installation work only after unacceptable conditions have been corrected and written approval has been received from the Departmental Representative.

3.2 INSTALLATION

.1 On graded surfaces, install geotextiles by unrolling them in the specified direction, manner, and location and secure them with stone or concrete blocks.

.2 Lay the geotextiles to obtain a smooth surface free of wrinkles, buckles, and areas under tension.

.3 Overlap geotextile joints by 600 mm.

.4 Prevent the geotextiles from moving and protect them from damage or deterioration before, during, and after installing the protective layers.

.5 Apply the layer of granular material within four (4) hours of installing the geotextile.

.6 Replace damaged or deteriorated geotextiles to the satisfaction of the Engineer.

.7 Layer and compact granular materials as per Section 31 23 00—Excavation and Backfilling.

3.3 CLEANING

.1 Clear construction waste from the site and dispose of in an environmentally sound manner as per regulatory requirements.

3.4 PROTECTION MEASURE

.1 Prohibit vehicle traffic directly on the geotextiles.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 74 11 – Clean-up.

.2 Section 31 11 00 – Earthworks - Minor Works.

.3 Section 32 91 19.13 – Topsoil Placement and Grading.

1.2 REFERENCES

.1 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33

.2 Fertilizers Act (RSC, 1985. c. F-10.

.3 Fertilizers Regulations (CRC, c. 666

.4 Transportation of Dangerous Goods Act (SC 1992, ch. 34)

.2 Pest Management Regulatory Agency ((PMRA).

.1 Standard for Pesticide Education, Training and Certification in Canada (1995).

.3 Canadian Nursery Landscape Association (CNLA)

.4 Société internationale d'arboriculture Québec (SIAQ) best practices.

.5 Bureau de normalisation du Québec — NQ 0605 0605/-200 (BNQ)— Arboreal and Horticultural Management.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit data sheets and manufacturer's instructions and product literature if requested.

1.4 QUALITY ASSURANCE

.1 Perform construction occupational health and safety.

.2 Company carrying out the work must be a commercial member in good standing of the SIAQ (Société internationale d'arboriculture Québec).

.3 Field Samples: do sample pruning in manner to enable Departmental Representative to identify:

.1 Knowledge of target areas including branch bark ridge and branch collars.

.2 Technique for selection process and pruning used to establish desired form and shape for each species.

.4 Acceptance of Work will be determined by Departmental Representative from field sample.

1.5 SCHEDULING

.1 Obtain approval from Departmental Representative of schedule indicating beginning of Work.

1.6 IDENTIFICATION

.1 Contractor and Departmental Representative must identify the plantings on site to be preserved and protected. Contractor must apply measures in accordance with the Departmental Representative's instructions.

1.7 PROTECTION

.1 Do not damage plantings, site features, markers, existing buildings, public utility services that must remain in place. Repair damage.

.2 Contractor may use wood chips to reduce compaction of roots or to control surface water. Wood chips must be removed once landscaping work is completed.

.3 The following is not allowed without written consent from the Departmental Representative

.1 Removal, pulverization, fertilization, pruning, above or below ground, disturbance or modification of trees.

.2 Objects or materials interfering with supply of water, air or nutrients to root systems.

.3 Marking, puncture or removal of tree bark, including any action likely to damage the tree bark.

.4 Attaching objects to trees.

.5 Attaching objects to tree supports and protection.

.6 Exposing trees to toxic or hazardous substances in gas, liquid or solid form.

.7 Exposing trees to heat from fire or other source.

.8 Changing slopes and drainage, creating obstacles to water, air and nutrient supply to trees.

.9 Attaching materials to trees and leaning materials on trees while executing work in their vicinity.

.10 Removing or displacing tree protection.

.11 Interfering with openings in tree protection, creating obstacles to water, air and nutrient supply to trees.

.12 Excavating, disturbing or compacting soil inside drip line of trees.

.13 Excavating, disturbing or compacting soil inside drip line of trees.

.14 Digging ditches, tunnels or trenches, building or covering walkways inside drip line, or at a distance from a tree's truck equal to 10 times its diameter, measured at 1.40 metres from the ground with a minimal distance of 100 cm.

.4 Meet with Departmental Representative prior to carrying out work near trees to avoid prohibited actions. A procedure will be provided at the meeting specifying the work methods to be used near the trees and protective measures.

1.8 TOOL MAINTENANCE

.1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.

.2 Disinfect tools before each tree is pruned.

.3 On diseased plant material disinfect tools before each cut.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Materials:

- .1 High density polyethylene fencing, 1,200 mm high, orange.
- .2 Steel T stake, 2,500 mm.
- .3 Wood to protect tree trunks: softwood (spruce, pine or balsam), utility grade, 38 x 65 x 1,830 mm.
- .4 Metal straps as needed and approved by Departmental Representative.
- .5 White geotextile.
- .6 Reinforcing 100% non-woven needle-punched geocomposite or equivalent, air and water permeable.
- .7 Steel rod or stake, 600 mm.
- .8 Soil: refer to specifications under Section 32 91 19.13 – Topsoil Placement and Grading.

.2 Peatmoss:

- .1 Derived from partially decomposed species of Sphagnum Mosses.
- .2 Elastic and homogeneous.
- .3 Free of wood and deleterious material which could prohibit growth.
- .4 Shredded particle minimum size: 5 mm.

.3 Fertilizer:

- .1 To Canada Fertilizer Act and Fertilizers Regulations.
- .2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.

.4 Trunk injected microcapsule fertilizer.

.5 Filter fabric.

- .1 Type: 100% non-woven needle punched polyester, 2.75 mm thick, 240 g/m2 mass.

.6 Wood posts: 38 x 38 x 600 mm length.

PART 3 EXECUTION

3.1 IDENTIFICATION AND PROTECTION

.1 Perform construction occupational health and safety.

.2 Contractor and Departmental Representative must identify the plantings on site to be preserved and protected. Contractor must apply measures in accordance with the Departmental Representative's instructions.

.3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.

.4 Ensure no pruning is done inside drip line shown in the drawing. If pruning inside drip line is required consult a Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

.5 Departmental Representative must inspect Contractor's protective measures prior to beginning work. If necessary the Departmental Representative will request to have branches over work zone trimmed by specialized personnel. Trimming must be supervised based on guidelines provided to the workers.

.6 Remove tree and shrub roots exposed or damaged by excavation or removal of existing structures by specialized personnel and as indicated by Departmental Representative. Use clean cuts or tree surgery.

3.2 PROTECTIVE FENCING

.1 Apply the following measures during construction period to all Work lasting two days or more.

.2 Use fence to identify protection zone for plant groupings and row of trees. Mobile fencing is allowed inside work zone provided. However, root systems located inside work zone must be protected.

.3 Install fence as far as possible from optimal tree protection zone or as indicated by Departmental Representative if Work is located within optimal tree protection zone. If Work is located within optimal tree protection zone, install fence at minimum tree protection perimeter, determined case by case with Departmental Representative.

.4 Circulation of machinery, storage of materials and excavation, clearing, backfilling or grubbing work is prohibited inside the optimal tree protection zone as indicated in tree protection plan table or inside fenced tree protection zones.

.5 Remove tree protection and access road fencing after site is fully restored and approved by Departmental Representative.

.6 Follow Departmental Representative's indications for installing fencing 1.2 metres high and 3 metres minimum distance from trunk, wooded area, tree or trees and shrubs to be preserved. Fencing may also be located outside drip line, as specified by Departmental Representative. Fencing (high density polyethylene 35 KN) must be attached to steel stakes spaced every two metres.

3.3 TRUNK PROTECTION

.1 Where fencing cannot be installed, protect trees identified by the supervisor with 2 metre planks around the trunks of all trees identified by Departmental Representative. Secure planks with plastic or steel straps cushioned with two strips of rubber such as tire rubber.

3.4 ROOT CURTAIN SYSTEM

.1 Identify limits for required construction excavation as approved by Departmental Representative.

.2 Clearly identify excavation boundaries near protected trees. Departmental Representative must approve excavation boundaries around root systems of trees identified on plan prior to commencement of work.

.3 Prior to construction excavation, dig down to rock for trees located along Grande-Allée and dig down 400 mm for trees along George V Est, a trench 500 mm wide along excavation boundary around tree root systems indicated on plan.

.4 Clear around roots along excavation trench following the protection zone identified on plan. Clean cut roots in trench using sharp tool (concrete saw). Trim roots during excavation work or after clearing root systems. Remove cut roots. Do not pull with machinery. Do not cut roots unless in the presence of Departmental Representative.

.5 Excavation or root removal work near trees must be carried out using methods or techniques keeping tree's root system intact.

.6 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards

.7 Secure filter cloth using wooden stakes on vegetation side the full height of excavation and at least one (1) m over surface.

.8 Protect root protection system from damage during construction.

.9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.

.10 Water protective screen using fine spray or drip irrigation system. Avoid eroding soil near trees.

.11 Protect root curtain from damage during construction operations.

3.5 EXCAVATION ABOVE TREE ROOT SYSTEM

.1 Excavate above tree root system in the fall of 2022 to avoid stressing the trees along Grande-Allée.

.2 At the protection boundary identified on the plan, manually excavate and remove sod and a thin layer of topsoil to a thickness of approximately 85 mm without damaging the existing root system.

.3 Use methods or techniques that preserve the integrity of tree root system to excavate or clear roots near trees.

.4 During construction, water plants and root protection sufficiently to maintain optimum soil moisture conditions until backfill operations are completed.

.5 Water root barrier using fine spray or by installing a drip irrigation system. Avoid erosion of natural soil near the tree.

.6 Immediately and progressively cover the surface of all tree islands, including exposed root systems, with a geotextile drainage membrane.

.7 Cover stone screening membrane with thicknesses indicated on plan.

.8 Maintain tree island protection fence during and after earthwork operations.

3.6 PROTECTION AGAINST COMPACTION

.1 To store or circulate machinery within the optimal tree protection zone, notify

Departmental Representative at least 48 hours in advance and obtain authorization.

.2 If authorization is granted, implement additional soil protection measures to prevent

disturbance or compaction of soil. Spread 300 mm layer 20-40 mm clean crushed stone on reinforcing 100% non-woven needle-punched geocomposite or equivalent, air and water permeable over traffic and storage areas located between optimal and minimum tree protection zones. Lay stone using machinery with crawler tracks and carefully remove after Work. Apply this measure to all accesses on site located between the optimal and minimum tree protection zones.

.3 Protection must be in good condition and maintained for the duration of Work.

3.7 EXCAVATION WORK IN THE AREA COMPRISED BETWEEN THE OPTIMAL TREE PROTECTION ZONE AND MINIMAL TREE PROTECTION ZONE

.1 Every tree to be preserved and protected during excavations between optimal and minimal protection perimeter must respect all root system protection measures.

.2 Departmental Representative must evaluate the particular situation of every tree where excavation work is to be done between optimal and minimal tree protection perimeter.

.3 Axis and trench limits must be assessed by Departmental Representative before any excavation work can begin.

.4 Contractor must notify Departmental Representative 48 hours before top soil stripping, excavation or clearing within the optimal and minimal tree protection perimeter. Work methods must be approved beforehand by Departmental Representative and work cannot begin presence of Departmental Representative.

.5 Excavation work must be done carefully so that tree roots are not damaged in any way. Excavator operators must begin excavation carefully by digging a trench from the exterior of the optimal protection perimeter and progressively advance towards the tree trunk until first roots are exposed. At tree roots, excavation under roots only to release surrounding soil without damage. Continue excavation until projected limit is reached.

.6 Clean cut roots in trench using sharp tool (concrete saw). Trim roots during excavation work or after clearing root systems. Do not cut roots unless in the presence of Departmental Representative.

.7 Each tree where excavation took place in its minimal protection zone must be evaluated by the Departmental Representative. Excavation work must be done one tree at a time. Departmental Representative to re-evaluate final work in cases where stability or survival of tree is compromised.

.8 Take necessary measures to promptly backfill excavated trenches near trees. Backfill within 24 hours of excavation work.

3.8 COMPENSATORY PRUNING AND FERTILIZATION

.1 Clearing work area: Remove branches interfering with machinery and likely to be damaged as indicated on site by Departmental Representative.

.2 Remove branches prior to machinery work following thinning procedure defined under section IV of BNQ 0605-200/2020 (Arboreal and Horticultural Management).

.3 Pruning work must be carried out by arborists certified by a recognized institution or organization and who have undergone training in safe arboriculture-pruning work practises. Spikes to carry out pruning work are prohibited.

.4 Compensatory pruning: Carry out compensatory pruning of trees prior to final acceptance of Work, one year after Work, ie spring 2024. Purpose is to improve aesthetics and further promote health of the tree. Remove dead, dying, diseased and weak branches. Comply with current pruning standards.

.5 Dispose of cuttings in such a way as not to affect the quality of the environment in accordance with the regulations in force. Waste that may increase the spread of insects or diseases (e.g. Dutch elm disease) must be treated and disposed of in accordance with requirements of current regulations.

.6 Remove live branches that:

.1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.

.2 Are of weak structure including narrow crotches.

.3 Obstruct development of more important branches.

.4 Are broken.

.7 Remove live branches to re-establish natural species form including:

.1 One or more developing leaders.

.2 Multiple growth due to previous topping.

.3 Branches extending outward from natural form.

.4 Undesirable sucker growth.

.8 Remove loose branches, twigs and other debris lodged in tree.

.9 Remove vines.

.10 For branches under [50] mm in diameter:

.1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.

.2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.

.3 Do not cut lead branches unless directed by Departmental Representative.

.11 For branches under 50 mm in diameter:

.1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.

.2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.

.3 Make final cut adjacent to and outside branch collar.

.12 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.

.1 Repair areas which are damaged, or remove damaged area back to next branch collar.

.13 Remove additional growth designated by Departmental Representative.

.14 Fertilizing: Apply phosphorus-rich fertilizer to trees with damaged root systems.

.15 Fertilize by micro-injection prior to final acceptance of Work, one year after Work, i.e. spring 2024. Apply fertilizer in a single dose during the period of bud opening and leaf unfolding no later than mid-June.

3.9 WATERING

.1 Trees for which protective measures are required to be identified by Departmental Representative.

.2 Trees for which protective measures are required to be identified by Departmental Representative.

.3 Water root system to prevent soil from drying along excavated areas.

.4 Water plantings and transplants within diameter of tree cover to 15 cm deep, successively to facilitate penetration of water in mulch and minimize runoff.

.5 Water root systems two times per week during construction period or excavation when roots systems have been exposed. Each tree may require an average 1,000 litres of water per watering. Continuous automated watering is also an option.

3.10 PENALTY FOR DAMAGE TO TREES

.1 If breakage or damage is caused to trees to be conserved during Work, Departmental Representative must first determine whether repair or restoration is possible. If damage is caused to trees, Departmental Representative will give instructions for repair or restoration to the contractor, who must carry out work at own expense.

.2 Any unauthorized felling of a tree or injury to a tree is considered an offence and subject to penalties specified.

3.11 CLEAN-UP

.1 Proceed in accordance with Section 01 74 11 — Cleaning.

.2 Collect and dispose of compost/recycle whenever applicable and remove daily from site.

.3 Chip all vegetative matter removed during clearing and grubbing work and dispose of at authorized sites according to regulations in force.

.4 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.5 Apply strict control to the disposal of elms, due to Dutch Elm disease and butternut canker. Remove all parts of elm trees that have been cut, including the trunk, to an authorized disposal facility and provide proof to Departmental Representative.

END OF SECTION

PART 1 GENERAL INFORMATION

1.1 RELATED SECTIONS

.1 Section 31 23 33.01 - Excavation, trenching and Fill.

.2 Section 32 16 00 - Concrete Walks, Curbs, and Gutters.

.3 Section 33 05 16 - Manholes and catch basins.

.4 Notwithstanding the foregoing, it is the Contractor's responsibility to obtain a copy of all sections of these specifications even if they do not appear to be relevant to his speciality. The Contractor implicitly acknowledges that he accepts the clauses and requirements of all sections of the specifications, even if he fails to review certain sections. Refer to the table of contents for a complete list of the specification sections.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.2 ASTM C117- 13, Standard Test Methods for Material Finer Than 0.075 mm in Mineral Aggregates by Washing.

.3 ASTM C131- 06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.4 ASTM C136- 06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.5 ASTM D698- 12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3) (600 kN-m/m3).

.6 ASTM D1557- 12, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2,700 kN-m/m3).

.7 ASTM D1883- 07e2 07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.8 ASTM D4318- 10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.9 Canadian General Standards Board (CGSB):

.1 CAN/CGSB- 8.1- 88, Wire Cloth Test Sieves, Non-Metric

.2 CAN/CGSB- 8.2- M88, Wire Cloth Test Sieves, Metric

.10 *Ministère des Transports du Québec* (MTQ), general specifications (CCDG), latest edition.

.11 NQ 2501-258/2012— Soils— Determination of water content— density relationship— Vibration hammer test.

.12 MTQ, Standard 1101 - Soil Classification, latest version.

.13 MTQ, Standard 2101 - Aggregates, latest version.

.14 BNQ 2560 - 114/114, Civil Engineering Work—Aggregates.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Direct unused aggregates to a local off-site quarry or processing facility.

PART 2 PRODUCTS

2.1 MATERIALS

.1 MG-20 crushed stone as per the requirements of Section 31 23 33.01—Excavation, trenching and Backfill.

PART 3 EXECUTION

4. PLACING

.1 Place granular sub-base after subgrade is inspected and approved by the Departmental Representative.

.2 Placing:

.1 Construct granular sub-base to depth and grade in areas indicated. No reused material will be allowed.

.2 Ensure no frozen material is placed.

.3 Place materials on a clean, unfrozen surface, free of snow or ice.

.4 Place granular sub-base materials using methods which do not lead to segregation or degradation

.5 Place the material to full width of the structure to be built, in uniform layers not exceeding 300 mm compacted thickness.

.6 Shape each layer to a smooth contour and compact to specified density before succeeding layer is placed.

.7 Remove and replace any portion of a layer in which material has become segregated during spreading.

.3 Compaction:

.1 Compaction equipment must be capable of obtaining required material densities for the present work.

.2 Compact to not less than 98% of the corrected maximum dry density.

.3 Alternately shape and roll to obtain a smooth, even, and uniformly compacted foundation.

.4 During compaction, apply water as necessary to obtain the stipulated density.

.5 In areas not accessible to compaction equipment, also known as rolling equipment, compact the material to the stipulated density with a vibrating plate or mechanical tampers.

.6 Correct surface irregularities by loosening the soil and adding or removing material until the surface is within the stipulated tolerances.

4.2 TRANSITIONS

.1 The transition for connection with the existing pavement structure shall be 1V: 1H in the granular sub-base and base layers.

4.3 TOLERANCES

.1 The permissible deviation of the finished base surface is 10 mm above or below the stipulated grade and cross-section; however, this deviation, high or low, may not be uniform over the entire surface of the base surface.

4.4 PROTECTION

.1 Maintain finished sub-base in a condition that conforms to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

4.5 BATCH REJECTION

.1 A batch is rejected when the difference between the average of the three (3) particle size results and the required values exceeds at least one of the critical deviations (CD) defined below:

.2 CD (for 112 mm sieve specification): - 5%

.3 CD (for the sieve specification above 80 µm): + 1%

.4 In such case, the Contractor shall remove and replace, at his expense, the granular materials included in the rejected batch.

END OF SECTION

PART 1 GENERAL INFORMATION

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 - Excavation, trenching and Fill.

.2 Section 32 16 00 - Concrete Walks, Curbs, and Gutters.

.3 Section 33 05 16 - Manholes and catch basins.

.4 Notwithstanding the foregoing, it is the Contractor's responsibility to obtain a copy of all sections of these specifications even if they do not appear to be relevant to his speciality. The Contractor implicitly acknowledges that he accepts the clauses and requirements of all sections of the specifications, even if he fails to review certain sections. Refer to the table of contents for a complete list of the specification sections.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) 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 D 698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft lbf/ft^3) (600 kN-m/m^3).

.5 ASTM D1557-09, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft lbf/ft^3) (2,700 kN-m/m^3).

.6 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.7 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, Wire Cloth Test Sieves, Non-Metric

.2 CAN/CGSB-8.2-M88, Wire Cloth Test Sieves, Metric.

.3 *Ministère des Transports du Québec* (MTQ), general specifications (CCDG), latest edition.

.4 NQ 2501-258/2012— Soils—Determination of water content—density relationship—Vibration hammer test.

.5 MTQ, Standard 1101—Soil Classification, latest version.

.6 MTQ, Standard 2101—Aggregates, latest version.

.7 BNQ 2560— 114/114, Civil Engineering Work—Aggregates.

1.3 TRANSPORTATION, STORAGE, AND HANDLING

.1 Transport, store, and handle materials and equipment as per Section 31 05 16—Aggregate Materials and the manufacturer's written instructions.

.2 Storage and handling

.1 Stockpile a minimum 50% of total aggregate required prior to commencing operations.

.2 Store materials and equipment in a clean, dry, well-ventilated area as per manufacturer's recommendations.

.3 Replace damaged materials and equipment with new materials and equipment.

.4 Store cement in weatherproof bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

PART 2 PRODUCT

2.1 MATERIALS

.1 Granular base materials shall be as per Section 31 05 16—Aggregate Materials and those set out below.

.1 Crushed stone or gravel.

.2 Granulometry shall be within the specified limits when tested to ASTM C136 and ASTM C117 standards. Sieve sizes to be as per CAN/CGSB 8.1 or CAN/CGSB 2 standards.

.1 Method 1—Sizing requirements as per the following:

Sieve designation	**% of underflow**		
	(1)	(2)	(3)
100 mm	-	-	-
75 mm	-	-	-
50 mm	[100]	-	-
37.5 mm	[70–100]	-	-
25 mm	-	[100]	-
19 mm	[50–75]	-	[100]
12.5 mm	-	[65–100]	[70–100]
9.5 mm	[40–65]	-	-
4.75 mm	[30–50]	[35–60]	[40–70]
2.00 mm	-	[22–45]	[23–50]
0.425 mm	[10–30]	[10–25]	[7–25]
0.180 mm	-	-	-
0.075 mm	[3–8]	[3–8]	[3–8]

.2 Method 2—Granulometric requirements as per the following: specify the name of the agency having jurisdiction and the type of material required but specify that the 0.075 mm sieve shall not pass more than 8% of the particles.

.3 The granularity of type 2 materials used to level surface depressions shall be as per Method 1.

.4 Liquidity limits: not more than 25, as per ASTM D4318 standard.

.5 Plasticity index: not more than 6, as per ASTM D4318 standard.

.6 Los Angeles test (resistance to fragmentation): maximum loss of 45% by weight, as per ASTM C131 standard.

.7 Crushed particles: At least 60% by weight of the particles passing through the sieves listed below must have at least one (1) newly broken surface. Separate materials by size, as per the methods described in ASTM C136 standard.

Passing the sieve		Retained on the sieve
[50] mm	to	[25] mm
[25] mm	to	[19.0] mm
[19.0] mm	to	[4.75] mm

.8 CBR index after immersion: measured as per the test described in ASTM D1883 standard, the index must be at least 80 after compaction of the sample at 100% as per ASTM D1557 standard.

PART 3 EXECUTION

3.1 PREPARATION

.1 Temporary erosion and sediment control

.1 Use temporary erosion and sediment control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust and particles to adjacent properties and walkways.

.2 Inspect, maintain, and repair implemented control measures as necessary until permanent vegetation has been established.

.3 Remove the control measures and restore and stabilize the areas disturbed during this work.

3.2 SET-UP AND INSTALLATION

.1 Once the foundation layer has been inspected and approved in writing by the Dep place the granular base course materials.

.2 Placing

.1 Construct the granular sub-base to the depth and grade stipulated in the specified locations.

.2 Ensure no frozen material is placed.

.3 Place materials on a clean, unfrozen surface, free of snow or ice.

.4 Begin spreading the sub-base material on the crown line of the pavement or high side of a one-way slope.

.5 Place granular materials using methods which do not lead to segregation or degradation.

.6 Use spreaders equipped with adjustable rulers or templates to ensure that the material is spread in uniform layers of the required thickness.

.7 Place the material to full width of the structure to be built, in uniform layers not exceeding 150 mm compacted thickness.

.1 The Departmental Representative may authorize thicker layers to be applied if the stipulated compaction can be achieved.

.8 Shape each layer to smooth contours and compact to specified density before the succeeding layer is placed.

.9 Remove and replace any portion of a layer in which material has become segregated during spreading.

.3 Compaction equipment

.1 Ensure that the compaction equipment is capable of obtaining the required material density for the present work.

.2 Should the Contractor wish to use compaction equipment other than the one stipulated, the efficiency of this equipment must be proven at least as efficient as stipulated equipment at no extra cost and written approval must be received from the Departmental Representative before use.

.3 The compaction equipment shall be equipped with a device that records hours of actual work, not motor running hours.

.4 Compacting

.1 Compact to not less than 100% of the corrected maximum dry density.

.2 Alternately shape and roll the materials to obtain a smooth, even, and uniformly compacted base.

.3 During compaction, apply water as necessary to obtain the stipulated density.

.4 In areas not accessible to compaction equipment, also known as rolling equipment, compact the material to the stipulated density with mechanical tampers approved in writing by the Departmental Representative.

.5 Correct surface irregularities by loosening the soil and adding or removing material until the surface is within the stipulated tolerances.

.5 Proof rolling

.1 For proof rolling, use a standard roller with a gross weight of 45,400 kg, mounted on four pneumatic tires each carrying 11,350 kg and inflated to a pressure of 620 kPa. The four tires arranged abreast with centre to centre Spacing of 730 mm.

.2 Obtain written approval from the Departmental Representative to use non-standard proof rolling equipment.

.3 Proof roll at the level indicated for the granular base.

.1 If non-standard compaction equipment is approved, the Departmental Representative shall determine the level of proof rolling.

.4 Make sufficient passes with the proof roller to subject every point of the surface to three separate passes of a loaded tire.

.5 Where proof rolling reveals defects in any part of the subgrade, proceed as follows:

.1 Remove base, sub-base, and sub-grade materials to the depth and extent as directed by the Departmental Representative.

.2 Backfill the excavated subgrade with material from the sub-base, then compact as per Section 32 11 16.01—Granular Sub-base.

.3 Replace sub-base material and compact as per Section 32 11 16.01—Granular Sub-base.

.4 Replace the base materials and compact them as per the requirements of this section.

.6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by the Departmental Representative and replace with new materials as per Section 32 11 16.01—Granular Sub-base and this section at no extra cost.

3.3 TOLERANCES

.1 The permissible deviation of the finished base surface is [10] mm above or below the stipulated grade and cross-section; however, this deviation, high or low, may not be uniform over the entire surface of the base surface.

3.4 CLEANING

.1 Progress cleaning:

.1 Leave the work area clean at the end of each day.

.2 Final cleaning: upon completion, remove surplus materials, rubbish, tools and equipment from the site.

.3 Waste Management:

.1 Remove recycling bins and dumpsters from the job site and dispose of materials at the appropriate facilities.

.2 Move unused aggregate from the landfill to an approved local quarry as directed by the Departmental Representative.

3.5 PROTECTION

.1 Maintain finished sub-base in a condition conforming to this section until succeeding base is placed, or until granular sub-base is accepted by the Departmental Representative.

END OF SECTION

PART 1 GENERAL INFORMATION

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 - Excavation, trenching and Fill.

.2 Section 32 11 16.01 - Granular Sub-base.

.3 Section 32 11 23 - Aggregate Base Courses.

.4 Notwithstanding the foregoing, it is the Contractor's responsibility to obtain a copy of all sections of these specifications even if they do not appear to be relevant to his speciality. The Contractor implicitly acknowledges that he accepts the clauses and requirements of all sections of the specifications, even if he fails to review certain sections. Refer to the table of contents for a complete list of the specification sections.

1.2 REFERENCES

.1 ASTM International

.1 ASTM C 88-13, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.

.2 ASTM D 698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3[600 kN-m/m^3]).

.2 *Ministère des Transports du Québec* (MTQ)

.1 *Cahier des charges et devis généraux* (CCDG) (general specifications) - Latest edition.

.2 Standard 4201, Hot mix asphalt formulated according to the Marshall method.

.3 Standard 4202, Hot mix asphalt formulated according to the principle of the Pavement Laboratory method.

.4 Standard 4104, Fluidized bitumen.

.5 Standard 4105, Bitumen emulsions.

.3 *Devis des clauses techniques générales – Volume 1 – Conduites d'eau potable, égouts et voirie, version la plus à jour de la Ville de Québec* (specifications of general technical clauses - Volume 1 - drinking water, sewage and roadway conduits, City of Quebec's latest version).

1.3 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION

.1 Submit the required documents and samples as per Section 01 33 00 – Submittal Procedures.

.2 At least two (2) weeks prior to commencement of work, submit the asphalt mix design and test results to the Consultant for verification.

1.4 TRANSPORTATION, STORAGE, AND HANDLING

.1 Transport, store, and handle materials and equipment as per the manufacturer's written instructions.

PART 2 PRODUCTS

2.1 MATERIALS

.1 The materials in this section shall conform to the provisions of Article 3.4 of the *Devis des clauses techniques générales –Conduites d'eau potable et d'égouts* – dernière version (general technical specifications - water and sewer mains - latest version) and the following clauses:

.2 Bituminous mixes complying with standard 4201 or standard 4202 of the *Ministère des Transports du Québec* (MTQ)

.1 ESG-14 type base course with a minimum compacted thickness as per the plans for the pavement of the parking lot.

.2 ESG-10 wear course of a minimum compacted thickness as per the plans for the pavement of the parking lot.

.3 Aggregates: CGCC compliant

.1 ESG-14 Plant mix: 3b2.

.2 ESG-10 Plant mix: 3c2.

.4 PG 58-34 grade bitumin binder.

.5 Asphalt primer: bitumen emulsion compliant with MTQ standard 4105.

.1 Upon approval, use a fluidized bitumen that complies with MTQ standard 4104 after October 1st and before May 1st.

PART 3 EXECUTION

3.1 INSTRUCTIONS

.1 Conform to the provisions of Article 3.4 of the *Devis des clauses techniques générales – Conduites d'eau potable et d'égouts* – dernière version (general technical specifications - water and sewer mains - latest version) and the following clauses:

3.2 OVERVIEW

.1 Check Conditions: Prior to laying the bituminous pavement, ensure that the condition of previously installed surfaces/substrates under other sections or contracts is acceptable and allows the work to be performed according to the manufacturer's written instructions.

.1 Visually inspect surfaces/substrates in the presence of the Consultant.

.2 Immediately notify the Consultant of any observed unacceptable condition.

.3 Commence installation work only after unacceptable conditions have been corrected and written approval has been received from the Consultant.

3.3 ASPHALT PAVING

.1 Preparing the pavement surface: as per the CGCC.

.2 Applying the impregnation layer: as per the CCDG.

.3 Paving of asphalt concrete: as per the CCDG.

.4 Applicable penalty: as per the CGCC.

3.4 CLEANING

.1 Leave the work area clean at the end of each day.

3.5 "AS-BUILT" SURVEYS

.1 Each discipline shall produce a survey plan, incorporating all items implemented as part of the work, including all changes in construction.

.2 The Contractor shall survey the position (X, Y, ZSCOPQ NAD 83) of all structures built.

.3 Specifically, the Contractor shall survey all structures he has installed (buried and above ground structures and fixtures), and a complete survey is mandatory. This must include, but is not limited to, the following:

- manholes and catch basins (centre cover/grate)
- pipe racks
- sidewalks, curbs, and concrete slabs
- roadway profile every ten (10) metres and at slope changes
- buildings, fences, gates, etc.

.4 The electronic file (drawing including surveyed points in .dwg format) of all surveyed points shall be submitted to the Consultant for completion of the "as-built" drawings. This file shall be submitted to the Consultant two (2) weeks prior to the provisional acceptance of the project. The Engineer reserves this time to verify if any items are missing from the survey.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Action and Informational Submittals.

.2 Section 32 11 16.01 Granular Sub-base

1.2 REFERENCES

.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 CSA Group.

.1 CSA A23.1/A23.2-F09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA A231.1/A231.2-[-06(R2010)], Precast Concrete Paving Slabs/Precast Concrete Pavers.

.3 CSA A283-F06(R2011), Qualification Code for Concrete Testing Laboratories.

.3 Canadian Standards Association CSA International.

.1 CSA A23.1-F04 Concrete: Materials and Methods of Concrete Construction:

.2 CSA A23.2-F04 Concrete: Test Methods and Standard Practices for Concrete.

.3 CSA A23.4-F00 Precast Concrete - Materials and Construction.

.4 CANCSA-A179-04(A179-F04). Mortar and Grout for Unit Masonry.

.5 CSA A251-F00-C2005 Concrete: Rules for qualification for manufacturers of architectural concrete and precast structural concrete.

.6 CSA A231.2 Precast Concrete Paving Slabs.

.7 ASTM and ADA standards.

.4 Bureau de normalisation du Québec (BNQ).

.1 NQ 1809-840 Pavés préfabriqués en béton de ciment — Pose - Clauses techniques générales.

.2 NQ 2624-120 Pavés de béton de ciment préfabriqués.

.3 NQ 2624-900 Protocole particulier de certification — Pavés préfabriqués de béton de ciment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 — Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for concrete paver cladding. Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit data sheets for samples, tests, gradation, characteristics of following materials:

.1 Bedding: stone screenings.

.2 Polymeric sand for raking joints (joint filler).

.3 Samples:

.1 Submit full size sample of each type, standard size pavers.

.2 Submit product data for approval for the following:

.1 Concrete pavers.

.2 Joint filler.

.3 Bedding sand if quantities sufficient for analysis by a laboratory.

.3 Submit shop drawings for the following:

.1 Galvanized steel base cover for big lights, including anchors. Drawing to include design for manufacture.

.4 Provide samples for approval by Departmental Representative of approximately 20 sq. m. for commemorative area and 10 sq. m. for public space.

.5 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[s], colour[s] and texture.

.3 For testing to determine compliance with performance requirements. Perform the following tests:

.4 Construct mock-up where indicated.

.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 work. Approved mock-up may remain as part of finished Work.

.4 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.

.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.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: specializing in precast concrete paver installations with required permits and licences.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in clean dry well-ventilated area in accordance with manufacturer's recommendations.

.2 Store and protect precast concrete units from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 CONCRETE PAVERS

.1 Industrial type concrete pavers, factory made, as follows:

.1 Type 1 for commemorative and ceremonial areas: rectangular chevron pattern. Refer to plan AP 11.

.2 Dimensions:

.1 150 x 300 x 100 mm.

.2 150 x 150 x 100 mm.

.3 300 x 300 x 100 mm.

.3 Colours: Limestone grey.

.4 Finishes: Rough anti-skid, 3 mm bevel around all sides of top.

.2 Industrial type concrete pavers, factory made, as follows:

.1 Type 2 for public place: rectangular, model 1 linear pattern. Refer to plan AP 11.

.2 Dimensions:

.1 150 x 300 x 100 mm.

.2 150 x 300 x 100 mm.

.3 150 x 450 x 100 mm.

.4 300 x 300 x 100 mm.

.3 Finishes: Rough, anti-skid, 3 mm bevel around all sides of top.

.4 Colours: Three shades of grey: Nickel grey, limestone grey, onyx grey randomly laid following approximate pattern and quantities indicated on plan.

.3 Physical properties:

.1 Compressive Strength (50MPa)

.2 Water absorption limited to 5%

.3 Maximum loss of dry volume in saline solution (NaCl3%): 225 g/m2 after 28 cycles and 500 g/m2 after 49 cycles.

.4 Manufactured in moulds, with spacers, suitable for installation and delivered on site in cubes of laying panels, in protective wrapping.

.5 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 [2] [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 High-performance polymeric sand joint filler, commercial grade, colours selected by Departmental Representative.

.6 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 micrometres	25 — 65	
600 micrometres	35 — 80	
315 micrometres	10 — 35	
300 micrometres	15 — 20	
160 micrometres	2 — 10	
150 micrometres	2 — 15	

2.3 INSTALLATION OF CURBS, BASE CAPS AND EDGE RESTRAINTS

.1 Edge restraints: aluminum.

.2 Cut stone curb: as indicated in specifications.

.3 Industrial and flexible type aluminum edging, manufactured for use in paver installation, complete with connectors and pre-manufactured anchoring locations for spikes. Edging to include spiral shank nails 254 mm x 9.5 mm or appropriate fasteners.

.4 Bolt circle base covers for big lights: galvanized steel, built specifically for the project, 10 mm thick, contoured to match concrete paver and substructure and size and shape of concrete base for secure attachment, bolted on all four sides.

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.

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 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 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.

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 [25] 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: as recommended by manufacturer 3 mm wide.

.2 Use appropriate end, edge and corner stones. Saw cut pavers to fit around obstructions and at abutting structures.

.3 Place pavers and edging in pattern indicated on plan. Install pavers manually or mechanically following slopes, levels, sizes, layouts and patterns shown on plan.

.4 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 100 square metres or 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.

.5 Cut paving stones and kerbs with a water masonry saw. Cut paving stones in circles or at angles, in thickness if necessary, to fit existing elements (tree grates, lampposts, gutters, manholes, etc.). Unless otherwise indicated on the plan or as directed on site by the supervisor, use only complete elements along the edges, at the beginning and end of the pavement, on the sides and in the corners. Tolerate pavers as detailed on the plan and as directed on site by the Supervisor to meet requirements of Work.

.6 Do not cut concrete pavers by more than one-half of their total dimension. Provide for patch cuts on some pavers preceding junctions to avoid pavers less than half size.

.7 For pavers adjacent to asphalt concrete, mount the paver pattern on the asphalt concrete for a length of 1 to 3 metres, prior to cutting the asphalt concrete, positioning the joints at the width specified in this section, to determine the actual width of the cut to be made.

.8 Avoid all traffic (machinery, vehicles and equipment) on concrete paver surfaces prior to settling sand and filling joints. Place paver pallets and other materials without exceeding load bearing capacity, or otherwise detrimentally affecting installations.

.9 Use a low amplitude, high frequency plate compactor capable of at least 22 kN centrifugal compaction force to vibrate pavers into bedding sand.

.10 Inspect, remove, and replace chipped, broken and damaged pavers.

.11 Sweep dry joint sand material into joints.

.12 Settle sand by vibrating pavers with plate compactor.

.13 Continue application of joint material and vibrating of pavers until joints are full. Do not vibrate within 1 m of unrestrained edges of pavers.

.14 Complete installation to within 1 m of laying face, with sand-filled joints, at completion of each work day.

.15 Sweep off excess joint material when installation is complete.

.16 Allow for the addition of polymer sand several times to ensure a uniform finish and anchorage.

.17 Proof roll street pavements with at least two passes of a 10 T rubber-tired roller.

.18 Final surface elevations not to exceed plus or minus [10] mm under [3] m long straightedge. Surface elevation of pavers:

.19 3 to 4 mm above adjacent drainage inlets, concrete collars or channels.

.20 Ensure conformance of final elevations.

3.6 PRECAST CONCRETE UNIT CLEANING

.1 Remove and dispose of loose, extraneous materials from surfaces to be cleaned.

.2 Apply cleaning compounds appropriate for removal of various contaminants encountered in accordance with manufacturer's recommendations.

.3 Final surface to be free of contamination.

3.7 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 5,000 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.

3.8 CLEAN-UP

.1 Leave Work area clean at end of each day.

Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.2 Remove and dispose of loose, extraneous materials from surfaces to be cleaned.

.3 Final surface to be free of contamination.

3.9 MAINTENANCE

.1 Regularly inspect entire paved area. If necessary, sand joints between paving stones as described above, until final acceptance of Work.

END OF SECTION

PART 1 GENERAL INFORMATION

1.1 RELATED SECTIONS

.1 Section 03 30 00—Cast-in-Place Concrete.

.2 Section 03 39 00—Concrete Curing.

.3 Section 31 23 33.01—Excavation, trenching and Fill.

.4 Section 32 11 16.01—Granular Sub-base.

.5 Section 32 11 23—Aggregate Base Courses.

.6 Notwithstanding the foregoing, it is the Contractor's responsibility to obtain a copy of all sections of these specifications even if they do not appear to be relevant to his speciality. The Contractor implicitly acknowledges that he accepts the clauses and requirements of all sections of the specifications, even if he fails to review certain sections. Refer to the table of contents for a complete list of the specification sections.

1.2 REFERENCE AND STANDARDS

.1 ASTM International

.1 ASTM C117 13, Standard Test Methods for Materials Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136 06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.

.4 ASTM D698 12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft lbf/ft^3) (600 kN m/m^3).

.2 CSA Group

.1 CSA-A23.1/A23.2-09, Concrete: Concrete materials and methods of concrete construction/Test methods and standard practices for concrete

.3 *Ministère des Transports du Québec* (MTQ)

.1 *Cahier des charges et devis généraux* (CCDG) (general specifications), latest edition.

.2 Standard 3101, Normal density cement concrete, latest edition.

1.3 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION

.1 At least two (2) weeks prior to commencement of work, submit the cement mix design and test results to the Departmental Representative for review.

PART 2 PRODUCTS

2.1 MATERIALS/EQUIPMENT

.1 Concrete mixtures and materials for concrete: as per Section 03 30 00—Cast-in-Place Concrete.

.2 Curing compound: as per Section 03 39 00—Concrete Curing and applied to exposed concrete facing

.3 Granular base course: materials as per Section 31 23 33.01—Excavating, Trenching, and Backfilling and the requirements below.

.1 Type: MG 20 granular material.

.2 Granulometry: when tested as per ASTM C136 and ASTM C117, the granulometry of the materials used shall be within the specified limits; the mesh size of the sieves shall be as per CAN/CGSB-8.1.

.4 Non-staining form oil: chemically active release agent containing products that react with free lime to produce a water-soluble soap.

.5 Backfill materials: materials conforming to Section 31 23 33.01—Excavating, Trenching, and Backfilling.

PART 3 EXECUTION

3.1 PREPARING THE SITE

.1 Prepare the site as per Section 31 23 33.01 - Excavating, Trenching, and Backfilling.

.2 Build embankments with excavation material; this material must be free of organic matter and other harmful substances.

.1 Dispose of excess or unsuitable excavation material off site.

.3 Place the backfill material in layers not exceeding 300 mm and compact to at least 95% of the maximum dry density as determined by the Modified Proctor Test.

3.2 GRANULAR BASE COURSE

.1 Prior to spreading the granular base course material, have the subgrade approved by the Departmental Representative.

.2 Spread the granular base course material (MG-20) in the patterns, widths, and depths indicated. Spread 150 mm (after compaction) of MG-20 under sidewalks and concrete curbs.

.3 Compact the granular base course materials in layers up to 150 mm thick to at least 95% of the maximum density, as per the Modified Proctor.

3.3 CONCRETE STRUCTURES

.1 Prior to pouring the concrete, have the granular base course approved by the laboratory and the Departmental Representative.

.2 Build concrete structures as per Section 03 30 00 - Cast-in-Place Concrete.

.3 The concrete mix used for concrete in the construction of exterior sidewalks and curbs shall conform to the following requirements:

.1 Cement: Portland cement GUb-SF type

.2 Maximum nominal coarse aggregate size 20 mm

.3 Settlement at time and point of discharge: 80 ± 30 mm

.4 Air content: 5 to 8%

.5 Minimum cement mass: 350 kg/m³

.6 Exposure class: C-1

.7 Minimum compressive strength: 35 MPa at twenty-eight (28) days.

.4 Immediately after trowelling, give the sidewalk surface a uniform brushed finish with even grooves not more than 2 mm deep, by brushing perpendicular to the sidewalk's centreline.

.5 Round the edges as indicated using a masonry edger with a 10 mm radius.

3.4 CONCRETE TOLERANCES

.1 The permissible deviations of the finished surfaces are 3 mm per 3 metres of length, measured with a 3 m ruler.

3.5 EXPANSION JOINTS AND SHRINKAGE JOINTS

.1 The expansion and shrinkage joints are a saw cut of at least 50 mm across the full width of the concrete. See the drawings for the location of the saw cuts. If no indication is provided on the plans, follow the pattern of the nearby joints.

.2 Saw the joints as per CSA A23.1, not more than twenty-four (24) hours after the concrete is placed.

.3 Expansion joints should be provided where the concrete touches the building, see description on the plans.

3.6 CONCRETE CURING

.1 Cure concrete by continuously exposing exposed finished surfaces to a damp atmosphere as required by CSA-A23.1/A23.2 after concrete is placed or, as directed by the consultant, by sealing with a curing compound to ensure that the mixture retains the moisture necessary for curing.

.2 If burlap is used to cure concrete in a damp atmosphere, place two layers of premoistened burlap over the concrete surfaces and keep them continuously moist during the curing period.

.3 Apply the curing compound evenly to form a continuous film as per the manufacturer's requirements.

3.7 CONCRETING IN COLD WEATHER

.1 Insulation, heating of the components, and heating during the cure is at the Contractor's expense regardless of conditions.

3.8 BACKFILL

.1 Allow concrete to cure for seven (7) days before backfilling and compacting near the concrete.

.2 Backfill to the indicated levels, with the materials indicated on the plans.

.1 Compact and profile as per the plans.

3.9 CLEANING

.1 Carry out cleaning work.

.2 Upon completion of installation and performance testing, remove excess materials, waste, tools, and equipment from the site.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Action and Informational Submittals.

.2 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

.1 CSA International

.1 CAN/CAN/CSA-Z809-F08, Sustainable Forest Management.

.2 Forest Stewardship Council (FSC).

.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.3 Sustainable Forestry Initiative (SFI)

.1 SFI-2010-2014 Standard

1.3 QUALITY ASSURANCE

.1 Only company or companies with staff specialized in the manufacture of wrought metal, street furniture and interpretative elements will be accepted for Work in this section.

.2 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. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.4 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 and datasheet. Submit manufacturer's instructions, printed product literature and data sheets and 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.

.2 Shop drawings for manufacture and anchors:

.1 Benches.

.2 Trashcans.

.4 Materials:

.1 Submit two (2) 300 mm long samples of wood and two choices of stain selected for bench boards and trash bins. Coat sample with prescribed finish.

1.5 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for resilient flooring for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

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 clean dry well-ventilated area in accordance with manufacturer's recommendations.

.2 Store and protect wood from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.7 WARRANTY

.1 Bench and trashcan: 1 (one) year from date of provisional acceptance against all defects in workmanship and materials.

.2 Manufacturers must provide a written warranty for urniture and equipment supplied for a period from the date of provisional acceptance of work.

.3 The warranty includes proper functioning and appearance of equipment (parts and labour), replacement of any defective parts covered by this project.

.4 Manufacturer's warranties on standards and particularly on equipment components must be honoured by Contractor.

PART 2 PRODUCTS

2.1 GENERAL

.1 Steel sections, plates and bars: to CSA standard G40.21-1976 grade 38W, round and flat.

.2 Aluminium bars: to ASTM-B736, round and flat, grade appropriate to the application. All products required for manufacture and metal elements are made of aluminium. Anchors required for installation shall be grade 302 stainless steel.

.3 Screws and bolts: to ASTM A-325M, sized appropriately for structures and as indicated on drawings.

.1 Where vandal resistant anchors are provided, removable and reinstallable with a special tool designed to accommodate the geometry of the assembly. Provide two (2) special tools and submit to Departmental Representative.

.4 Accessories:

.1 Other materials and accessories: as indicated on drawings or as required.

.5 Solder:

.1 Welding materials: to CSA W59.

.2 Welders must be qualified according to the requirements of CSA standard W47.2.

.6 Shop applied paint finish: polyester resin powder, to 92GP-12P.

.7 Dimensions specified in drawings and specifications for interpretive furniture are for guidance only. Shop drawings specify dimensions and arrangements of mounting and fixing parts.

.8 Fastening furniture: Bolts, screws, washers in vandal resistant stainless steel.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured. Decorative Metals: described and sized on drawings. All work fabricated to approved shop drawings. Curves shall be smooth, with radii as indicated, and without undulations or deviations.

.2 Laser cuts are required as indicated on the drawings.

.3 Fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.5 Care should be taken not to distort components in any way or mark surfaces or their finishes when welding.

.6 Welded joints must be strong and durable, tight and flush.

.7 Profiles shall be clean and true, free of snags, depressions or other imperfections. No knots are permitted.

2.3 GALVANIZING

.1 Grind the welds so that they are as invisible as possible.

.2 When surfaces are brought into contact and welded together before galvanising, the weld must be watertight and made along the entire contact perimeter.

2.4 ALUMINUM

.1 Prepare surfaces so that finish is smooth, burr-free and uniform.

.2 Use type 5052-H32 aluminum to thicknesses shown on drawing.

2.5 PAINT/STAIN

.1 All furnishings:

.1 Shop paint exposed surfaces.

.2 Apply the polyester resin powder mixture by spraying; deposit the powder particles on the surface by electrostatic effect. Stabilize the polyester resin powder by baking in a controlled temperature oven to obtain the prescribed, durable and UV resistant finish. Minimum finish thickness : 86 microns.

.3 Carry out a 10-day cure after painting and before transporting the work to the site.

.4 Paint system performance results.

Criteria.	Standards.	Results.
Moisture resistant.	ASTM D-2247.	1,500 hours.
Finish salt spray resistance.	ASTM B-117. ASTM D-1654.	1,500 hours. Minimum 6 result.

.2 Wood benches.

.1 Colourless UV protector, waterproof, scratch resistant, superior quality, mat finish.

2.6 BENCH

.1 Model 1: Bench with backrest and two armrests.

.2 Model 2: Bench with backrest and two armrests.

.3 Parts:

.1 Backrest: Wood, ash, preferably cut to control borer, grade A1, FSC compliant.

.2 Backrest support: painted aluminium.

.3 Arm support: painted aluminium.

.4 Structural surface : wood, ash, A1 grade, to FSC.

.5 Legs: painted aluminum.

.4 Materials:

.1 Aluminum: 5052-H32.

.2 Wood: Ash, sanded and stained.

.3 Concealed mounting hardware: Expansion bolt, vandal resistant, stainless steel # 316, per manufacturer's specifications.

.5 Paint:

.1 Polyester powder coating, Z-series, meeting requirements for five years of sun exposure according to AAMA 2604. Colour selected by DCC Representative from the manufacturer's standard range.

.2 Wood: UV protective stain, colour to be chosen by Departmental Representative.

.6 Fabrication.

.1 Shop fabrication.

.7 Dimensions:

.1 Model with backrest and two armrests: Depth 431.8 mm, Length: 1,829 mm, High: 750 mm.

.2 Bench with backrest and two armrests. Depth 431.8 mm, Length: 1,829 mm, High: 432 mm.

2.7 TRASH CONTAINER

.1 Trash containers, in groups of two: one waste and one recycling.

.2 Parts:

.1 Legs: painted aluminum.

.2 Slats: Wood, ash, preferably cut to control borer, grade A1, FSC compliant.

.3 Materials:

.1 Aluminum: 5052-H32.

.2 Wood: Ash, sanded and stained.

.3 Concealed mounting hardware: Expansion bolt, vandal resistant, stainless steel # 316, per manufacturer's specifications.

.4 Paint:

.1 Polyester powder coating, Z-series, meeting requirements for five years of sun exposure according to AAMA 2604. Colour selected by DCC Representative from the manufacturer's standard range.

.2 Wood: Wood: UV protective stain, colour to be chosen by Departmental Representative.

.5 Fabrication.

.1 Shop fabrication.

.6 Sizes:

Model: Depth 292 mm, Length: 603 mm, High: 889 mm.

2.8 FLAGPOLE

.1 Materials:

.1 Aluminum pole, SCA 40 N2, conical tube, 12.20 m high, in two sections, 7 diameter cross, 0.188 wall thickness, designed for 1,371 x 2,743 mm flag.

.2 Internal single halyard with plastic chain/stainless steel cable, standard econoline system, 5 mm double braided, stainless steel roller.

.3 Aluminum access hatch, anti-vandelism, key lock.

.4 Flagpole set in concrete.

.5 Clear anodized finish.

.6 Anchors, nuts and bolts, galvanized steel cast in concrete design.

.7 Cap, standard revolving truck assembly, natural anodized 6 cap.

.8 B5 concrete base; see specifications in engineer's documents.

2.9 FINISHING MATERIALS FOR FLAGPOLE AND LIGHTING.

.1 Materials:

.1 Surface finishing to mask anchoring base, galvanized steel with anchor bolts.

.2 Polyurethane cap sheet and epoxy membrane.

2.10 ANCHORS

.1 For benches:

.1 Anchoring with bolts as specified by manufacturer.

.2 Expansion bolts for attachment to a stone surface, of appropriate size and length for the work and as specified, with stainless steel nuts and washers, with vandal-resistant and decorative heads approved by Departmental Representative.

.2 For trash containers:

.1 Anchoring with bolts as specified by manufacturer.

.2 Expansion bolts for attachment to a stone surface, of appropriate size and length for the work and as specified, with stainless steel nuts and washers, with vandal-resistant and decorative heads 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 masonry 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 Build furniture to shop drawings and plan.

.2 Install furnishing true, plumb, as indicated by Departmental Representative.

.3 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction.

.4 Fasten trash containers to concrete bases using stainless steel antivandalism bolts.

3.3 CLEAN-UP

.1 Cleaning during work:

.1 Leave Work area clean at end of each day.

3.4 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 01 33 00 – Action and Informational Submittals.

.2 Section 32 92 23 – Sodding.

.3 Section 32 93 10 – Trees, Shrubs and Ground Cover.

1.2 MEASUREMENT PROCEDURES

.1 Preparation of sub-grade for placing of topsoil will not be measured for payment.

.2 Planting pit soil fill and spreading will not be measured for payment.

1.3 PAYMENT

.1 Soil testing: Contractor must assume costs.

1.4 REFERENCES

.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 PN1340-2005 or most recent, Guidelines for Compost Quality.

.3 Norme NQ 0605-100 Landscaping with Plants.

.4 Standard NQ 2501-025, amended for mixed soils (organic and inorganic).

.5 U.S. Environmental Protection Agency (EPA)/Office of Water.

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

.6 References for structural soils:

.1 ASTM American Society of Testing Materials.

.2 USDA: United States Department of Agriculture.

.3 AASHTO: American Association of State Highway and Transportation Officials.

.4 AOAC: Association of Official Agricultural Chemists.

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 that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminates.

.4 CCME Guidelines for Compost Quality, Category (A) (B).

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Quality control submittals:

.1 Submit confirmation of source to Departmental Representative.

.2 Soil testing: Provide certified test reports showing compliance with specified performance characteristics and physical properties. Toxicological analysis of inputs must comply with CCME Residential/Parkland Standard.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Provide one (1) sample of each type of topsoil to Departmental Representative for validation.

.5 Acceptance of each material will depend on the results of soil testing and inspection of samples. Do not begin backfilling or filling operations until material has been approved for use by Departmental Representative.

1.7 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.

1.8 SCHEDULING

.1 Finishing grading work must be done in timely manner to allow sodding and planting work to be undertaken in ideal conditions.

1.9 OBSTACLES

.1 Contractor must take necessary measures to protect adjacent and underground works.

1.10 ON-SITE STORAGE

.1 Store materials away from bad weather. Where appropriate, place in containers or on the ground and cover with a membrane with adequate ballast material

.2 Avoid excessive settling of stored materials on site or contamination by any other material.

.3 Place deposits no higher than 1.5 m on previously cleaned surfaces to avoid contamination.

.4 Store material to be weatherproof and moisture-proof, while remaining easily accessible for inspection and identification of each consignment.

.5 Protect surface with polyethylene sheeting or plywood, as directed by Departmental Representative.

.6 Do not deliver or install materials in frozen, wet or muddy conditions. Material shall be supplied under optimum moisture conditions for compaction as determined by AASHTO T99 (ASTM D 698). Do not supply or place material with excessive moisture content above 8%.

.7 Protect soils and mix materials from excess water and erosion at all times. Protect stored material during major rain events and the finished surface before compaction. If the surface receives a large amount of water after compaction, allow time for the surface to drain and dry to the optimum moisture content for compaction.

PART 2 PRODUCTS

2.1 TOPSOIL

.1 Topsoil for seeded areas, planting beds: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.-Soil:

- .1 Free of pesticide residues.
- .2 Uniform, homogenous.
- .3 Free of objects over 2 cm in diameter.
- .4 Contain no toxic elements or growth inhibiting materials.
- .5 Consistence: friable when moist.
- .6 Finished surface free from:
  - .1 Debris and stones over 50 mm diameter.
  - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.2 Structural potting soil manufactured for reinforced lawns, planting of trees in a grid, expansion of planting beds for existing trees along Rue Grande-Allée: a mixture of stones, particles, micro-organisms and organic matter constituting a favourable environment for the growth of desired plants.

.3 **Mix No. 1** (sodded areas and shrub beds).

- .1 Composition:
  - .1 45% compost, sand, topsoil, black soil.
  - .2 55% recycled matter.

.4 **Mix No. 2** (reinforced sodded areas).

- .1 Composition:
  - .1 Water, proprietary hydrogel, crushed stone, clayey soil.
  - .2 20 % recycled matter.
- .2 Product:
  - .1 Manufactured structural soil.

.5 **Mix No. 3** (for shrub, perennial and grass beds).

- .1 Composition:
  - .1 55% compost, organic fertilizer, sand, topsoil, black soil.
  - .2 45% recycled matter.

.6 **Mix No. 4** (for perennial and grass beds).

.1 Composition:

.1 80% compost, organic fertilizer, sand, topsoil, black soil.

.2 20% recycled matter.

2.2 GENERAL CHARACTERISTICS OF MIXES

.1 Overall, mixes must be:

.1 Free of pesticide residues.

.2 Uniform, homogenous.

.3 Free of objects over 2 cm in diameter.

.2 **Mix No. 1** (standard sodded areas and trees):

.1 Organic matter between 4% and 8% (dry).

.2 Water pH between 6 and 7.

.3 Cation exchange capacity (C.E.C.) above 10 and 20 meq/100 gr of soil.

.4 Settlement and compaction: 25%.

.5 Bulk density (wet, unsettled) 100 kg/m³.

.6 P (phosphorous): 80 ppm.

.7 K (potassium): 156 ppm.

.8 Mg (magnesium): 45 ppm.

.9 Particle size.

Sieve Size	Maximum Passing
10 mm.	100
5 mm.	98 — 100
2.5 mm.	90 — 100
1.25 mm.	90 — 97
0.63 mm.	80 — 95
0.315 mm.	50 — 85
0.16 mm.	35 — 65
0.08 mm.	15 — 35

.3 **Mix No. 2** (reinforced sodded areas).

.1 Composition:

.1 Water pH between 6 and 7.5.

.2 California Bearing Ratio Test (CBR): over 50.

.3 Active earth pressure coefficient (Ka): 0.33

.4 Passive earth pressure coefficient (Ka): 3.0

.5 Earth pressure at rest coefficient (Ka). 0.50

.6 Compacted granular base

.7 Minimum density: 2,088 kg.

.8 Maximum density: 41.2%.

.9 Particle size

Sieve Size	Maximum Passing
56.00 mm.	100
40 mm.	80 — 100
31.5 mm.	60 — 85
20 mm.	20 — 35
14 mm.	10 — 25
10 mm.	10 — 25
5 mm.	10 — 20
2.5 mm.	8 — 20
1.25 mm.	8 — 20
0.63 mm.	7 — 20
0.315 mm.	5 — 18
0.16 mm.	5 — 15
0.08 mm.	4 — 10

.4 **Mix No. 3** (for shrub, perennial and grass beds)

.1 Must contain:

.1 Organic matter between 8% and 12% (dry).
.2 Water pH between 6 and 7.
.3 Cation exchange capacity (C.E.C.) above 10 meq/100 gr of soil.
.4 Settlement and compaction: 30%.
.5 P (Phosphorous): 200 ppm.
.6 K (Potassium): 200 ppm.
.7 Mg (magnesium): 67 ppm.
.8 Ca (Calcium): greater than 535 ppm.
.9 Sieve size: 20 mm.
.10 Particle size

Sieve designation	% Passing
10 mm.	100
5 mm.	98 — 100
2.5 mm.	90 — 100
1.25 mm.	90 — 97
0.63 mm.	80 — 95
0.315 mm.	50 — 85
0.16 mm.	35 — 65
0.08 mm.	15 — 35

.5 **Mix No. 4** (perennial and grass groupings).

.1 Must contain:

.1 Organic matter between 20% (dry).
.2 Water pH between 5and 6.5.
.3 Cation exchange capacity (C.E.C.) above 20 meq/100 gr of soil.
.4 Settlement and compaction: 35%.
.5 P (Phosphorous): 85 ppm.
.6 K (Potassium): 260 ppm.
.7 Mg (magnesium): 280 ppm.
.8 Ca (Calcium): greater than 2,400 ppm.
.9 Sieve size: 20 mm.

.6 Compliance requirements

.1 Planting soil mix must comply with grading ranges of the BNQ-2501-025 standard, amended for mixed soils (organic and inorganic).

.7 Soil testing

.1 Provide a soil analysis certificate signed by a chemist indicating organic matter, pH, P, K, Mg and Ca as well as particle size distribution if requested, at least 30 days before Work starts.

.2 Amend soil if it does not comply with the requirements of these specifications.

.3 Examine soil samples using procedures described in “Méthodes d’analyse des sols, des fumiers et des tissus végétaux – Agdex 533,” of the Conseil des productions végétales du Québec.

.4 Manufacturer must amend soil to correspond to indicated proportions.

2.3 SOIL AMENDMENTS

.1 Loam:

.1 Arable soil (cultivable soil) not too clayey (more or less 50%), nor too sandy (more or less 50%) with organic matter between 4% and 5% for sandy loam and between 2% and 3% for clayey soil. Soil must be free of subsoil, roots, grass clumps, weeds, toxic matter, stones or other foreign matter.

.2 Black soil:

.1 Decomposing materials, relatively supple and homogeneous, free of colloidal residue, wood, sulphur and iron. Size of shredded particles must be 6 mm or less.

.2 PH coefficient may vary between 5 and 7. Soil must contain at least 60% organic matter in weight. Adsorption capacity between 150% and 500%.

.3 Course sand:

.1 Natural sand only, particle size as follows. No more than 45% of particles passing between two consecutive sieves in the table. Particle size must be determined using CAN/CSA-A23.2-2A test method.

Particle (sieve) size	Percentage passing %
10 mm	95 to 100
5 mm	80 to 100
2.5 mm	50 to 85
1.25 µm	25 to 65
630 µm	10 to 35
315 µm	2 to 10

.4 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.

.5 Organic matter: compost Category A, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.6 Fertilizer:

.1 Complete, synthetic, slow release with 35% of nitrogen content in water-insoluble form or preferably organic. Industry standard product containing nitrogen, phosphorous, potassium and other micronutrients suitable for plants and specific applications or according to soil analyses.

.2 Fertility: major soil nutrients present in following amounts: Nitrogen (N):

.3 [20] to [40] micrograms of available N per gram of topsoil.

.4 [40] to [50] micrograms of phosphate per gram of topsoil.

.5 Potassium (K):

.6 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.7 Lime:

.1 Ground agricultural limestone.

.2 Gradation requirements: percentage passing by weight, Gradation requirements: percentage passing by weight, 90 % passing 1.0 mm sieve, 50 % passing 0.125 mm sieve.

.3 Composition and quantity as recommended by laboratory.

PART 3 EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

.2 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION OF EXISTING GRADE

.1 Verify that grades are correct.

.1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

.2 Remove debris which protrudes more than 75 mm above surface.

.3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.

.1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

.5 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.

3.3 INSTALLATION AND REMOVAL

.1 Place topsoil after Departmental Representative has accepted subgrade.

.2 Spread topsoil in uniform layers not exceeding 150 mm.

.3 For sodded areas keep topsoil 15 mm below finished grade.

.4 Spread topsoil as indicated to following minimum depths after settlement.

.1 150 mm for seeded areas

.2 300 mm for seeded areas

.3 300 mm for perennial and grass beds.

.4 500 mm for shrub beds

.5 300 mm around tree or shrub bed, isolated or as indicated on plan.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

.6 For planting holes, spread topsoil in successive 300 mm layers for planting trees and shrubs, to avoid subsequent settling of soil. Use method of application approved by Departmental Representative. Soil must be compacted to 90% P.M.

.7 For planting holes, trees with grills and reinforced sod, spread structural soil as specified by manufacturer in 300 mm layers maximum. Soil must be compacted to 90% P.M.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Use topsoil salvaged from landscaping work and topsoil deposited on site

3.5 SOIL AMENDMENTS

.1 Apply and thoroughly mix soil amendments into [full specified depth of topsoil]

3.6 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Spread topsoil in uniform layers not exceeding 150 mm.

.2 Compact the material to dry density according to a standard AASHTO settlement curve (AASHTO T 99), 95% of M.P. Delay compaction for 24 hours if moisture content exceeds maximum allowable. No settling will occur when moisture content exceeds the identified maximum. Protect surface with polyethylene sheeting or plywood, as directed by Departmental Representative.

.3 Once finished levels are reached, immediately protect the structural soil from contamination by toxic materials, trash, debris, water containing cement, clay, silt or materials that will change the particle size distribution of the mix. Protect surface with polyethylene sheeting or plywood, as directed by Departmental Representative.

.4 A periodic check of the delivered and installed material may be conducted by the Departmental Representative to ensure consistency of colour and texture of the sample with the contractor's original approved sample. The representative may request an analysis of the material in place in the event that the installed material varies significantly from the approved sample. Any material that varies significantly from the approved test results will be removed and replaced at the contractor's expense.

3.7 FINISH 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 [Departmental Representative] [DCC Representative] [Consultant].

.1 Leave surfaces smooth, uniform and firm against deep footprinting.

.3 A check of the rough grading of the structural soil must be provided after installation. The contractor shall install a sufficient number of grade stakes to allow for a quick check of the grade.

.1 Adjust the final grade as indicated on the plans and other construction documents.

.2 Ensure smooth transitions between different areas.

.3 Fill all imperfections with structural soil and remove all bumps in the overall plane of the slope.

.4 The finishing tolerance is 10 mm per 3 m.

.5 The final grading must be inspected and approved prior to the installation of the finishing surface (stone dust, concrete pavers).

3.8 ACCEPTANCE

.1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.9 CLEAN-UP

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Action and Informational Submittals.

.2 Preparation of planting beds in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.

1.2 PRICE AND PAYMENT PROCEDURES

.1 Stripping of topsoil will not be measured for payment. It must be included in fill.

.2 Contractor may not claim costs for work conducted outside the site, nor costs for repairs incurred for storage requirements, vehicle circulation or other management oversights under the Contractor's responsibility.

1.3 REFERENCES

.1 Standards:

.1 All work under this section must comply with N.Q. 605-030 "Aménagement paysager – Engazonnement et ensemencement" unless otherwise indicated.

1.4 ADMINISTRATIVE

.1 SCHEDULING

.1 Schedule sod laying to coincide with preparation of soil surface.

.2 Schedule sod installation when frost is not present in ground.

1.5 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 and datasheet Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Planting Contractor, certified, insurance, permit and work permit.

.2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.

1.7 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 The contractor must establish a delivery schedule to reduce on-site storage times to a minimum without causing undue delays in execution of the work.

.3 Roll and place sod to prevent damage during transportation and handling.

.4 Transport, unload and store sod on palettes only.

.5 Have sod delivered within twenty-four (24) hours of being harvested and laid within thirty-six (36) hours.

.6 Do not deliver sod that is too small, asymmetrical or damaged.

.7 Allow sod to dry sufficiently during humid weather to avoid damage during harvest or handling.

.8 During dry periods, protect sod to prevent drying out and water sufficiently to maintain vitality and soil loss during handling. Dry sod will not be accepted.

.9 Sod must be installed upon arrival. Keep sod humid and cool until installation if there is a delay between delivery and installation.

.10 Deliver and store fertilizer in sealed containers with labels clearly indicating weight, composition and manufacturer's name.

.11 Packaging Waste Management: remove for reuse and return by manufacturer. E.g., pallets.

1.8 Scheduling.

.1 Lay sod when soil is spread.

.2 Do not harvest or lay sod when soil is excessively dry or when temperature is under 0 °C.

.3 Turf is to be laid in the autumn of 2022 in order to ensure its proper recovery and establishment for activities scheduled for the summer of 2023.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop. Turf Grass Nursery Sod types:

.1 Turf Grass Nursery Sod:

.1 Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.

.2 100% Kentucky Bluegrass - A blend of different high-performing Kentucky Bluegrass cultivars that are certified "Water Efficient" and require up to 50% less water when properly established.

.3 Mixture of 4-5 carefully selected cultivars for intensive use, with excellent tolerance to trampling, 80-85% from the Compact, Midnight, CompactAmerica or Mid-Atlantic families, 15-20% from the Aggressive family for faster regeneration due to competitive rhizomes, good drought tolerance, suitable for shorter mowing and intensive maintenance (NTEP Schedule "A").

.2 Nursery Sod grown from certified seed. Turf Grass Nursery Sod quality:

.1 Density of sod sufficient so that no soil is visible from height of 1,1500 mm when mown to height of 50 mm.

.2 35 to 65 mm.

.3 6 to 15 mm in thickness.

.2 Number one nursery sod, Quebec grown (on mineral soil), preferably in proximity to site in compliance with N.Q. 0640-050 “Gazon en plaques classification et caractéristiques” with seed mix corresponding to intended use and location.

.3 Sod cultivated and sold in accordance with all quality standards. Sod to have strong, fibrous root system, free of stones, weeds or deficiencies.

.4 WATER

.1 Supplied by Contractor using water tanker.

.2 Free of impurities that would inhibit plant growth.

.5 Fertilizer:

.1 To Canada "Fertilizers Act" and Fertilizers Regulations.

.2 Complete, synthetic, slow release with 35% of nitrogen content in water-insoluble form or preferably organic.

.3 8-30-12: 8% nitrogen from two sources, including aluminum sulphate; 30% normal superphosphate and monoammonium phosphate; 12% potassium with one part in the form of sulfate; magnesium, sulfur and trace elements.

.4 Formula and type of fertilizer proposed by Contractor, recommended by the laboratory, according to season and period. Formulas must be identified on establishment and maintenance plan and approved by Departmental Representative.

.6 Grass soil

.1 Grass soil must comply with criteria under 32 91 19 13 – Topsoil Placement and Grading.

2.2 SOURCE QUALITY CONTROL

.1 Obtain written approval from Departmental Representative of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

PART 3 EXECUTION

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative. Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 GENERAL PREPARATIONS

.1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading. If discrepancies occur, notify Departmental Representative and commence work when instructed by Departmental Representative.

.2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.

.3 Finish grading to achieve gentle, uniform slope, free of hollows and rough patches, according to levels indicated, facilitating natural drainage.

.4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site,

.5 Apply fertilizer before laying sod and incorporate 3.8 kg per 100 square metres to first five (5) centimetres of soil.

3.3 INSTALLATION OF GYPSUM SHEATHING

.1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.

.2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

.3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

.4 Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

.5 Peg sod on slopes steeper than 1V: Peg sod on slopes on slopes steeper than 1 vertical to 2 horizontal, 5 stakes per metre of grassed surface area

3.4 CLEAN-UP

.1 Cleaning during work:

.1 Leave Work area clean at end of each day.

.2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Final Cleaning: Remove surplus materials, excess materials, rubbish, tools and equipment.

.1 Clean and reinstate areas affected by Work.

3.5 PROTECTION BARRIERS

.1 Protect newly sodded areas from deterioration with as directed by Departmental Representative.

.2 Remove protection after inspection as directed by Departmental Representative.

3.6 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of installation until acceptance.

.1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

.2 Cut grass to 50 mm when or prior to it reaching height of 120 mm.

.3 Maintain sodded areas weed free 95%.

.4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

.5 Temporary barriers or signage to be maintained where required to protect newly established sod.

3.7 SYSTEM DESCRIPTION

.1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:

.1 Sodded areas are properly established.

.2 Sod is free of bare and dead spots.

.3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 60 mm.

.4 Sodded areas have been cut minimum 2 times prior to acceptance.

.2 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:

.1 Sodded areas are properly established.

.2 Extent of surface soil visible when grass has been cut to height of 60 mm is acceptable.

.3 Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.

.4 Sodded areas have been cut minimum 2 times prior to acceptance.

.5 Fertilizing in accordance with fertilizer program has been carried out at least once.

.3 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

.4 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

3.8 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:

.1 Water sodded Commercial Grade Turf Grass areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.

.2 Repair and resod dead or bare spots to satisfaction of Departmental Representative.

.3 Cut grass and remove clippings that will smother grass as directed by Departmental Representative to height as follows: Maintain sodded areas weed free 95%.

.1 Commercial Grade Turf Grass Nursery Sod:

.1 60 mm during normal growing conditions.

.2 Cut grass as necessary until desired height is reached. At intervals so that approximately [one third] of growth is removed in single cut.

.3 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.

.4 Eliminate weeds by mechanical or manual means to extent acceptable to Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Action and Informational Submittals.

.2 Section 32 91 19.13 – Topsoil Placement and Grading.

.3 Section 32 01 90.33 – Tree and Shrub Preservation.

1.2 REFERENCES

.1 Definitions:

.1 Mycorrhiza: association between fungus and roots of plants. This symbiosis enhances plant establishment in newly landscaped and imported soils.

.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-last edition.

.3 Norme NQ 0605-100 Landscaping with Plants.

.1 All the work described in this section must be carried out according to the rules of the trade and the most recent standards of the Bureau de Normalisation du Québec (BNQ).

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.5 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.

.6 Tree grate.

.1 ASTM B26 Specification for Aluminum-Alloy Sand Castings.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Contractor must obtain approval from Departmental Representative before commencing work.

.2 Submit detailed delivery and planting schedule, coordinated with supplier, to Departmental Representative for approval. Method and planting times must be submitted for approval and integrated into other site activities.

.3 Schedule to include:

.1 Shipping dates.

.2 Planting Dates.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Provide Departmental Representative with the Plant Purchase Order indicating name and address of supplier and guarantees that the plants are reserved for project and available at the time of planting.

.3 Product Data:

.1 Submit required data sheets and manufacturer's instructions and documentation for fertilizers, mycorrhizae, anchoring material, mulch, stakes, saddles, rodent guards, tree grate and associated support and frame, grated tree protection. Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Planting Contractors with permit and work permit.

.2 Landscape Planting Supervisor: Landscape Industry Certified Technician.

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.

.3 Protect plant material from frost, excessive heat, wind, sun and sudden temperature changes during delivery and storage.

.4 Contractor is responsible for unloading plants and for damage to plants.

.5 Contractor must also coordinate all delivery and planting operations to minimize time between excavation and planting.

.6 Plants damaged due to transportation and handling may be rejected before, during and after planting.

.2 Storage and Handling Requirements

.1 Store plants in protected, shaded location until they can be planted. Root balls and containers must be covered in mulch (heeled in) and kept humid until planting.

.2 Protect stored plant material from frost, wind and sun and as follows:

.1 For pots and containers, maintain moisture level in containers.

.2 Maintain moisture level in root zones.

.3 Keep roots moist at all times.

.3 Store and manage hazardous materials in accordance with manufacturer's written instructions.

1.7 SCHEDULE

.1 Contractor must obtain approval from Departmental Representative before commencing work.

.2 Submit detailed delivery and planting schedule, coordinated with supplier, to Departmental Representative for approval. Method and planting times must be submitted for approval and integrated into other site activities.

Plant during periods favourable to plant health and growth. Target periods are located between early spring and 24 June and 15 August and 15 October.

1.8 WARRANTY

.1 Contractor must guarantee all plants for a period of twelve (12) months, as of the provisional acceptance of the Work.

.2 Contractor must replace dead, deteriorated or defective plants at own expense and according to drawing and plan specifications at his own cost. Replacement plants must be of the same specifies, size, quality and guarantee as the original plant.

.3 Contractor must remove dead plants within ten consecutive days of the notice from Departmental Representative and replace them immediately or the following planting season.

.4 Contractor must have Departmental Representative inspect the plants at the end of the warranty period.

.5 Contractor's warranty includes materials, labour, equipment and tools necessary to replace all plants that do not meet the growing conditions required in this section.

.6 All materials and planting methods used in the replacement of plants shall meet all specifications in these specifications.

.7 Contractor shall honour the manufacturer's warranty for the grid and grid tree protection and provide a warranty for the frame, support and anchoring of the grid for a period of twelve (12) months from provisional acceptance of the work.

PART 2 PRODUCTS

2.1 PLANT MATERIAL

.1 General:

.1 Plants will be nursery grown and typical of their species. Sizes and species are as shown on the planting list.

.2 Departmental Representative must approve the plants at the nursery or on delivery to the site prior to planting. If the Contractor does not do so, the plants may be rejected prior to planting.

.2 Supply of plants:

.1 Contractor must provide all the plants indicated on the bid schedule.

.2 Substitutes must receive prior authorization from Departmental Representative.

.3 One (1) month after the contract signing, Contractor must inform Departmental Representative of the source and provide proof of the plant order corresponding to the bid schedule.

.4 Planting materials must be first quality and correspond to BNQ, NQ 0605-300-2001, and the planting table provided in the planting plan.

.5 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.

Source of plant material: grown in Zone 3 and 4 in accordance with Plant Hardiness Zones in Canada.

.6 Plants will be nursery grown.

.7 Plants will be inspected and selected at the main production and storage nursery. Supplier must organize and participate in the visit to nursery to facilitate inspector's work to find the plants to verify.

.3 Trees

.1 Quality and supply source:

Supply first quality nursery trees. Size and development of trees and roots must comply with BNQ standard 0605-300 du BNQ, Written approval is required for trees with root balls smaller than the Standards. Tree size must be measured 30 cm from the ground for trees 100 mm and more in diameter and 15 cm from the ground for trees under 100 mm in diameter. Measure trees when branches are in normal position. Sizes indicated for tree height and branch development are based on the dimension of the main part of the tree and not the distance between branch extremities.

.2 Plants will be nursery grown and typical of their species. Sizes and species are as shown on the planting list. Substitutes must receive prior authorization from Departmental Representative. Container plants will be acceptable if cultivated for at least one season, two seasons at most in the same container. Containers must be large enough for development of the roots.

.4 Shrubs

.1 Provide shrubs with ball of earth, container grown unless otherwise indicated.

.2 Container grown shrubs must be as follows:

Plants must be grown for at least one complete active growing season in containers and must have a sufficiently developed root system to keep the ball of earth intact upon removal from containers.

.5 Perennials, annuals, grasses

.1 Specifications regarding container size are provided in the planting table. Plant development must be proportional to container size.

.2 Specifications regarding growth:

Dimension or volume of container	Growth time in container (min.)
10 cm	8 weeks
1 litre	6 months
4 litres	2 years

.3 Free of impurities that would inhibit plant growth.

2.2 TREE GRATE.

.1 See section 05 50 00.01 – Metalwork – Exterior Furnishings.

2.3 WATER

.1 Free of impurities that would inhibit plant growth.

2.4 STAKES

.1 T-bar, steel, 40 x 40 x 5 x 2,440 mm, galvanized and painted black.

2.5 TIES

.1 For trees with caliper size of 70 mm or less, rubber “Pro-Tie” type tie, flexible and adjustable, as distributed by “Derco,” Quebec or equivalent approved by Departmental Representative.

.2 Tie fastener

5 mm round screw, for square screwdriver and galvanized steel bolts.

2.6 TRUNK PROTECTION

.1 Wire mesh: galvanized, electrically welded 1.4 mm wire with 25 x 25 mm mesh and fastener.

2.7 TRUNK PROTECTION

.1 See section 05 50 00.01 – Metalwork – Exterior Furnishings.

2.8 MULCH

.1 Trees along commemorative area, shrubs, flowers: RCW mulch composed of hardwood chips, maximum 20% softwood chips. Mulch must be uniform in size not exceeding 50 X 50 X 5 mm and exempt of leaves and branches under 5 mm.

.2 Decorative stone, washed, 20 mm diameter, under tree grates.

2.9 FERTILIZER

.1 Fertilizers must comply with federal fertilizer law and regulation.

.2 Synthetic commercial type as recommended by soil test report and manufacturer’s recommendations according to period and season. Indicate formulas for planting and maintenance and have validated by Departmental Representative.

.3 Bonemeal, 100% natural, 2-11-0 ratio.

.4 Mycorise™ growing medium.

.1 Ensure new root growth is in contact with mycorrhiza.

.2 Apply primer as recommended by manufacturer.

2.10 PLANTING SOIL

.1 Section 32 91 19,13 —Topsoil Placement and Grading.

2.11 SOURCE QUALITY CONTROL

.1 Obtain approval from Departmental Representative of plant material 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 conditions of substrates previously installed under other Sections or Contracts are acceptable for product 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 PREPARATION

.1 Proceed only after receipt of written acceptability of plant material from 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.

.6 Temporary Erosion and Sedimentation Control:

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

3.3 PREPARATION AND TRANSPORTATION

.1 Coordinate delivery of plants with digging to ensure that digging and planting occur at the same time.

.2 Solidly attach plant branches and protect from rubbing and drastic changes in temperature during transportation.

.3 Roots must be kept humid after uprooting and approval of plants on site. Protect exposed roots with humid mulch, peat moss, sawdust and other acceptable materials to avoid drying during transportation and storage.

.4 Ship plants from nursery to Work site as quickly as possible.

.5 The Contractor must transport plants in closed vehicle. Attach branches during transportation. Protect plant material from frost, excessive heat, wind, sun and sudden temperature changes during delivery and storage.

.6 The supplier must notify Departmental Representative of departure from nursary and arrival time of plants at Work site.

.7 Contractor is responsible for unloading plants and for damage to plants. Plants rejected at delivery will be returned to supplier

3.4 PLANTING SEASON

.1 The Contractor must follow the steps in the planting schedule coordinated with the General Contractor and Owner.

.2 Plant during periods favourable to plant health and growth.

3.5 PLANTING

.1 Use wood stakes to indicate position of individual trees, shrubs, perennials and grasses as indicated on drawings and have stake locations approved by Departmental Representative before digging.

.2 Notify Departmental Representative of discrepancies with the drawings (location, quantity, etc.).

.3 Usual planting periods are spring and fall, even if plants are container grown. Special care must be given to plants planted during the growing season to ensure they acclimatize; avoid hot days or lengthy periods of sun. Water abundantly and regularly.

.4 The Contractor must pay special attention to underground pipes and cables where markers have been put down to avoid damage.

3.6 EXCAVATION AND PREPARATION OF PLANTING BEDS

.1 Establishment of sub-grade for planting beds in accordance with Section 31 23 33.01 - Rough Grading.

.2 Preparation of planting beds in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.

.3 For individual planting holes:

.1 Stake out location and obtain approval from Departmental Representative prior to excavating.

.2 Excavate to depth and width as indicated.

.3 Remove subsoil, 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 Departmental Representative if water source is ground water.

.4 Digging

.1 Dig holes and remove excavated material off site or as indicated by Departmental Representative.

.2 Contractor must all necessary measures during excavation to protect existing underground piping.

.3 Except where indicated otherwise on the drawings, holes must have vertical sides and with sufficient space to allow for adding soil around the roots.

.4 Except where indicated otherwise on the drawings, hole diameter must be twice the width of the root ball or large enough to spread roots at least 500 mm on sides.

.5 For tree pits to be excavated in rock, the dimensions must correspond to those shown on the plan, and be drained by a channel excavated in the rock that naturally drains to a low point.

.6 When plants are spaced more than 1,500 mm apart, plant in individual holes.

.7 The Contractor must keep the site clean and the holes dry. Immediately remove earth and debris accumulated on hard surfaces. Avoid damage to adjacent landscaping or repair damage.

.8 Protect adjacent areas when digging. Use tarps to hold excavated earth if necessary.

.9 Do not leave open pits and remove mounds of earth after workday.

.10 Before planting, remove water in holes, ensuring that water is not underground sourced. Remove debris, branches, stones over 100 mm and other inappropriate material.

3.7 PLANTING TREES

.1 Backfill soil in 150 mm lifts.

.2 Protect the trunk, top and root ball during transportation and handling. Use a three-point tree spade with clamp to keep trees in upright position during handling. Equipment must be approved by Departmental Representative prior to planting.

.3 Remove soil from top of rootball and measure to make sure root collar is at the correct height. Make sure plants are straight in the hole; adjust position to blend well with surroundings.

.4 Place rootball to ensure that collar level is at the same height as surrounding finish grade.

.5 Orient plant material to give best appearance in relation to structure, roads and walks.

.6 Loosen burlap and remove 1/3 of the top, taking care not to disturb rootball. Do not remove the burlap and rope under rootball. In the case of container plants, remove containers without breaking up rootball.

.7 Do not leave wrapping materials in holes that are not biodegradable.

.8 Add and compress by 150 mm, to eliminate air pockets. Do use frozen and water saturated soil. Fill in 2/3 of the hole with soil and the remainder with water. Let the water soak and fill in the hole up to the collar and finished soil level.

.9 For isolated plantings, form a watering saucer (well) with substrate 100 to 150 mm high with the inner diameter of the well the same size as the exterior perimeter of the hole. Cover the berm with 10 cm mulch within 15 cm of the tree trunk.

3.8 PLANTING SHRUBS, PERENNIALS, ANNUALS AND GRASSES

.1 Always remove plants from container.

.2 Fill holes in successive layers of well crumbled soil, placed carefully between the roots, compressed and stabilized with water, to eliminate air pockets.

.3 Tamp soil carefully to avoid crushing or breaking roots.

.4 Do not plant in soil that is too wet or compacted.

.5 Make a well around the plantings to retain water.

.6 Ensure plant collars are even with finish grade of beds.

3.9 PRUNING

.1 Plantings require minimal trimming at planting time, if transported properly.

Cut away dead, dry or damaged branches or parts of branches.

Remove stems, parts of stems and twigs that are dead, dry, damaged or misshapen.

Trim back healthy, very long or straggly branches in keeping with specific requirements of plant species or cultivar. Follow instructions of specialized overseer.

3.10 FERTILIZATION

.1 Trees: mix in the following with soil:

.1 200 grams 2-11-0 fertilizer (bonemeal)/tree.

.2 500 ml Mycorise Pro Végétalisation/tree.

.2 Shrubs: mix in the following with soil:

.1 100 grams 2-11-0 fertilizer (bonemeal)/tree.

.2 100 ml Mycorise Pro Végétalisation/tree.

Perennials, annuals, grasses

.3 Organic base slow-release granular fertilizer, 10-25-20, 3.8 kg/100 m² / plant.

.4 30 ml Mycorise Pro Végétalisation/tree.

3.11 TRUNK PROTECTION

.1 Tree groupings: Install trunk protection on deciduous trees as indicated.

.2 Install trunk protection before installation of tree supports.

3.12 TREE GROUPINGS:

.1 Deciduous trees:

.1 Fill in 2/3 of hole and drive in T-bar stakes, taking care not to damage main roots. Equipment remains the owner's property. Install stakes, two per tree, 150 mm from trunk on prevailing wind side. Attach trunk to stake with collars. Stakes must remain in place for a minimum of two (2) years.

.2 Do not alter collars, except in the case of a modified collar.

.3 Collar screws must not be longer than 5 mm past nuts once collar is attached.

.4 Collars and stakes must be compatible to ensure solid, safe installation.

3.13 TREE GROUPINGS:

.1 Deciduous trees:

.1 Securely attach shaft protector to cast iron grate as recommended by manufacturer.

3.14 MULCHING

.1 Ensure soil settlement has been corrected prior to mulching.

.2 .Mulch beds as indicated by Departmental Representative

.3 Ensure soil settlement has been corrected, and remove debris and weeds prior to mulching.

.4 Spread mulch evenly 100 mm thick. If mulch is likely to blow away, wet and mix with a little soil. Thin at base of plantings and avoid placing too close to perennials.

.5 Reduce to 50 mm near perennials, grasses and annuals.

.6 Add 50 mm decorative stone 20 mm in diameter under the tree grates.

3.15 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following maintenance operations from time of planting to acceptance by 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 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.

3.16 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by 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.

.1 Water plantings and transplants within diameter of tree cover to 15 cm deep, successively to facilitate penetration of water in mulch and minimize runoff.

.2 Water, when necessary, twice a week in hot weather. Each tree may require an average 1,000 litres (1 m3) of water per watering.

.2 Reform damaged watering saucers.

.3 Remove weeds monthly.

.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 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 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.

3.17 CLEAN-UP

.1 Cleaning during work: Leave Work area clean at end of each day.

.2 FINAL CLEANING Remove surplus materials, excess materials, rubbish, tools and equipment.

3.18 CLOSEOUT ACTIVITIES

.1 Submit maintenance reports for trees, shrubs, and other plantings.

3.19 PROVISIONAL ACCEPTANCE OF PLANTING WORK

.1 Once planting work is completed, provisional acceptance is given after verified and approved by Departmental Representative.

.2 Provisional acceptance of planting work will be given, provided that:

.1 All plant materials installed on the site are healthy and meet normal growth conditions.

.2 Comply with requirements of planting list regarding species and size.

.3 Planting materials are insect and disease free.

.3 Labels identifying plants are removed after provisional acceptance.

3.20 PROVISIONAL ACCEPTANCE OF PLANTING WORK

.1 Final acceptance of work will be granted after the warranty period following provisional acceptance of the last step, provided all conditions are met.

END OF SECTION

PART 1 GENERAL INFORMATION

1.1. RELATED SECTIONS

.1 Section 31 23 33.01—Excavating, Trenching, and Backfilling.

.2 Section 31 32 19.23—Geotextile Layer Separation.

.3 Section 33 31 13—Public Sanitary Utility Sewerage Piping.

.4 Section 33 41 00—Storm Utility Drainage Piping.

.5 Section 32 11 16.01—Granular Sub-base.

.6 Notwithstanding the foregoing, it is the Contractor's responsibility to obtain a copy of all sections of these specifications even if they do not appear to be relevant to his speciality. The Contractor implicitly acknowledges that he accepts the clauses and requirements of all sections of the specifications, even if he fails to review certain sections. Refer to the table of contents for a complete list of the specification sections.

1.2. REFERENCES

.1 ASTM International

.1 ASTM A 48/A 48M-03(2016), Standard Specification for Gray Iron Castings.

.2 ASTM A 123/A 123M-2015, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM C 117-13, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.

.4 ASTM C 136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.5 ASTM C 139-14, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.

.6 ASTM C 478M-15a, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).

.7 ASTM D 698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 [600 kN-m/m^3]).

.2 CSA Group

.1 CSA A23.1/A23.2-14 Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.

.2 CAN/CSA A165 SERIES-04(R2014), CSA Standards on Concrete Masonry Units (includes A165.1, A165.2 and A165.3).

.3 CAN/CSA-A3000-13, Cementitious materials compendium (contains A3001, A3002, A3003, A3004 and A3005).

.4 CSA G30.18-R2014, Carbon Steel Bars for Concrete Reinforcement.

.3 Bureau de normalisation du Québec (BNQ).

.1 BNQ 1809-300/2018, Construction Work — General Technical Clauses—Water and Sewer Lines.

.2 BNQ 2622-400, Precast Reinforced Concrete Manholes.

.3 BNQ 2622-410, Reinforced concrete sumps.

.4 BNQ 2622-120, Reinforced Concrete Circular Pipes.

.4 *Ministère des Transports*:

.1 CCDG, latest edition;

.2 Volumes I to VIII.

.5 *Ministère de l'Environnement*, Directive No. 004.

1.3. DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION

.1 Submit the required documents.

.2 Technical data sheets

.1 Submit required data sheets and manufacturer's documentation for manholes, flow controllers, and catch basins. Technical data sheets must include product characteristics, performance criteria, dimensions, limitations, and finish.

1.4. TRANSPORTATION, STORAGE, AND HANDLING

.1 Transport, store, and handle materials and equipment as per the manufacturer's written instructions.

.2 Delivery and Acceptance: Deliver materials and equipment to the job site in their original packaging, which must be labelled with the manufacturer's name and address.

.3 Storage and handling

.1 Store materials and equipment off the ground and in a clean, dry, and well-ventilated area as per the manufacturer's recommendations.

.2 Store manholes and catch basins in a manner that protects them from marks, scratches, and scuffs.

.3 Replace damaged materials and equipment with new materials and equipment.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Monolithic type, precast reinforced concrete manholes with watertight joints: as per ASTM C 478M, circular or square.

.1 Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.

.2 Diameter as indicated on drawings and/or angles and diameters of inlet and outlet pipes.

.3 Seal each concrete section with waterproof gaskets.

.4 Unless otherwise indicated on the plans, manhole and shafts shall be 900 mm in diameter.

.5 Ladder rungs: to CAN/CSA G30.18, No.25M Billet-Steel Bars for Concrete Reinforcement, hot dipped galvanized to CAN/CSA-G164. The rungs shall have a non-slip, low-profile surface.

.6 Unless otherwise indicated on the plans, manholes shall be equipped with a Type C cunette. The catch basin manholes must be equipped with a type A cunette.

.2 Monolithic type, precast reinforced concrete control chamber with watertight joints per ASTM C 478M.

.1 Dimensions as shown on the plans and diameters of inlet and outlet pipes

.2 Unless otherwise indicated on the plans, the control chamber vents shall be 900 millimetres in diameter.

.3 Adjusting rings: conforms to ASTM C478M.

.4 Where a flow regulator is provided, the Contractor shall provide sufficient space between the pipe outlet invert and the bottom of the concrete structure to allow the regulator to be placed.

.5 Manholes, catch basins, and catch basin manholes' frames, gratings, and covers: as required below.

.1 Metal gratings and covers to bear evenly on frames with to which it is attached.

.1 A frame with grating or cover to constitute one unit.

.2 Assemble and mark unit components before shipment.

.3 Unless otherwise specified on the plans, frames and covers in the paving shall be self-adjusting and be 572 mm in diameter.

.2 Grey iron castings: conform to ASTM A 48/A 48M, strength class 30B.

.3 Acceptable products:

.1 Self-standing and self-adjusting 572 mm diameter frames and covers (roadway) with grey cast iron cover: Mueller AJ-22 1/2 (straight or tapered) or Laperle C-50M1 (straight or tapered) or Laroche 572 adjustable (straight or tapered) or approved equivalent.

.2 Standard 572 mm frames and covers with grey cast iron cover (off pavement): Laperle C-46 or Laroche 572 standard or approved equivalent.

.4 The type of network must be written on the manhole covers and the control chamber.

.6 Granular bedding and backfill materials: as per the requirements of Section 31 23 33.01—Excavation, Trenching and Backfilling.

.7 Texel brand Tex-O-Flex 40-12, Novatex brand Geoflex or Soleno brand TXMP membrane over a height of 1.8 metres around each of the concrete structures in the roadway and in the parking lots.

.8 Flow regulator: Minimum opening of 75 mm diameter and according to the specifications of the plans.

PART 3 EXECUTION

3.1 INSPECTION

.1 Check Conditions: Prior to installation of precast concrete structures, ensure that the condition of previously installed surfaces/substrates under other sections or contracts is acceptable and allows the work to be performed according to the manufacturer's written instructions.

.1 Visually inspect surfaces/substrates in the presence of the Department Representative.

.2 Immediately notify the Department Representative of any observed unacceptable condition.

.3 Commence installation work only after unacceptable conditions have been corrected.

3.2 EXCAVATION AND BACKFILL

.1 Perform excavation and backfill work as per Section 31 23 33.01—Excavation, Trenching and Backfill and as directed.

.2 Excavation work must be approved by the Department Representative prior to the installation of manholes or catch basins.

3.3 CONCRETE WORK

.1 Carry out concrete work as per the BNQ.

.2 Place the concrete reinforcements as per the BNQ.

.3 Position other metal inserts as per stipulated dimensions and details provided.

3.4 INSTALLATION

.1 Construct units as per the details provided, plumb and true to alignment and grade.

.2 Complete units as pipe laying progresses.

.3 Precast manholes:

.1 Set the bottom section of the precast structure on a granular base course as per BNQ 1809-300 specifications.

.2 Before proceeding to the next, make each successive joint watertight with rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or a combination thereof, approved by the Department Representative.

.3 Clean excess mortar and joint compounds from the inside wall of the manhole or catch basin as work progresses.

.4 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

.4 Sewer lines

.1 Place stub inlets and outlets and partitions at elevations and in positions indicated.

.2 Manhole inverts shall have a Type C cunette.

.1 The depth of the cunette shall comply with BNQ 1809-300 2019 (R 2020) requirements.

.2 The manholes' invert shall have two adjacent benches sloped at a 2% grade.

.3 The cunette must have a smooth curve.

.4 The cunette must have a slope which corresponds to that of the sewer line.

.5 Compact the granular backfill to 90% of the modified Proctor.

.6 Installing units in existing systems:

.1 When adding a new manhole, manhole cover, or catch basin to an existing system, ensure full support of existing pipe during installation, carefully remove the required length of pipe and install the new manhole or catch basin as specified.

.2 Make joints watertight between new unit and existing pipe.

.3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.

.7 Place the frame and cover on the top section of the manhole to elevation as indicated.

.1 Adjust as required using a concrete ring.

.8 Clear debris and other foreign materials from manholes, catch basin manholes or sewer drains.

.1 Remove fins and sharp projections.

.2 Prevent debris from entering the system.

.9 Around manholes, catch basins and catch basin manholes located in roadways or parking lots, the Contractor shall install a geomembrane to protect against frost heave as per Section 31 32 19.23—Geotextiles Layer Separation. The membrane must be installed at a minimum height of 1.8 metres and attached with two (2) drift pins. It shall cover the top section between the top of the head and the top of the highest water mains.

3.5 ON-SITE QUALITY CONTROL

.1 Leakage test requested as per BNQ 1809-300/2019 (R 2020):

.1 Install watertight plugs or seals on inlets and outlets of each new manhole and fill manhole with water.

.2 Leakage shall not exceed 0.3% per hour of manhole volume.

.3 If permissible leakage is exceeded, correct defects.

.4 Repeat the leakage test until the percentage of leakage is within the limits deemed acceptable by the Department Representative.

3.6 DECOMMISSIONING EXISTING PIPES

.1 The Contractor shall decommission all existing pipes, manholes, and catch basins rendered inoperative by the installation of the new pipes.

.2 For all visible structures or parts of structures located in the trench, the Contractor shall dismantle and dispose of the existing structures.

.3 For all non-visible structures or parts of structures located within the trench or outside the trench, the Contractor shall proceed as follows:

.1 Pipes: Fill the interior of the structure with lean concrete or non-shrink “fluid sand” type backfill and seal the ends with appropriate plugs. The Contractor may also choose to dispose of them altogether.

.2 Manholes and catch basins (under or off pavement): The ends of the pipes should be closed and the top section of the manhole or catch basin should be removed to a depth of 2.0 metres. The lower section of the manhole or catch basin shall then be removed or filled with lean concrete or non-shrink “fluid sand” type backfill to a depth of 2.0 metres. The backfill for the last two (2) metres shall be done as per the plans and specifications.

.4 The backfilling of the structures to be decommissioned shall be done in the presence of the Supervisor and the method used shall allow the volume of concrete injected to be measured. The volume must be sufficient to completely fill the pipe.

.5 Before decommissioning a pipe, the Contractor shall ensure that the pipe is no longer in use.

3.7 CLEANING

.1 On completion and verification of performance of installation, remove excess materials, waste, tools, and equipment from the site.

.2 Prior to final inspection, clean all concrete structures (catch basin, manhole, catch basin manhole, control chamber, etc.).

END OF SECTION

PART 1 GENERAL INFORMATION

1.1 RELATED SECTIONS

.1 Section 31 23 33.01—Excavating, Trenching, and Backfilling.

.2 Geotechnical study of the site.

.3 Notwithstanding the foregoing, it is the Contractor's responsibility to obtain a copy of all sections of these specifications even if they do not appear to be relevant to his speciality. The Contractor implicitly acknowledges that he accepts the clauses and requirements of all sections of the specifications, even if he fails to review certain sections. Refer to the table of contents for a complete list of the specification sections.

1.2 REFERENCES

.1 American Society for Testing and Materials International(ASTM)

.1 ASTM C12 09, Standard Practice for Installing Vitrified Clay Pipe Lines.

.2 ASTM C14M 07, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).

.3 ASTM C76M 10a, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).

.4 ASTM C117 04, Standard Test Method for Material Finer Than 75 MU m (No. 200) Sieve in Mineral Aggregates by Washing.

.5 ASTM C136 06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.6 ASTM C425 09, Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.

.7 ASTM C428 05(2006), Standard Specification for Asbestos Cement Nonpressure Sewer Pipe.

.8 ASTM C443M 07, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

.9 ASTM C663 98(2008), Standard Specification for Asbestos Cement Storm Drain Pipe.

.10 ASTM D698 07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft^4 lbf/ft^3 [600 kN m/m^3]).

.11 ASTM D1869 95(2005)e1, Standard Specification for Rubber Rings for Asbestos Cement Pipe.

.12 ASTM D2680 01(2009), Standard Specification for Acrylonitrile Butadiene Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.13 ASTM D3034 08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.14 ASTM D3350 10, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

.2 Canadian Standards Association (CSA)/CSA International

.1 CAN/CSA A3000 F08, Cementitious materials compendium

.1 CAN/CSA A5 F98, Portland Cement.

.2 CAN/CSA A257 09 Series, Standards for concrete pipe and manhole sections

.3 CSA B1800 E11, *Recueil des normes sur les tuyaux sans pression en plastique* (compendium of standards for non-pressure plastic pipe) (consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).

.1 CSA B182.1 11, Plastic Drain and Sewer Pipe and Pipe Fittings.

.2 CSA B182.2 11, PVC Sewer Pipe and Fittings (PSM Type).

.3 CSA B182.6 11, Profile Polyethylene Sewer Pipe and Fittings.

.4 CSA B182.11 11, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

.3 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act (CEPA), 1999.

.4 Bureau de normalisation du Québec (BNQ).

.1 BNQ 1809-300/2019, Construction Work — General Technical Clauses—Water and Sewer Lines.

.2 BNQ 3624-115, Polyethylene (PE) pipe and fittings—flexible corrugated pipes for drainage—Characteristics and test methods.

.3 BNQ 2622-120, Reinforced Concrete Circular Pipes.

.5 *Ministère des Transports du Québec*:

.1 CCDG, latest edition;

.2 Volumes I to VIII.

.6 *Ministère de l'Environnement*, Directive No. 004.

1.3 DEFINITIONS

.1 A "section of pipeline" means the length of pipeline between two successive manholes or between a manhole and any other structure forming part of the sewer system.

1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED

.1 Submit the required shop drawings.

.2 Pipe certification to be on pipes.

.3 Submit data sheets and manufacturer's instructions.

1.5 SCHEDULING OF WORK

.1 Prepare the construction schedule to minimize disruption to existing services and maintain normal flow during construction.

.2 Submit the schedule of planned interruptions for approval and subsequently adhere to the approved schedule.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPE

.1 Polyvinyl chloride (PVC) pipe, DR-35: meets CSA B182.2.

2.2 BEDDING AND OVERLAY MATERIALS

.1 Granular bedding and backfill materials: as per Section 31 23 33.01—Excavation, Trenching and Backfilling.

2.3 BACKFILL MATERIAL

.1 Backfill materials: as per Section 31 23 33.01—Excavation, Trenching and Backfilling.

PART 3 EXECUTION

3.1 PREPARATORY WORK

.1 Clean and dry the pipes and fittings prior to installation.

.2 Have the Departmental Representative approve the pipe and fittings before installation.

3.2 TRENCH EXCAVATION

.1 Do trenching work as stipulated in Section 31 23 33.01—Excavation, Trenching and Backfilling.

.2 Prevent the contents of pipes, drains and sewer connections from flowing into trenches.

.3 Install rigid insulation if the pipe is not covered with a 2.1 m thick cover.

.4 Prior to placing bedding material and pipe, obtain the Departmental Representative's approval of the alignment and depth of the trench.

3.3 GRANULAR BEDDING

.1 Use base materials that are not frozen.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to specified depth.

.3 Lay the bedding according to the prescribed levels and in such a way as to form a continuous and uniform support surface for the pipes.

.1 Do not use blocks to support the pipes.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to at least 95% of corrected maximum density, as per ASTM D698 and Modified Proctor.

.6 Backfill any excavation made above the prescribed lower grade for bedding adjacent to manholes and other structures with the material used for bedding, then compact Class B backfill material.

3.4 INSTALLATION

.1 Lay and join pipe and fittings as per ASTM C12.

.2 Lay and join pipe and fittings as per the manufacturer's recommendations and to the satisfaction of the Departmental Representative.

.3 Handle the pipes as per the manufacturer's approved procedures.

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.4 Place the pipes on the bedding, which must be prepared according to the specified layouts and levels, and must be flat and free of low and high spots.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Commence laying at outlet and proceed in upstream direction with bell ends of pipe facing upgrade.

.6 At the joints, do not exceed maximum joint deflection recommended by the manufacturer.

.7 Do not run water through the pipes during construction except with the express permission of the Departmental Representative.

.8 If work is interrupted, use a removable watertight bulkhead at the free end of the last section installed to prevent foreign matter from entering.

.9 Install plastic pipes and fittings as per CSA B182.11.

.10 Provide for temporary pumping of the sanitary sewer required during connection work on the existing network.

.11 Execution of joints.

.1 Install gaskets as per manufacturer's recommendations and as indicated.

.2 Support pipes as required with slings or a crane to reduce lateral pressure on the fittings and assure concentricity until joint is properly completed.

.3 Carefully align the pipes before joining.

.4 Keep pipe joints free from mud, silt, gravel or other foreign material.

.5 Avoid displacing gasket or contaminating with mud or other foreign material. If necessary, remove, clean, lubricate, and reinstall gaskets before continuing with the pipe assembly.

.6 Complete each joint before laying next length of pipe.

.7 Once they are completed, minimize any deflection at the joints to avoid damaging them.

.12 Make watertight connections to manholes.

.1 Use appropriate gaskets.

3.5 COVERING THE PIPES

.1 After installing the pipe and the structures in place have been inspected by the Departmental Representative, cover the pipe with Class A (CG-14) granular material as shown on the plan.

.2 Backfill shall be done as indicated, in uniform layers not exceeding two hundred millimetres (200 mm) thickness of Class A material (CG-14) to a minimum height of three hundred millimetres (300 mm) above each pipe.

.3 Place each layer evenly and simultaneously on both sides of the pipe.

.4 Do not use frozen material to cover the pipes.

.5 Compact each layer to at least 90% of corrected maximum density, as per ASTM D698 and Modified Proctor.

3.6 BACKFILL

.1 Place the Class B backfill material over the cover layer in uniform layers not exceeding 300 mm compacted thickness to the specified grade.

.2 Do not use frozen material to cover the pipes.

.3 Under pavements, parking lots and pedestrian areas, compact backfill to at least 90% of the maximum corrected dry density, as per ASTM D698.

3.7 SEWER CONNECTIONS

.1 Lay and join pipe and fittings to manufacturer's published instructions and as stipulated.

.2 For horizontal or vertical bends, use elbows not exceeding 22 degrees, separated by a straight section of pipe at least four (4) times the pipe diameter.

.1 Use only large radius elbows.

.3 Bring the building service pipe to a 1 m distance from the outside wall of the building foundation in line with the main connection point, or as indicated on the plans.

.1 Install the required coupling sleeve to make the connection to the building's system.

.2 If the building' s system is already in place, make the connection, otherwise, plug and seal the end of the standby service line and place a temporary marker.

3.8 TESTING AND COMMISSIONING

.1 Perform the tests required by BNQ1809-300 on all installed sewage mains, including service pipes. Provide an inspection report and compliant test results.

.2 The Contractor shall perform waterproofing, deformation, infiltration and leakage tests as well as a closed circuit television inspection.

.3 For PVC pipe, the Contractor shall perform one set of tests after installation and another after a freeze-thaw cycle.

3.9 DECOMMISSIONING EXISTING PIPES

.1 The Contractor shall decommission the existing unitary conduit as shown on the drawings.

.2 For all visible structures or parts of structures located in the trench, the Contractor shall dismantle and dispose of the existing structures.

.3 For all non-visible structures or parts of structures located within the trench or outside the trench, the Contractor shall proceed as follows:

.1 Pipes: Fill the interior of the structure with lean concrete or non-shrink "fluid sand" type backfill and seal the ends with appropriate plugs. The Contractor may also choose to dispose of them altogether.

.2 Manholes and catch basins (under or off pavement): The ends of the pipes should be closed and the top section of the manhole or catch basin should be removed to a depth of 2.0 metres. The lower section of the manhole or catch basin shall then be removed or filled with lean concrete or non-shrink “fluid sand” type backfill to a depth of 2.0 metres. The backfill for the last two (2) metres shall be done as per the plans and specifications.

.4 The backfilling of the structures to be decommissioned shall be done in the presence of the Supervisor and the method used shall allow the volume of concrete injected to be measured. The volume must be sufficient to completely fill the pipe.

.5 Before decommissioning a pipe, the Contractor shall ensure that the pipe is no longer in use.

3.10 RESTORING THE SURFACES

.1 After the installation and the backfilling of the pipes are completed, restore the surfaces to their original condition as directed by the Departmental Representative.

END OF SECTION

PART 1 GENERAL INFORMATION

1.1 RELATED SECTIONS

.1 Section 31 23 33.01—Excavating, Trenching, and Backfilling.

.2 Section 31 32 19.23—Geotextile Layer Separation.

.3 Geotechnical study of the site.

.4 Notwithstanding the foregoing, it is the specialized Contractor's responsibility to obtain a copy of all sections of these specifications even if they do not appear to be relevant to his speciality. The Contractor implicitly acknowledges that he accepts the clauses and requirements of all sections of the specifications, even if he fails to review certain sections. Refer to the table of contents for a complete list of the specification sections.

1.2 REFERENCES

.1 American Society for Testing and Materials International(ASTM)

.1 ASTM C117 04, Standard Test Methods for Materials Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136 06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D698 07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft lbf/ft^3 [600 kN m/m^3]).

.4 ASTM D1056 07, Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber.

.5 ASTM D2680 01(2009), Standard Specification for Acrylonitrile Butadiene Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.6 ASTM D3034 08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.7 ASTM F405 05, Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.

.8 ASTM F667 06, Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.

.9 STM 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)

.1 BNQ 3624 115 2004, Polyethylene pipe and fittings—Flexible corrugated pipe for drainage—Characteristics and test methods.

.2 BNQ 1809-300/2019, Construction Work — General Technical Clauses—Water and Sewer Lines.

.3 Canadian Standards Association (CSA)/CSA International

.1 CSA B1800 F06, Compendium of Standards for Non-Pressure Plastic Pipe (contains: B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).

.1 CSA B182.1 02, Plastic Drain and Sewer Pipe and Pipe Fittings.

.2 CSA B182.2 02, PVC Sewer Pipe and Fittings (PSM Type).

.3 CSA B182.11 02, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

.4 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act (CEPA), 1999.

.5 *Ministère des Transports du Québec*

.1 CCDG, latest edition;

.2 Volumes I to VIII.

1.3 DEFINITIONS

.1 A “section of pipe” is defined as length of pipe between successive catch basins and/or manholes.

1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED

.1 Submit the required shop drawings.

.2 Shop drawings to indicate proposed method for installing carrier pipe for undercrossings.

.3 At least two (2) weeks prior to the commencement of work, notify the Departmental Representative of the proposed source of bedding materials and provide access for sampling.

.4 At least two (2) weeks prior to commencement of work, submit the manufacturer’s tests data and certification that the pipes meet the requirements.

.5 Pipe certification to be on pipes.

.6 Submit to the Departmental Representative one (1) copy of the manufacturer’s installation instructions.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Remove all packaging materials from the job site and dispose of them at appropriate recycling facilities.

1.6 SCHEDULING OF WORK

.1 Prepare the construction schedule to minimize disruption to existing services and maintain normal flow during construction.

.2 Submit the schedule of planned interruptions for approval and subsequently adhere to the approved schedule.

PART 2 PRODUCTS

2.1 PIPES

.1 Type PSM Polyvinyl Chloride (PVC): meets ASTM D3034 and CSA B182.2.

.1 Standard Dimensional Ratio (SDR): 35.

.2 Connection: Integral gaskets and push-fit connection.

2.2 BEDDING AND OVERLAY MATERIALS

.1 Section 31 23 33.01—Excavating, Trenching, and Backfilling as well as the following requirements:

.1 Crushed or screened stone, gravel or sand (CG-14).

.2 Granulometry to be within the specified limits when tested to ASTM C136 and ASTM C117 standards. Sieve size of shall be as per CAN/CGSB 8.1 and CAN/CGSB 8.2.

2.3 BACKFILL MATERIAL

.1 According to the indications on the plans.

.2 Backfill materials: as per Section 31 23 33.01—Excavation, Trenching and Backfilling.

2.4 FLOW REGULATOR

.1 The flow regulators to be installed are of the vortex type. The specifications (flow rate and water head) are shown on the plans.

.2 Where a flow regulator is provided, the Contractor shall provide sufficient space between the pipe outlet invert and the bottom of the concrete structure to allow the regulator to be installed.

PART 3 EXECUTION

3.1 PREPARATORY WORK

.1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

3.2 TRENCH EXCAVATION

.1 Do trenching work as per Section 31 23 33.01—Excavation, Trenching and Backfilling.

.2 Prevent the contents of pipes, drains and sewer connections from flowing into trenches.

.3 Prior to placing bedding material and pipe, obtain the Departmental Representative's approval of the alignment and depth of the trench.

3.3 GRANULAR BEDDING

.1 Use unfrozen granular materials.

.2 Place granular bedding material to the specified thickness in uniform layers not exceeding 200 mm compacted thickness.

.3 Lay the bedding according to the prescribed levels and in such a way as to form a continuous and uniform support surface for the pipes. Do not use blocks when bedding pipes.

.4 Shape transverse depressions in bedding as required to suit joints.

.5 Compact each layer full width of bed to at least 95%.

.6 Backfill any excavation made beyond the prescribed lower grade for bedding adjacent to manholes, catch basins or sewer drains with bedding materials and then compact.

3.4 INSTALLATION

.1 Lay and join pipe and fittings as per ASTM C12.

.2 Lay and join pipe and fittings as per the manufacturer's recommendations and to the satisfaction of the Departmental Representative.

.3 Handle pipe using approved methods.

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends

.4 Place the pipes on the bedding, which must be prepared according to the specified layouts and levels, and must be flat and free of low and high spots.

.1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Commence laying at outlet and proceed in upstream direction with bell ends of pipe facing upgrade.

.6 At the joints, do not exceed maximum joint deflection recommended by the manufacturer.

.7 Do not run water through the pipes during construction except with the express permission of the Departmental Representative.

.8 If work is suspended, install a removable watertight bulkhead at the open end of the last section of pipe installed to prevent foreign material from entering the pipe.

.9 Install plastic pipe and associated fittings as per CSA B18 2.11.

.10 Joints

.1 Install the gaskets as per manufacturer's recommendations.

.2 Support the pipe with slings or a crane, if necessary, to minimize lateral pressure on the gaskets and to maintain concentric alignment of the pipe until it is properly positioned.

.3 Carefully align the pipes before joining.

.4 Keep pipe joints free from mud, silt, gravel or other foreign material.

.5 Avoid displacing gasket or contaminating with mud or other foreign material. If necessary, remove, clean, lubricate, and reinstall gaskets before continuing with the pipe assembly.

.6 Complete each joint before installing a new section of pipe.

.7 Once the pipes are assembled, minimize deflection at the joints to avoid damage to the joints.

.8 When assembling the pipe, apply sufficient pressure to ensure that the joints adhere all the way around the pipe as recommended by the manufacturer.

.11 When work is interrupted, restrain pipes to prevent any movement during the downtime.

.12 Plug lifting holes with the Departmental Representative's approved prefabricated plugs, set in shrinkage compensating grout.

.13 As necessary, cut the pipes to fit the required inserts, fittings,and plugs. Make a clean cut, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.14 Make watertight connections to manholes, catch basins, and sewer drains.

.1 Use a non-shrink grout when suitable gaskets are not available.

.15 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.

.1 Joint to be structurally sound and watertight.

.16 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel, or plastic bulkheads.

.17 Install the drains so as to obtain an even slope towards the lower point. There should be no depression in the drain alignment. Drains must have a minimum slope of 0.3% without depression.

3.5 COVERING THE PIPES

.1 Use covering materials that are not frozen.

.2 After the installation of the pipes and the joints have been inspected by the Departmental Representative, surround and cover pipes as indicated.

.1 Leave joints and fittings exposed until field testing is completed.

.3 Backfill shall be done as indicated, in uniform layers not exceeding two hundred millimetres (200 mm) thickness of Class A material (CG-14) to a minimum height of three hundred millimetres (300 mm) above each pipe.

.4 Place the layers evenly and simultaneously on each side of the pipe.

.5 Compact each layer to at least 90% of corrected maximum density, as per ASTM D698 and Modified Proctor.

.6 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.6 BACKFILL

.1 Use backfill materials that are not frozen.

.2 Place backfill material, above pipe surround, in uniform layers not exceeding 300 mm compacted thickness up to grades as indicated.

.3 Under pavements, parking lots and pedestrian areas, compact backfill to at least 90% of the maximum corrected dry density, as per ASTM D698.

.4 Place dimensionally stabilized backfill material as per Section 31 23 33.01—Excavation, Trenching and Backfilling.

3.7 DECOMMISSIONING EXISTING PIPES

.1 The Contractor shall decommission all existing pipes, manholes, and catch basins rendered inoperative by the installation of the new pipes.

.2 For all visible structures or parts of structures located in the trench, the Contractor shall dismantle and dispose of the existing structures.

.3 For all non-visible structures or parts of structures located within the trench or outside the trench, the Contractor shall proceed as follows:

.1 Pipes: Fill the interior of the structure with lean concrete or non-shrink “fluid sand” type backfill and seal the ends with appropriate plugs. The Contractor may also choose to dispose of them altogether.

.2 Manholes and catch basins (under or off pavement): The ends of the pipes should be closed and the top section of the manhole or catch basin should be removed to a depth of 2.0 metres. The lower section of the manhole or catch basin shall then be removed or filled with lean concrete or non-shrink “fluid sand” type backfill to a depth of 2.1 metres. The backfill for the last two (2) metres shall be done as per the plans and specifications.

.4 The backfilling of the structures to be decommissioned shall be done in the presence of the Supervisor and the method used shall allow the volume of concrete injected to be measured. The volume must be sufficient to completely fill the pipe.

.5 Before decommissioning a pipe, the Contractor shall ensure that the pipe is no longer in use.

3.8 PIPE INSPECTION

.1 The Contractor shall perform a complete inspection of the existing pipe section at the locations indicated on the plans.

.2 The Contractor is responsible for cleaning the pipe prior to the inspection.

.3 The inspection must be performed by a specialized firm.

.4 The inspection must comply with BNQ requirements.

.5 The Contractor must then provide the Departmental Representative with the complete inspection report and the inspection DVD.

.6 The Contractor must provide for the necessary efforts to complete the inspection of the entire section. For example, the inspection may have to be conducted from both ends of the pipe to allow for a complete inspection in case of a blockage.

3.9 FIELD TESTING

.1 Repair or replace pipes, pipe joints or bedding materials found to be inadequate.

.2 Remove any foreign matter from sewers and related appurtenances by flushing with water.

.3 Carry out inspection of installed sewers by television camera or photographic camera.

.4 Perform all tests and inspections required by BNQ 1809-300 for all installed pipes, including service connections.

.5 Provide the inspection report and compliant inspection results.

END OF SECTION

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

PART 2 PRODUCTS

2.1 PVC DUCTS AND FITTINGS

.1 Rigid PVC duct: Type DB2/ES2, with moulded fittings, for direct burial [expanded flange ends], Trade size 6.

.1 Nominal length: 6m plus or minus 12 mm.

.2 Rigid PVC split ducts.

.3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make a complete installation.

.4 Rigid PVC 90 degrees, 45 degrees bends and 5 degrees angle couplings as required.

2.2 SOLVENT WELD COMPOUND

.1 Solvent cement for PVC duct joints.

2.3 CABLE PULLING EQUIPMENT

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

2.4 WARNING TAPE

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

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

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

.2 Clean inside of ducts before laying.

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

.4 Slope ducts with 1 to 400minimum slope.

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

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

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

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

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

.9 Install markers as required.

.10 Notify the Departmental Representative for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

3.3 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Construction/demolition Waste Management and Disposal.

END OF SECTION

Public Services and Procurement Canada

Geotechnical Investigation Report

Place George-V Restoration Project

805 Wilfrid-Laurier Av., Quebec, QC G1R 2L

R.094682.100

CIMA+ file number : Q213080A
December 2021 - Review 00

Public Services and Procurement Canada

Geotechnical Investigation Report

Place George-V Restoration Project

805 Wilfrid-Laurier Av., Quebec, QC G1R 2L

R.094682.100

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1. Introduction

1.1 Project Description

Public Services and Procurement Canada (PSPC) has undertaken the development of Place George-V, located in front of the Quebec City Armoury, in the heart of Old Quebec. PSPC has retained the services of the consortium *OPTION aménagement* | *CIMA+* to assist in the various stages of design and construction of the project, which includes a geotechnical study.

1.2 Scope of Work

This report is an addition to the Place George-V Development Report and an update to the Geotechnical Study Report QR0272A issued in March 2021. This report is also an addition to the soil permeability evaluation report (QCM-0-43166) issued in September 2021. It provides additional knowledge of bedrock characteristics at Place George-V.

More specifically, this project aims to:

- Complete seven (7) geotechnical boreholes with soil and rock sampling to a depth of four (4) meters;
- Complete one (1) geotechnical borehole with soil and rock sampling to a depth of seven (7) meters in the area of the electrical chamber;
- Survey the ground water levels;
- Provide geotechnical recommendations regarding the reuse of filling materials, frost protection, soil and rock bearing capacity, excavations, groundwater control and type of foundation for the installation of a buried electrical room and new monuments;
- Preparation of reports (French and English) including a map of the rock profile on the site.

1.3 Report Limitation

This report has been produced at the request of the PSPC, within the specific terms of a contract with **CIMA+**. No copy of this report may be used by any third party without the authorization of OPG. The limits of this Geotechnical Investigation are presented in Appendix A.

2. Context

2.1 Study site description

The study site is located in front of the Voltigeurs de Quebec Armoury. The approximate coordinates at the centre of the study site are latitude 46.80693°N and longitude - 71.21445°W. The location of the study area is identified in Figure 1 below.

Figure 1 : Study site location

2.2 Regional Geology

The regional geology of the study area was obtained from the *Système d'information géominière du Québec (SIGÉOM)* from the *Ministère de l'Énergie et des Ressources naturelles du Québec*.

In the study area, the surface geology is almost absent, leaving their place to filling materials of variable thickness. The strong anthropization of this region of Quebec has caused the reworking of the soils in place and the filling of the bedrock.

In this regard, the rock formation in the study area is part of the Appalachian geological province. More specifically, this rock mass is composed of Ordovician clayey limestone.

3. Fieldwork and Laboratory Testing

3.1 Fieldwork

3.1.1 Screening Underground Infrastructures

Prior to the drilling, CIMA+ called upon the expertise of RadEX Detection Inc. to locate the underground infrastructures present on the study site. Radiosensing of the location of each borehole allowed us to secure their location and to identify the surrounding underground services. In addition, the location plans provided by *Info Excavation* during the first phase of work in June 2021 were also used for this drilling campaign.

3.1.2 Fielwork Methodology

Seven (7) geotechnical boreholes of four (4) meters depth and one (1) of seven (7) meters depth were carried out on September 15, 16 and 17, 2021 at Place George-V by Mr. Samuel Bilodeau, environmental professional at CIMA+.

The boreholes were carried out using a georeferenced site plan and a handheld GPS with an approximate accuracy of three (3) meters. The ground level was estimated in relation to the survey. The drilling location plan is presented in Appendix D.

The eight (8) geotechnical borings carried out at George-V Place were completed using a trailer-mounted drilling rig from the company *Forage Comeau*.

First, the drilling work consisted in sampling the soils while performing standard penetration tests (ASTM D 1586). For the realization of this test, three (3) models of standardized split spoon samplers of different calibres were used, namely calibres "H", "N" and "B" with an external diameter of 90, 63 and 51 millimetres respectively.

Soil and residual granular material (RGM) samples were collected in accordance with sections 1 and 5 of the *Guide d'échantillonnage à des fins d'analyses environnementales* made by the *Centre d'expertise en analyse environnementale du Québec* (CEAEQ) and following the *Guide de caractérisation des terrains*. Between each sample taken, the split spoons were cleaned with soapy water, then rinsed with distilled water, acetone, hexane, then again with acetone and finally with distilled water. The collected soil samples were directly placed in amber glass jars and kept cool until delivery to the analytical laboratory.

A quality control program was implemented to ensure quality control of the laboratory's sampling and chemical analysis methods. Thus, a duplicate of soil collected in the field was analyzed. This method allows us to assess the reproducibility of the results. The environmental characterization of the site will be presented in a joint report.

Then, once the drilling progression reached the bedrock, an 88.9 millimetres diameter "NW" casing was anchored to the bedrock to allow coring. Rock samples were collected using a 75.7 mm NQ double wall corer. The quality of the bedrock was determined in the field by calculating the RQD of the samples.

Observation tubes of 50 millimetres in diameter, with a 1.5 metres long screen at the bottom, were installed in each of the drill holes at the maximum depth reached. The screens were coated with silica sand to prevent clogging of the slots and the boreholes were sealed at the surface with granular bentonite.

3.2 Laboratoy Testing

All soil samples collected during drilling were sent to the CIMA+ laboratory where they were subjected to a thorough visual examination. Subsequently, among all the soil samples collected, some were retained to be submitted to the following geotechnical tests and/or analyses:

- Four sieve analyses (BNQ 2501-025);
- Two hydrometer analyses (BNQ 2501-025);
- Two uniaxial compressive strength test (ASTM D 7012).

The samples selected for these tests were chosen to complement those collected and analyzed following the field campaign conducted earlier in June 2021.

The results of these tests and analyses are presented in Appendix C. Unanalyzed samples will be retained for a period of six months from the date of issuance of this report, after which they will be destroyed unless otherwise directed by the client.

4. Site Conditions and Soil Stratigraphy

The soils in place are generally composed of a granular fill of sand with variable proportions of gravel and silt. Debris such as brick, sandstone, porcelain, pebbles and rock fragments are also present.

The sieve analysis results for the coarse fraction and by sedimentometry for the fine fraction is compiled in Table 1. The laboratory results are included in Appendix C.

Table 1 : Sieve and Hydrometer Analyses

Borehole	Sample	Depth (m)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
F-102-21	CF-01A	0,00 – 0,30	7,9	13,8	63,1	15,2
F-102-21	CF-02A	0,30 – 0,61	12,3		35,8	51,9
F-104-21	CF-01	0,00 – 0,41	5,8	14,0	52,0	28,2
F-105-21	CF-01B	0,05 – 0,61	11,4		86,3	2,3

The depths at which the bedrock was encountered are compiled in Table 2 and illustrated in table 2 below.

Table 2 : Depth of auger refusal on bedrock (m)

F-101-21	F-102-21	F-103-21	F-104-21	F-105-21	F-106-21	F-107-21	F-108-21
1,73	0,97	0,08	0,41	1,70	2,03	1,80	2,24

The bedrock depths shown in table 2 are based on the data collected during the drilling of the present study, but also during the drilling of the geotechnical study of March 2021 and the soil permeability study of September 2021.

Note that the groundwater table was encountered during the borings. Information on the groundwater level is presented in section 5.

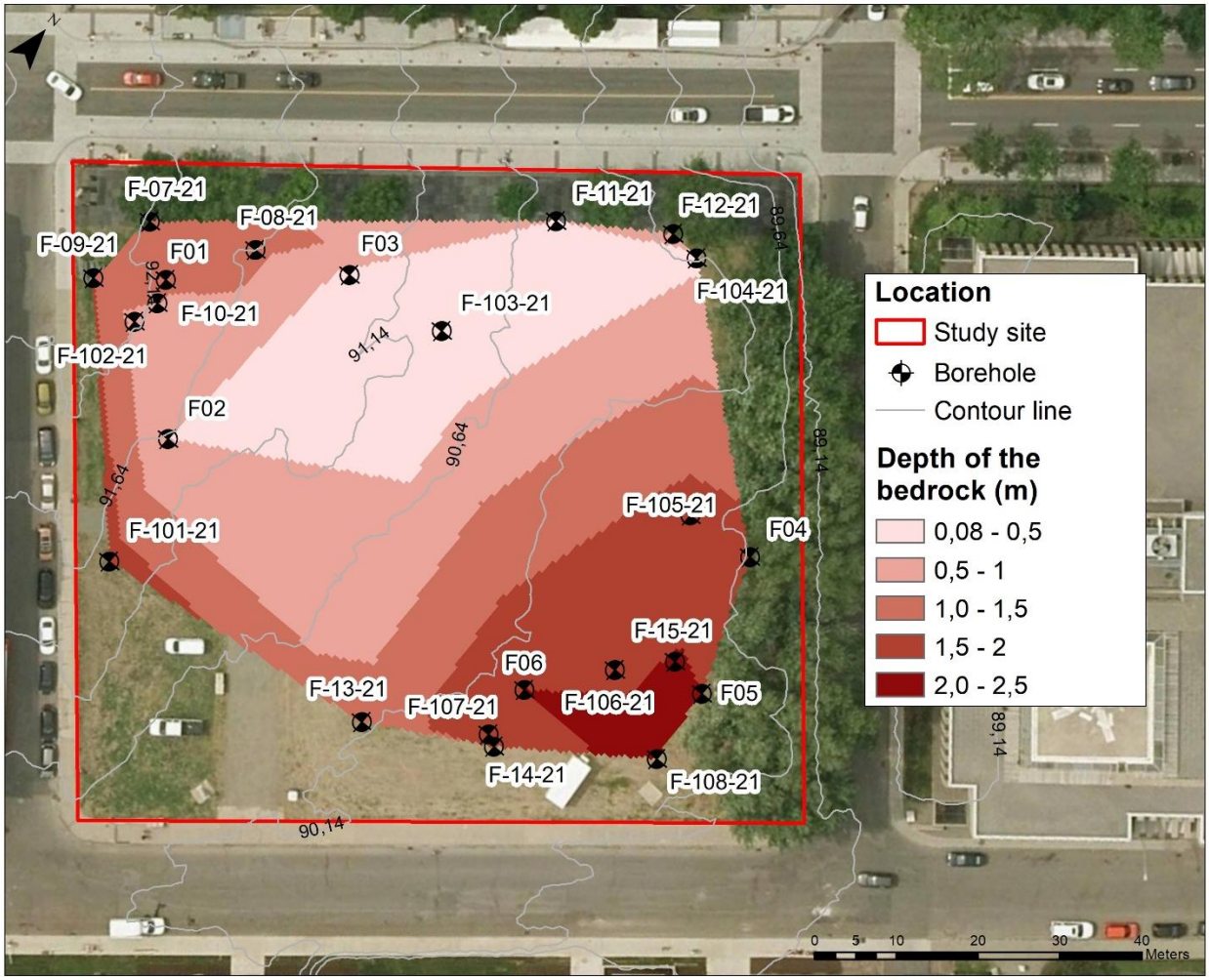

Figure 2 : Model representing the depth of the bedrock at Place George-V

4.1 Bedrock Properties

The bedrock was reached in all boreholes at depths ranging from 0.41 to 2.24 metres below ground surface. The bedrock at this site is composed of clayey limestone with black shale bedding.

The Rock Quality Designation (RQD) is used to provide a quantitative estimation of the fracturing of the rock mass based on the examination of core samples obtained from drilling.

Specifically, the RQD index is defined as the percentage of intact pieces greater than 10 cm in length over the total length of the core run (Deere et al., 1967):

$$RQD = 100 \times \frac{\sum length\ of\ sound\ pieces > 10\ cm}{Total\ core\ run\ length}$$

The classification of the sampled rock from the RQD index is determined according to the following Table 3 (Deere et al., 1967):

Table 3 : Rock classification (RQD)

Percentage of Unbroken Pieces >10 cm	Rock Quality
< 25 %	Very poor
25-50 %	Poor
50-75 %	Fair
75-90 %	Good
90-100 %	Excellent

RQDs ranging from 0% to 96% were measured for the rock samples at the boreholes. These values indicate rock quality ranging from very poor to excellent. The following table summarizes the RQDs observed in boreholes F-101-21 to F-108-21.

Table 4 : Rock classification (RQD)

Run	F-101-21			F-102-21			F-103-21			F-104-21		
	Depth (m)		RQD (%)	Depth (m)		RQD (%)	Depth (m)		RQD (%)	Depth (m)		RQD (%)
CR-02	-	-	**-**	-	-	**-**	0,076	1,73	**95**	0,41	1,98	**90**
CR-03	-	-	**-**	1,22	2,26	**58**	1,73	2,97	**78**	1,98	3,15	**74**
CR-04	1,75	2,46	**28**	2,26	2,89	**84**	2,97	4,22	**93**	3,15	4,11	**96**
CR-05	2,46	2,82	**0**	2,89	4,04	**68**	-	-	**-**	-	-	**-**
CR-06	2,82	4,17	**39**	-	-	**-**	-	-	**-**	-	-	**-**
CR-07	4,17	4,57	**27**	-	-	**-**	-	-	**-**	-	-	**-**
CR-08	4,57	5,64	**76**	-	-	**-**	-	-	**-**	-	-	**-**
CR-09	5,64	7,16	**67**	-	-	**-**	-	-	**-**	-	-	**-**
Mean	-	-	**39,5**	-	-	**70**	-	-	**89**	-	-	**87**
Maximum	-	-	**76**	-	-	**84**	-	-	**95**	-	-	**96**
Minimum	-	-	**0**	-	-	**58**	-	-	**78**	-	-	**74**

Run	F-105-21			F-106-21			F-107-21			F-108-21		
	Depth(m)		RQD (%)	Depth (m)		RQD (%)	Depth (m)		RQD (%)	Depth (m)		RQD (%)
CR-02	-	-	-	-	-	-	-	-	-	-	-	-
CR-03	-	-	-	-	-	-	-	-	-	-	-	-
CR-04	1,78	2,57	**0**	-	-	-	1,93	2,57	**0**	-	-	-
CR-05	2,57	3,58	**61**	2,03	2,64	**84**	2,57	3,35	**16**	2.29	2,44	**0**
CR-06	3,58	4,19	**77**	2,64	3,53	**46**	3,35	4,19	**46**	2,44	2,77	**0**
CR-07	-	-	-	3,53	4,14	**21**	-	-	-	2,77	3,12	**0**
CR-08	-	-	-	-	-	-	-	-	-	3,12	3,86	**12**
CR-09	-	-	-	-	-	-	-	-	-	3,86	4,24	**0**
Mean	-	-	**46**	-	-	**50**	-	-	**21**	-	-	**2,4**
Maximum	-	-	**77**	-	-	**84**	-	-	**46**	-	-	**12**
Minimum	-	-	**0**	-	-	**21**	-	-	**0**	-	-	**0**

Compressive strength tests were performed on rock cores collected during drilling. The results of these tests are presented in Table 5.

Table 5 : Compressive strength test results

Borehole	Depth (m)	Compressive strength (MPa)
F-101-21	2,57 - 3,35	47,1
F-103-21	0,08 - 1,73	71,1

5. Ground Water Level Measurement

Groundwater levels were measured on September 17th, 2021 and on October 28th in the observation tubes left in the boreholes. The readings were made after a stabilization period of approximately two (2) days. At these times, the groundwater level was between 0.90 metres and 3.23 metres below the current ground level. The results of the groundwater readings are summarized in the following table.

Table 6 : Ground water levels (m)

Borehole	Surface Elevation (m)	September 17th		October 28th	
		Depth	Elevation	Depth	Elevation
F-101-21	91,6	1,13	90,47	1,45	90,15
F-102-21	92,0	1,42	90,58	-[1]	-
F-103-21	91,1	0,90	90,20	-[1]	-
F-104-21	89,9	1,14	88,76	-[1]	-
F-105-21	91,1	2,21	88,89	1,85	89,25
F-106-21	89,6	3,19	86,41	3,23	86,37
F-107-21	90	- [1]	-	- [1]	-
F-108-21	89,9	2,43	87,47	2,53	87,37

[1]Observation tube blocked or destroyed.

It is important to note that the water level in the soil is likely to fluctuate up or down with the seasons or climatic variations and therefore may be at different depths at other times of the year.

6. Conclusions et Recommendations

The next sections of the report provide an update to the geotechnical recommendations made in the report QR0272 issued in March 2021.

6.1 Project Summary and Study Site Conditions

As part of the *Place George-V* development project, an electrical room is planned to be buried approximately 3 metres below the current ground level in the area of the borehole F-101-21. Also, some of the monuments on the site will be relocated. A new foundation will be built for each of these monuments nearby borehole location F-105-21, F-106-21 and F-108-21. According to our observations, the site is composed of a fill layer made up mostly of sand with variable proportions of silt and gravel. Some residual materials (pieces of brick, mortar and porcelain) as well as organic materials were encountered in this fill. The rock was encountered at depths ranging from 0.08 to 2.24 metres.

6.2 Site Grading and Preparation

The fill material present on the surface of the existing site is not acceptable to support structural loads. Therefore, it is recommended that the fill-in the foundation right-of-way is removed and replaced with lean concrete or controlled fill with the following characteristics:

- Containing less than 15% of fine particles (< 80 µm);
- Without organic matter and potentially swelling materials (shale, pyrite shale, etc.);
- Without particles larger than 100 mm and materials unsuitable for construction (debris);
- With a poorly graded granulometry and a water content that facilitates its compaction at the time of the work;

Prior to placement of the controlled fill, a visual inspection shall be performed to ensure that the natural soil in place is intact. Any reworked or frozen soil shall be excavated and replaced with an overburden of controlled fill.

The controlled fill shall be placed in layers not exceeding 300 mm in thickness and shall be densified to at least 95% of the maximum dry density value obtained by the Modified Proctor Test.

The backfill shall be sufficiently wide at the base to support the loads under the foundation elements. It must extend beyond the entire perimeter of the projected structures for a minimum distance equivalent to at least one time the backfill height (45° slope).

6.3 Foundations and bearing capacity

The borehole results indicate that the loads of the proposed monuments will be supported directly on bedrock, on the controlled fill described in the previous section erected on the bedrock, or on thin concrete cast on bedrock with a minimum thickness of 50 mm.

The loads of the buried electrical room will be supported directly on the rock.

If it is necessary to uniform the footing surface, we recommend the installation of a MG 20 or MG 20b (or equivalent) pad of crushed aggregates under the footings. This pad must have a minimum thickness of 150 mm and must be densified to a minimum dry density of 95% of the maximum value obtained in the Modified Proctor test. A layer of thin concrete with a minimum thickness of 50 mm can also be used as a foundation.

The following bearing capacities may be used by the designer in the foundation design.

Table 7 : Bedrock bearing capacities

Conditions	Bearing capacities (kPa)
Ultimate limit state (ULS)	1500
Geotechnical resistance factor with a resistance coefficient of 0,5	750

Table 8 : Bearing capacities of the controlled fill

Conditions	Capacités portantes (kPa)
Ultimate limit state (ULS)	500
Geotechnical resistance factor with a resistance coefficient of 0,5	250
Limit state resistance for settlements of 25 mm (ELS25 mm)	200

The geotechnical resistance at ULS relates to safety, i.e., mainly to the failure mechanisms of the structure and corresponds to the total loads. The geotechnical resistance at SLS relates to the intended use of the structure, i.e., total and differential settlements. It corresponds to the stresses that can be added to the initial stresses in place at the considered level. No safety factors are used in the settlement calculations.

Based on knowledge of the current site, the clayey limestone may have swelling potential. Swelling rock can cause the lifting of slabs and paving stones if it is located at a depth of less than about 1.80 metres under them.

However, no laboratory tests have been conducted to confirm this. In the case where the MTQ wishes to validate the swelling potential of the rock, we recommend that a minimum of 3 PEPI tests and residual pyrite determination be performed.

The following paragraphs present the procedure to be followed to minimize the swelling of the rock under the slabs.

A first option is to excavate the rock to a depth of 1.80 metres below the level of the underside of the slab and backfill the excavation with non-swelling material. This option is not recommended, in order to limit over-excavation.

Another option is to clean the previously excavated rock during the foundation work and waterproof the surface of the unweathered rock with a suitable bituminous coating to cut off the oxygen supply. This second option is recommended. The excavation bottom should be checked and approved by a geotechnical engineer or his representative in order to detect any area unsuitable for construction and to proceed with the appropriate corrections if necessary.

The surface of the rock to be waterproofed must be dry and clean in order to facilitate the adhesion of the bituminous layer. A thin layer of lean concrete should be placed beforehand to facilitate the application of the coating if the surface of the rock is too irregular to allow an adequate placement of the coating. The choice of the most appropriate type of waterproofing should be determined with the supplier according to temperature and site conditions. We recommend placing a geotextile of sufficient thickness and good punching resistance or a layer of fine to medium sand 100 mm thick that is not compacted on top of the bituminous coating, in order to protect the coating from punching.

6.4 Frost Protection

For all structures, foundations exposed to the action of frost must be backfilled with soil to a minimum thickness of 1.5 metres from the final surface of the ground in order to protect them from the harmful effects of frost. However, in areas that are permanently cleared of snow or unheated, we recommend that this thickness be increased to 1.8 metres.

6.5 Excavations Groundwater Control and Discharge

Based on the borehole results, the use of conventional equipment may be considered for the excavation of soft ground. However, the excavation of rock will require blasting or special equipment, which could slow down production in the latter case.

Water level readings taken as part of this mandate indicate that the water table was at a depth of 0.90 to 3.23 metres at the time of the readings, but conditions at the time of construction could be different.

Seepage from precipitation, runoff, or perched water tables within the surface soil layers could occur during excavations, depending on weather conditions and/or the time of year the work is done. Water inflow should be eliminated by means of trenches and pumps judiciously placed at the periphery of the excavations, near the sources of infiltration.

The slopes will have to comply with the directives of the *Commission des normes, de l'équité, de la santé et de la sécurité du travail du Québec (CNESST)* in order to carry out the work safely for the workers. Unsupported temporary excavation slopes remain the responsibility of the contractor at all times. The contractor must shape the walls at slopes that will allow them to remain stable throughout the work. For engineering and economic analysis by the designer, temporary excavation slopes in loose soils in place should be sloped at no more than 1H:1V, taking into account adequate water control. In bedrock, excavation slopes may be increased to 1H:10V to the anticipated depth of the buried building.

It is important to ensure that a distance at least equal to the depth of the excavation is maintained between the top of the slope and the base of the stockpiles at the site. Vehicle passing near the trenches must be kept at a sufficient distance from the excavated area in order to minimize the impact of vibrations on the stability of the excavations. These conditions must be respected at all times, unless specific studies are made for each specific case and different recommendations are given by a geotechnical engineer.

If safe excavation slopes cannot be met due to physical contingencies, the contractor shall provide for safe shoring of the walls within the parameters indicated in the following section.

6.6 Reuse of Site Generated Material and Backfill

The results of the grain size analysis show that the majority of the backfill materials and natural soils to be excavated do not meet the requirements of a MG 112 granular material. These materials can only be reused as class B materials, provided that the water content of these materials allows their placement and compaction, and if they respect the environmental standards.

The possibility of reusing the excavated material will depend on the climatic conditions at the time of the work and the work methods of the contractor. Appropriate compaction equipment and methods should be used for the type of material and site conditions.

Where excavated material is not suitable for reuse, borrow material meeting the above requirements, with a gradation and moisture content suitable for compaction, shall be used for backfilling. This material must be free of particles larger than 300 mm.

6.7 Pavement Design

Based on the borehole results, the materials present under the subgrade line under the new paved roadway are predominantly SM type sand. These soils are considered to be permeable and not susceptible to frost. Due to the variable depth of the bedrock, the subgrade of the pavement structure will be built directly on bedrock at some locations on the site.

The pavement structures were designed using the *CHAUSSÉE 2* software of the *Ministère des Transports du Québec*. The Quebec City freezing index (1236°C-day) was used for this analysis. The following table shows the thicknesses of the various pavement elements recommended for the event plaza, considering that heavy trucks will be able to drive on it, as well as for the other low-stress driveways. The thicknesses of the different layers correspond to the minimum required to obtain acceptable structural and frost behaviour.

Table 9 : Design elements for paved surfaces

Pavement design elements	Materials	Thickness (mm)	
		Event Palza	Other areas
Surfaces	Interlocking pavement or stone paving		
Granular Base	MG-20 crushed stone compacted to 98% of the maximum dry density as determined by the Modified Proctor Test	300	300
Granular Subbase	MG-56 crushed stone compacted to 95% of the maximum dry density determined by the Modified Proctor Test	450	-
Granular Subbase	MG-112 granular material compacted to 95% of the maximum dry density determined in the modified Proctor test	-	350
Geotextile	Type III (Norme 13101 – MTQ)	Required	Required

When the subgrade soil is composed of fill, we recommend that it be compacted in at least two passes with a roller before the pavement structure is placed. The installation of a geotextile is also recommended between the backfill and the subgrade.

During excavations, all necessary precautions should be taken to avoid reworking the natural soil so that it retains its supporting qualities. In the event that over-excavation is necessary below the subgrade line (reworked soils, presence of organic matter, etc.), the difference in elevation up to the subgrade line shall be filled with materials of similar frostiness and free of organic matter, in layers not exceeding 300 millimetres in thickness, each of these layers being densified to 90% of the maximum density.

Materials shall conform to NQ 2560-114. Granular materials shall be compacted in layers not exceeding 300 millimetres. The minimum percentage of compaction described in the preceding table is determined according to BNQ standard 2501-255 "Test with modified compaction energy."

It is recommended that quality control and material testing be performed by a laboratory during the execution of the work.

6.8 Water main protection measure

Since the existing pipe is close to the surface and is located in the work area, special protection measures must be taken to minimize vibrations near this pipe. The use of low dynamic or static energy compactors should be preferred to avoid damaging this pipe. In doing so, the contractor should plan to moisten the new pavement structure material to its optimum moisture content before compaction begins, thus reducing the compaction energy required. Once compacted to the optimum moisture content, if compaction does not meet the specification requirements, the contractor will be required to avoid overburdening the pipe area and compaction requirements may be reduced. In all cases, the methods and results shall be monitored by a material control engineer.

6.9 Field Inspection

It is recommended that the excavation and foundation work be inspected by competent geotechnical personnel to ensure that the soil conditions are representative of the test borings and, if necessary, to detect any peculiarities that may affect our conclusions and recommendations.

7. References

Standard, ASTM, D2487-11, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

Standard, ASTM D2488-09a, Practice for the Description and Identification of Soils (Visual-Manual Procedure).

SCG, 2013. Manuel Canadien d'ingénierie des fondations, 4e édition.

CNRC, 2010. Code national du bâtiment

A

Appendix A
Study limitations

DETAILS AND LIMITATIONS OF THE REPORT AND THE SERVICES PROVIDED

This report has been prepared at the request and for the exclusive use of the client in the context determined by the specific terms of the mandate given to CIMA+ by the client and according to the agreement between the two parties. CIMA+ assumes no responsibility arising from the possible use of this report by a third party. No full or partial copy of this report may be made without the express consent of the client.

The findings presented in this report are strictly based on our current understanding of the project, the information consulted, the observations made by CIMA+ and the results obtained during the study, taking into account other limitations indicated within this report. Thus, the content of the report should at no time be considered as a final, complete or final judgment of the geotechnical conditions attached to the land under study.

This report should be used for design purposes only, not for construction purposes. The conclusions and recommendations of this study represent our professional opinion, to the best of our knowledge at the time of the preparation of this report. We require permission to revise our recommendations when the plans and specifications are completed or if the proposed development differs from that described in this report.

At no time can CIMA+ be held liable for damage resulting from erroneous conclusions attributable to the unavailability of relevant information from the site under study or due to the inaccuracy of such information.

The conditions encountered between surveys or elsewhere on the site may possibly differ from those observed at their location. Any extrapolation from these results is made on an interpretative basis and should be viewed with caution. Consequently, if the conditions encountered during the work differ from those observed at the location of the surveys, we would appreciate being informed immediately so that we can modify our recommendations accordingly.

Any opinion concerning the application or compliance with the laws and regulations appearing in this report is expressed subject to all reserves and must not, at any time, be considered as legal advice or replace such advice.

B

Appendix B
Borehole Log Reports

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-101-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM 7 (NAD83)	X: **250246,3**
			Y: **5185481,1**
			Z: **91,60**
Applicant :	**Services publics et Approvisionnement Canada (SPAC)**		
Location :	**Place George V, Québec**	Project No. :	**Q213080A**
Drilling contractor:	**Forage Comeau**	Localization figure No. :	
Type of drill:	**UM 2008**		
Borehole diameter :	**Tarière de 200 mm** — Inclination : **90** — Azimuth :	Drilling start date :	**2021-09-17**
Executed by :	**S. Bilodeau** — Core diameter: **NQ**		
Compiled by :	**M. Grenier** — Verified by : **D. Beaulieu**	Total borehole depth :	**7,16 m**

SAMPLE TYPE
- SS Split Spoon
- DC Diamond rock core
- MA Manual sampling
- AS Auger
- ST Shelby tube
- TW Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION INDEX "N"

Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: **2021-09-17** Date:

Depth (m): **1,13** Depth (m):

SAMPLE STATE
- Remoulded
- Intact (thin wall sampler)
- Lost
- Core (diamond rock core)

SYMBOLS
- N: Standard penetration value
- R: Refusal (N > 100)
- WoH: Weight of Hammer / 61 cm
- R.Q.D: Rock quality designation
- % R.Q.D = Σ Cores > 4 po. (10 cm) / Drilled length

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 à 0,080 mm
Sand	0,080 à 5 mm
Gravel	5 à 80 mm
Cobbles	80 à 300 mm
Boulders	> 300mm

CONSISTENCY / SHEAR STRENGTH (Cu)

Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

GRAPHIC
- ▲ : N (standard pen.)
- △ : Nc (dyn. pen.)
- ● : Cu (lab)
- ▽ : Cur (lab)
- × : Cu (site)
- + : Cur (site)

W_p w W_l

20 40 60 80

TESTS
- GSA : Grain size analysis
- S : Sedimentometry
- CA : Chemical analysis
- Wn : Water content
- Dup : Duplicate sample
- Att : Atterberg limits
- PAH : PAH analysis
- C10 : C10-C50 analysis
- MX : 14 metal analysis
- UCS : Unixial compressive strength of rock

DEPTH (m)	DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	WATER LEVEL (m)	TESTS
		91,60	Level									
		0,00	Fill : Sand, some silt and gravel. Presence of organic matter and debris.		CF-01		H	45	30	10-12-18-17		C10, PAH, MX et DUP7
			cemented ground at 0.46 m.									
		90,99										
		0,61	Fill : Gravelly sand, some silt, dark brown to black.		CF-02		N	30	21	13-13-8-6		C10, PAH, MX
1											1,13	
			Become saturated at 1.22 m.									
	5				CF-03		B	25	11	3-6-5 50/2'		C10, PAH, MX
		89,85										
		1,75	Bedrock. Clayey limestone with black shale layers of very poor to good quality.									
2					CR-04		NQ	100	*28*			
			Water losses in casing during boring at 2.54 m.									
					CR-05		NQ	100	*0*			UCS: 47,1 MPa

WELL INSTALLATION: 2021-09-17

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-101-21**

DEPTH (m)	DEPTH - pi	STRATIGRAPHY: LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	STRATIGRAPHY: SYMBOLS	SAMPLES: TYPE NO	SAMPLES: SUB - SAMPLE	SAMPLES: STATE	SAMPLES: RECOVERY %	SAMPLES: N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
					CR-06		NQ	100	*39*					
4														
					CR-07		NQ	100	*27*					
	15													
5					CR-08		NQ	100	*76*					
6														
	20				CR-09		NQ	100	*67*					
7														
		84,44 / 7,16	Fin du forage.											

GRAPHIC: ▲ : N (standard pen.); △ : Nc (dyn. pen.); ● : Cu (lab); ▽ : Cur (lab); × : Cu (site); + : Cur (site); w_p w w_l; 20 40 60 80

TESTS:
- GSA : Grain size analysis
- S : Sedimentometry
- CA : Chemical analysis
- Wn : Water content
- Dup : Duplicate sample
- Att : Atterberg limits
- PAH : PAH analysis
- C10 : C10-C50 analysis
- MX : 14 metal analysis
- UCS : Unixial compressive strength of rock

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : Public Services and Procurement Canada (PSPC)

BOREHOLE LOGGING

Borehole N° F-101-21

DEPTH (m)	DEPTH - pi	STRATIGRAPHY: LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	STRATIGRAPHY: SYMBOLS	SAMPLES: TYPE NO	SAMPLES: SUB - SAMPLE	SAMPLES: STATE	SAMPLES: RECOVERY %	SAMPLES: N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
	25													
8														
9	30													
10														
	35													
11														

GRAPHIC:
▲ : N (standard pen.)
△ : Nc (dyn. pen.)
● : Cu (lab)
▽ : Cur (lab)
× : Cu (site)
+ : Cur (site)
w_p w w_l
20 40 60 80

TESTS:
GSA : Grain size analysis
S : Sedimentometry
CA : Chemical analysis
Wn : Water content
Dup : Duplicate sample
Att : Atterberg limits
PAH : PAH analysis
C10 : C10-C50 analysis
MX : 14 metal analysis
UCS : Unixial compressive strength of rock

Remark(s):

Cima_Log_en.sty

Production date 2021-11-16

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-102-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM 7 (NAD83)	X: **250230,6**
			Y: **5185509,2**
			Z: **92,00**
Applicant :	**Public Services and Procurement Canada (PSPC)**	Project No. :	**Q213080A**
Location :	**Place George V, Québec**	Localization figure No. :	
Drilling contractor:	**Forage Comeau**	Drilling start date :	**2021-09-15**
Type of drill:	**UM 2008**	Total borehole depth :	**4,20 m**
Borehole diameter :	**Tarière de 200 mm**	Inclination : **90**	Azimuth :
Executed by :	**S. Bilodeau**	Core diameter: **NQ**	
Compiled by :	**M. Grenier**	Verified by : **D. Beaulieu**	

SAMPLE TYPE
- SS Split Spoon
- DC Diamond rock core
- MA Manual sampling
- AS Auger
- ST Shelby tube
- TW Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION	INDEX "N"
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: Date:
Depth (m): 1,42 Depth (m):

SAMPLE STATE
- Remoulded
- Intact (thin wall sampler)
- Lost
- Core (diamond rock core)

SYMBOLS
- N: Standard penetration value
- R: Refusal (N > 100)
- WoH: Weight of Hammer / 61 cm
- R.Q.D: Rock quality designation
- % R.Q.D = Σ Cores > 4 po. (10 cm) / Drilled length

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 à 0,080 mm
Sand	0,080 à 5 mm
Gravel	5 à 80 mm
Cobbles	80 à 300 mm
Boulders	> 300mm

CONSISTENCY	SHEAR STRENGTH (Cu)
Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

TESTS
- GSA : Grain size analysis
- S : Sedimentometry
- CA : Chemical analysis
- Wn : Water content
- Dup : Duplicate sample
- Att : Atterberg limits
- PAH : PAH analysis
- C10 : C10-C50 analysis
- MX : 14 metal analysis
- UCS : Unixial compressive strength of rock

DEPTH (m)	DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
		92,00	Level											
		0,00	Fill : Sand, some silt and gravel, dark brown. Presence of debris.			A								GSA, S C10, PAH, MX, DUP1
		91,70												
		0,30	Fill : Sand and gravel, some silt, gray to white. Presence of debris.		CF-01	B	H	80	23	6-8-15-24				C10, PAH, MX
		91,31				A								GSA
		0,69	Fill : Gravelly sand, some silt, black and white.		CF-02	B	N	90	60	8-10 50/2"				C10, PAH, MX
1		90,78												
		1,22	Roc. Clayey limestone with black shale layers. Fair to good quality.									1,42	1,420	
	5				CR-03		NQ	100	*58*					C10, PAH, MX
2														
					CR-04		NQ	84	*84*					

GRAPHIC: ▲ : N (standard pen.); △ : Nc (dyn. pen.); ● : Cu (lab); ▽ : Cur (lab); × : Cu (site); + : Cur (site); W_p w W_l; 20 40 60 80

Remark(s):

Cima_Log_en.sty

Production date 2021-11-16

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-102-21**

DEPTH (m)	DEPTH - pi	STRATIGRAPHY: LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	STRATIGRAPHY: SYMBOLS	SAMPLES: TYPE NO	SAMPLES: SUB - SAMPLE	SAMPLES: STATE	SAMPLES: RECOVERY %	SAMPLES: N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
					CR-05		NQ	100	*68*					
4		87,97 4,03	End of borehole at 4.03 m.											
	15													
5														
6	20													
7														

GRAPHIC: ▲ : N (standard pen.); △ : Nc (dyn. pen.); ● : Cu (lab); ▽ : Cur (lab); × : Cu (site); + : Cur (site)

w_p w w_l

20 40 60 80

TESTS:
- GSA : Grain size analysis
- S : Sedimentometry
- CA : Chemical analysis
- Wn : Water content
- Dup : Duplicate sample
- Att : Atterberg limits
- PAH : PAH analysis
- C10 : C10-C50 analysis
- MX : 14 metal analysis
- UCS : Unixial compressive strength of rock

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-103-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM 7 (NAD83)	X: **250259,3**
			Y: **5185529,0**
			Z: **91,10**
Applicant :	**Public Services and Procurement Canada (PSPC)**	Project No. :	**Q213080A**
Location :	**Place George V, Québec**	Localization figure No. :	
Drilling contractor:	**Forage Comeau**	Drilling start date :	**2021-09-15**
Type of drill:	**UM 2008**	Total borehole depth :	**4,21 m**
Borehole diameter :	**Tarière de 200 mm**	Inclination : **90**	Azimuth :
Executed by :	**S. Bilodeau**	Core diameter: **NQ**	
Compiled by :	**M. Grenier**	Verified by : **D. Beaulieu**	

SAMPLE TYPE
- SS Split Spoon
- DC Diamond rock core
- MA Manual sampling
- AS Auger
- ST Shelby tube
- TW Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION INDEX "N"

Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: Date:
Depth (m): 0,90 Depth (m):

SAMPLE STATE
- Remoulded
- Intact (thin wall sampler)
- Lost
- Core (diamond rock core)

SYMBOLS
- N: Standard penetration value
- R: Refusal (N > 100)
- WoH: Weight of Hammer / 61 cm
- R.Q.D: Rock quality designation
- % R.Q.D = Σ Cores > 4 po. (10 cm) / Drilled length

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 à 0,080 mm
Sand	0,080 à 5 mm
Gravel	5 à 80 mm
Cobbles	80 à 300 mm
Boulders	> 300mm

CONSISTENCY / SHEAR STRENGTH (Cu)

Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

STRATIGRAPHY

LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK
91,10	Level
0,00	Fill : Sand, some silt and gravel. Presence of organic matter (roots).
91,03 / 0,07	Roc. Clayey limestone with black shale layers of good to excellent quality.

SAMPLES

TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm
CF-01		H	100		50/3'
CR-02		NQ	100	*95*	
CR-03		NQ	82	*78*	

GRAPHIC
- ▲ : N (standard pen.)
- △ : Nc (dyn. pen.)
- ● : Cu (lab)
- ▽ : Cur (lab)
- × : Cu (site)
- + : Cur (site)

w_p w w_l

20 40 60 80

WATER LEVEL (m): 0,90

WELL INSTALLATION: 0,900

TESTS
- GSA : Grain size analysis
- S : Sedimentometry
- CA : Chemical analysis
- Wn : Water content
- Dup : Duplicate sample
- Att : Atterberg limits
- PAH : PAH analysis
- C10 : C10-C50 analysis
- MX : 14 metal analysis
- UCS : Unixial compressive strength of rock

UCS: 71,1 MPa

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-103-21**

DEPTH (m)	DEPTH - pi	STRATIGRAPHY: LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	STRATIGRAPHY: SYMBOLS	SAMPLES: TYPE NO	SAMPLES: SUB - SAMPLE	SAMPLES: STATE	SAMPLES: RECOVERY %	SAMPLES: N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
					CR-04		NQ	100	*93*					
4		86,91												
		4,19	Fin du forage à 4.19 mètres.											
	15													
5														
6	20													
7														

GRAPHIC:
- ▲ : N (standard pen.)
- △ : Nc (dyn. pen.)
- ● : Cu (lab)
- ▽ : Cur (lab)
- × : Cu (site)
- + : Cur (site)

w_p w w_l

20 40 60 80

TESTS:
- GSA : Grain size analysis
- S : Sedimentometry
- CA : Chemical analysis
- Wn : Water content
- Dup : Duplicate sample
- Att : Atterberg limits
- PAH : PAH analysis
- C10 : C10-C50 analysis
- MX : 14 metal analysis
- UCS : Unixial compressive strength of rock

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-104-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM 7 (NAD83)	X: **250277,6**
			Y: **5185555,9**
			Z: **89,90**
Applicant :	**Public Services and Procurement Canada (PSPC)**	Project No. :	**Q213080A**
Location :	**Place George V, Québec**	Localization figure No. :	
Drilling contractor:	**Forage Comeau**	Drilling start date :	**2021-09-15**
Type of drill:	**UM 2008**	Total borehole depth :	**13,50 m**
Borehole diameter :	**Tarière de 200 mm**	Inclination : **90**	Azimuth :
Executed by :	**S. Bilodeau**	Core diameter: **NQ**	
Compiled by :	**M. Grenier**	Verified by : **D. Beaulieu**	

SAMPLE TYPE
- SS Split Spoon
- DC Diamond rock core
- MA Manual sampling
- AS Auger
- ST Shelby tube
- TW Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION	INDEX "N"
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: Date:

Depth (m): 1,14 Depth (m):

SAMPLE STATE
- Remoulded
- Intact (thin wall sampler)
- Lost
- Core (diamond rock core)

SYMBOLS
- N: Standard penetration value
- R: Refusal (N > 100)
- WoH: Weight of Hammer / 61 cm
- R.Q.D: Rock quality designation
- % R.Q.D = Σ Cores > 4 po. (10 cm) / Drilled length

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 à 0,080 mm
Sand	0,080 à 5 mm
Gravel	5 à 80 mm
Cobbles	80 à 300 mm
Boulders	> 300mm

CONSISTENCY	SHEAR STRENGTH (Cu)
Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

TESTS
- GSA : Grain size analysis
- S : Sedimentometry
- CA : Chemical analysis
- Wn : Water content
- Dup : Duplicate sample
- Att : Atterberg limits
- PAH : PAH analysis
- C10 : C10-C50 analysis
- MX : 14 metal analysis
- UCS : Unixial compressive strength of rock

GRAPHIC: ▲ N (standard pen.), △ Nc (dyn. pen.), ● Cu (lab), ▽ Cur (lab), × Cu (site), + Cur (site); w_p w w_l; 20 40 60 80

DEPTH (m)	DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	WATER LEVEL (m)	TESTS
		89,90	Level									
		0,00	Fill : Gravelly sand, some silt, traces of clay, dark brown to black. Presence of organic matter (roots).		CF-01		H	81		8-9 50/4'		GSA,S C10, PAH, MX, DUP6
		89,49										
		0,41	Roc. Clayey limestone with black shale layers of good to excellent quality.									
1					CR-02		NQ	100	*90*		1,14	C10, PAH, MX
	5											
2					CR-03		NQ	100	*74*			

WELL INSTALLATION: 1,140

Remark(s):

Production date 2021-11-16

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Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-104-21**

DEPTH (m)	DEPTH - pi	STRATIGRAPHY: LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	STRATIGRAPHY: SYMBOLS	SAMPLES: TYPE NO	SAMPLES: SUB - SAMPLE	SAMPLES: STATE	SAMPLES: RECOVERY %	SAMPLES: N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
					CR-04		NQ	98	*96*					
4		85,79												
		4,11	End of borehole at 4.11 m.											
	15													
5														
6	20													
7														

GRAPHIC:
▲ : N (standard pen.)
△ : Nc (dyn. pen.)
● : Cu (lab)
▽ : Cur (lab)
× : Cu (site)
+ : Cur (site)
w_p w w_l
20 40 60 80

TESTS:
GSA : Grain size analysis
S : Sedimentometry
CA : Chemical analysis
Wn : Water content
Dup : Duplicate sample
Att : Atterberg limits
PAH : PAH analysis
C10 : C10-C50 analysis
MX : 14 metal analysis
UCS : Unixial compressive strength of rock

Remark(s):

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Production date 2021-11-16

Consultant : CIMA+

Client : Public Services and Procurement Canada (PSPC)

BOREHOLE LOGGING

Borehole N° F-104-21

DEPTH (m)	DEPTH - pi	STRATIGRAPHY: LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	STRATIGRAPHY: SYMBOLS	SAMPLES: TYPE NO	SAMPLES: SUB - SAMPLE	SAMPLES: STATE	SAMPLES: RECOVERY %	SAMPLES: N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
	25													
8														
9	30													
10														
	35													
11														

GRAPHIC:
▲ : N (standard pen.)
△ : Nc (dyn. pen.)
● : Cu (lab)
▽ : Cur (lab)
× : Cu (site)
+ : Cur (site)
w_p w w_l
20 40 60 80

TESTS:
GSA : Grain size analysis
S : Sedimentometry
CA : Chemical analysis
Wn : Water content
Dup : Duplicate sample
Att : Atterberg limits
PAH : PAH analysis
C10 : C10-C50 analysis
MX : 14 metal analysis
UCS : Unixial compressive strength of rock

Remark(s):

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Production date 2021-11-16

Consultant : CIMA+

Client : Public Services and Procurement Canada (PSPC)

BOREHOLE LOGGING

Borehole N° F-104-21

DEPTH (m)	DEPTH - pi	STRATIGRAPHY: LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	STRATIGRAPHY: SYMBOLS	SAMPLES: TYPE NO	SAMPLES: SUB - SAMPLE	SAMPLES: STATE	SAMPLES: RECOVERY %	SAMPLES: N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
12														
	40													
13														
	45													
14														
15														
	50													

GRAPHIC:
▲ : N (standard pen.)
△ : Nc (dyn. pen.)
● : Cu (lab)
▽ : Cur (lab)
× : Cu (site)
+ : Cur (site)
w_p w w_l
20 40 60 80

TESTS:
GSA : Grain size analysis
S : Sedimentometry
CA : Chemical analysis
Wn : Water content
Dup : Duplicate sample
Att : Atterberg limits
PAH : PAH analysis
C10 : C10-C50 analysis
MX : 14 metal analysis
UCS : Unixial compressive strength of rock

Remark(s):

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Production date 2021-11-16

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-105-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM 7 (NAD83)	X: **250297,3**
Applicant :	**Public Services and Procurement Canada (PSPC)**		Y: **5185531,1**
Location :	**Place George V, Québec**		Z: **91,10**
Drilling contractor:	**Forage Comeau**	Project No. :	**Q213080A**
Type of drill:	**UM 2008**	Localization figure No. :	
Borehole diameter :	**Tarière de 200 mm**	Inclination : **90**	Azimuth :
Executed by :	**S. Bilodeau**	Core diameter: **NQ**	Drilling start date : **2021-09-15**
Compiled by :	**M. Grenier**	Verified by : **D. Beaulieu**	Total borehole depth : **4,19 m**

SAMPLE TYPE	TERMINOLOGY	ROC QUALITY DESIGNATION	COMPACTION	INDEX "N"	GROUNDWATER
SS Split Spoon	"Traces" 1-10%	% RQD / QUALIFICATIVE	Very loose	0-4	Date: Date:
DC Diamond rock core	"Some" 10-20%	<25 Very poor	Loose	4-10	Depth (m): 2,21 Depth (m):
MA Manual sampling	adjective (...y) 20-35%	25-50 Poor	Compact	10-30	
AS Auger	"and" 35-50%	50-75 Fair	Dense	30-50	
ST Shelby tube		75-90 Good	Very dense	>50	
TW Thin wall sampler		90-100 Excellent			

SAMPLE STATE	SYMBOLS	SOIL CLASSIFICATION	CONSISTENCY	SHEAR STRENGTH (Cu)
Remoulded	N: Standard penetration value	Clay < 0,002 mm	Very soft	<12 kPa
Intact (thin wall sampler)	R: Refusal (N > 100)	Silt 0,002 à 0,080 mm	Soft	12-25 kPa
Lost	WoH: Weight of Hammer / 61 cm	Sand 0,080 à 5 mm	Firm	25-50 kPa
Core (diamond rock core)	R.Q.D: Rock quality designation	Gravel 5 à 80 mm	Stiff	50-100 kPa
	% R.Q.D = Σ Cores > 4 po. (10 cm) / Drilled length	Cobbles 80 à 300 mm	Very stiff	100-200 kPa
		Boulders > 300mm	Hard	>200 kPa

STRATIGRAPHY

DEPTH (m)	DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK
		91,10	Level
		0,00	Crushed stone.
		91,05 / 0,05	Fill : Sand, some silt and gravel, light brown.
			Become some silt and dark brown from 0.61 to 1.14m.
1		89,88 / 1,22	Fill : Gravelly sand, some silt, dark brown.
		89,75 / 1,35	Chunks of weathered rock, dry.
	5		
		89,33 / 1,77	Roc. Clayey limestone with black shale layers of very poor to good quality.
2			

SAMPLES

TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	TESTS
CF-01	A, B	H	95	7	2-3-4-4	GSA; C10, PAH, MX
CF-02	A, B	N	63	8	4-4-4-5	C10, PAH, MX, DUP5
CF-03	A, B	B	63	69	5-17-52 50/1'	C10, PAH, MX
CR-04		NQ	90	0		

GRAPHIC: ▲ : N (standard pen.); △ : Nc (dyn. pen.); ● : Cu (lab); ▽ : Cur (lab); × : Cu (site); + : Cur (site); w_p w w_l; 20 40 60 80

WATER LEVEL (m): 2,21

WELL INSTALLATION: 2,210

TESTS: GSA : Grain size analysis; S : Sedimentometry; CA : Chemical analysis; Wn : Water content; Dup : Duplicate sample; Att : Atterberg limits; PAH : PAH analysis; C10 : C10-C50 analysis; MX : 14 metal analysis; UCS : Unixial compressive strength of rock

Remark(s):

Production date 2021-11-16

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Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-105-21**

DEPTH (m)	DEPTH - pi	STRATIGRAPHY: LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	STRATIGRAPHY: SYMBOLS	SAMPLES: TYPE NO	SAMPLES: SUB - SAMPLE	SAMPLES: STATE	SAMPLES: RECOVERY %	SAMPLES: N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
					CR-05		NQ	98	*61*					
					CR-06		NQ	100	*77*					
4		86,91												
		4,19	End of borehole at 4.19 m.											
	15													
5														
6	20													
7														

GRAPHIC:
▲ : N (standard pen.)
△ : Nc (dyn. pen.)
● : Cu (lab)
▽ : Cur (lab)
× : Cu (site)
+ : Cur (site)
w_p w w_l
20 40 60 80

TESTS:
GSA : Grain size analysis
S : Sedimentometry
CA : Chemical analysis
Wn : Water content
Dup : Duplicate sample
Att : Atterberg limits
PAH : PAH analysis
C10 : C10-C50 analysis
MX : 14 metal analysis
UCS : Unixial compressive strength of rock

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-106-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM 7 (NAD83)	X: **250307,3**
			Y: **5185516,2**
			Z: **89,60**
Applicant :	**Public Services and Procurement Canada (PSPC)**	Project No. :	**Q213080A**
Location :	**Place George V, Québec**	Localization figure No. :	
Drilling contractor:	**Forage Comeau**	Drilling start date :	**2021-09-15**
Type of drill:	**UM 2008**	Total borehole depth :	**4,14 m**
Borehole diameter :	**Tarière de 200 mm**	Inclination : **90**	Azimuth :
Executed by :	**S. Bilodeau**	Core diameter: **NQ**	
Compiled by :	**M.Grenier**	Verified by : **D. Beaulieu**	

SAMPLE TYPE
- SS Split Spoon
- DC Diamond rock core
- MA Manual sampling
- AS Auger
- ST Shelby tube
- TW Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION	INDEX "N"
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: Date:
Depth (m): 3,19 Depth (m):

SAMPLE STATE
- Remoulded
- Intact (thin wall sampler)
- Lost
- Core (diamond rock core)

SYMBOLS
- N: Standard penetration value
- R: Refusal (N > 100)
- WoH: Weight of Hammer / 61 cm
- R.Q.D: Rock quality designation
- % R.Q.D = Σ Cores > 4 po. (10 cm) / Drilled length

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 à 0,080 mm
Sand	0,080 à 5 mm
Gravel	5 à 80 mm
Cobbles	80 à 300 mm
Boulders	> 300mm

CONSISTENCY	SHEAR STRENGTH (Cu)
Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

STRATIGRAPHY

DEPTH (m)	DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS
		89,60	Level	
		0,00	Fill : Sand, some silt and gravel, dark brown. Presence of red sandstone	
		88,99		
		0,61	Fill : Sand, some silt and gravel, dark brown. Presence of debris.	
1				
	5			
		87,77		
		1,83 / 87,67	Sand, some silt and gravel, dark brown.	
2		1,93 / 87,57	Chunks of altered rock.	
		2,03	Roc. Clayey limestone with black shale layers of very poor to good quality.	

SAMPLES

TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm
CF-01		H	95	24	5-10-14-16
CF-02		N	40	14	8-6-8-6
CF-03		B	35	11	7-4-7-25
CF-04	A / B	B	100		30 50/5'
CR-05		NQ	100	*84*	

GRAPHIC

▲ : N (standard pen.)
△ : Nc (dyn. pen.)
● : Cu (lab)
▽ : Cur (lab)
× : Cu (site)
+ : Cur (site)

w_p w w_l

20 40 60 80

WATER LEVEL (m)

WELL INSTALLATION

TESTS

GSA	: Grain size analysis
S	: Sedimentometry
CA	: Chemical analysis
Wn	: Water content
Dup	: Duplicate sample
Att	: Atterberg limits
PAH	: PAH analysis
C10	: C10-C50 analysis
MX	: 14 metal analysis
UCS	: Unixial compressive strength of rock

CF-01	C10, PAH, MX
CF-02	C10,PAH, MX et DUP2
CF-03	C10, PAH, MX

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : Public Services and Procurement Canada (PSPC)

BOREHOLE LOGGING

Borehole N° F-106-21

DEPTH (m)	DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
					CR-06		NQ	100	*46*			3,19	3,190	
					CR-07		NQ	95	*21*					
4		85,46												
		4,14	End of borehole at 4.14 m.											
	15													
5														
6	20													
7														

GRAPHIC:
▲ : N (standard pen.)
△ : Nc (dyn. pen.)
● : Cu (lab)
▽ : Cur (lab)
× : Cu (site)
+ : Cur (site)
w_p w w_l
20 40 60 80

TESTS:
GSA : Grain size analysis
S : Sedimentometry
CA : Chemical analysis
Wn : Water content
Dup : Duplicate sample
Att : Atterberg limits
PAH : PAH analysis
C10 : C10-C50 analysis
MX : 14 metal analysis
UCS : Unixial compressive strength of rock

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-107-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM 7 (NAD83)	X: **250295,7**
			Y: **5185494,7**
			Z: **90,00**
Applicant :	**Public Services and Procurement Canada (PSPC)**		
Location :	**Place George V, Québec**	Project No. :	**Q213080A**
Drilling contractor:	**Forage Comeau**	Localization figure No. :	
Type of drill:	**UM 2008**		
Borehole diameter :	**Tarière de 200 mm** — Inclination : **90** — Azimuth :	Drilling start date :	**2021-09-15**
Executed by :	**S. Bilodeau** — Core diameter: **NQ**		
Compiled by :	**M.Grenier** — Verified by : **D. Beaulieu**	Total borehole depth :	**4,19 m**

SAMPLE TYPE

SS	Split Spoon
DC	Diamond rock core
MA	Manual sampling
AS	Auger
ST	Shelby tube
TW	Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION	INDEX "N"
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: Date:

Depth (m): Depth (m):

SAMPLE STATE

- Remoulded
- Intact (thin wall sampler)
- Lost
- Core (diamond rock core)

SYMBOLS

N: Standard penetration value
R: Refusal (N > 100)
WoH: Weight of Hammer / 61 cm
R.Q.D: Rock quality designation

$$\% \text{ R.Q.D} = \frac{\Sigma \text{ Cores > 4 po. (10 cm)}}{\text{Drilled length}}$$

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 à 0,080 mm
Sand	0,080 à 5 mm
Gravel	5 à 80 mm
Cobbles	80 à 300 mm
Boulders	> 300mm

CONSISTENCY	SHEAR STRENGTH (Cu)
Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

STRATIGRAPHY

DEPTH (m)	DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS
		90,00	Level	
		0,00	Fill : Sand, some silt and gravel, dark brown.	
			Becomes gravelly at 1.22m.	
1		88,63		
		1,37	Chunks of altered roc	
	5			
		88,07		
2		1,93	Roc. Clayey limestone with black shale layers of very poor to poor quality.	

SAMPLES

TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm
CF-01		H	75	32	8-13-19-11
CF-02		N	75	8	5-4-4-4
CF-03	A	B	45	49	6-25-24 50/5'
	B				
CR-04		NQ	80	0	

GRAPHIC

▲ : N (standard pen.)
△ : Nc (dyn. pen.)
● : Cu (lab)
▽ : Cur (lab)
× : Cu (site)
+ : Cur (site)

w_p w w_l

20 40 60 80

WATER LEVEL (m)

WELL INSTALLATION

TESTS

GSA	: Grain size analysis
S	: Sedimentometry
CA	: Chemical analysis
Wn	: Water content
Dup	: Duplicate sample
Att	: Atterberg limits
PAH	: PAH analysis
C10	: C10-C50 analysis
MX	: 14 metal analysis
UCS	: Unixial compressive strength of rock

	TESTS
CF-01	C10, PAH, MX
CF-02	C10, PAH, MX, DUP4
CF-03	C10, PAH, MX
CF-03	C10, PAH, MX
CR-04	C10, PAH, MX

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : Public Services and Procurement Canada (PSPC)

BOREHOLE LOGGING

Borehole N° F-107-21

DEPTH (m)	DEPTH - pi	STRATIGRAPHY: LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	STRATIGRAPHY: SYMBOLS	SAMPLES: TYPE NO	SAMPLES: SUB - SAMPLE	SAMPLES: STATE	SAMPLES: RECOVERY %	SAMPLES: N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
					CR-05		NQ	94	*16*					
					CR-06		NQ	100	*46*					
4		85,81												
		4,19	Fin du forage à 4.19 mètres.											
	15													
5														
6	20													
7														

GRAPHIC:
▲ : N (standard pen.)
△ : Nc (dyn. pen.)
● : Cu (lab)
▽ : Cur (lab)
× : Cu (site)
+ : Cur (site)
w_p w w_l
20 40 60 80

TESTS:
GSA : Grain size analysis
S : Sedimentometry
CA : Chemical analysis
Wn : Water content
Dup : Duplicate sample
Att : Atterberg limits
PAH : PAH analysis
C10 : C10-C50 analysis
MX : 14 metal analysis
UCS : Unixial compressive strength of rock

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-108-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM 7 (NAD83)	X: **250313,5**
			Y: **5185505,7**
			Z: **89,80**
Applicant :	**Public Services and Procurement Canada (PSPC)**	Project No. :	**Q213080A**
Location :	**Place George V, Québec**	Localization figure No. :	
Drilling contractor:	**Forage Comeau**	Drilling start date :	**2021-09-15**
Type of drill:	**UM 2008**	Total borehole depth :	**4,24 m**
Borehole diameter :	**Tarière de 200 mm**	Inclination : **90**	Azimuth :
Executed by :	**S. Bilodeau**	Core diameter: **NQ**	
Compiled by :	**M.Grenier**	Verified by : **D. Beaulieu**	

SAMPLE TYPE
- SS Split Spoon
- DC Diamond rock core
- MA Manual sampling
- AS Auger
- ST Shelby tube
- TW Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION INDEX "N"

Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: Date:
Depth (m): 2,43 Depth (m):

SAMPLE STATE
- Remoulded
- Intact (thin wall sampler)
- Lost
- Core (diamond rock core)

SYMBOLS
- N: Standard penetration value
- R: Refusal (N > 100)
- WoH: Weight of Hammer / 61 cm
- R.Q.D: Rock quality designation
- % R.Q.D = Σ Cores > 4 po. (10 cm) / Drilled length

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 à 0,080 mm
Sand	0,080 à 5 mm
Gravel	5 à 80 mm
Cobbles	80 à 300 mm
Boulders	> 300mm

CONSISTENCY / SHEAR STRENGTH (Cu)

Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

GRAPHIC
- ▲ : N (standard pen.)
- △ : Nc (dyn. pen.)
- ● : Cu (lab)
- ▽ : Cur (lab)
- × : Cu (site)
- + : Cur (site)

W_p w W_l

20 40 60 80

TESTS
- GSA : Grain size analysis
- S : Sedimentometry
- CA : Chemical analysis
- Wn : Water content
- Dup : Duplicate sample
- Att : Atterberg limits
- PAH : PAH analysis
- C10 : C10-C50 analysis
- MX : 14 metal analysis
- UCS : Unixial compressive strength of rock

DEPTH (m) / DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	TESTS
	89,80	Level								
	0,00	Fill : Sand, traces of silt and gravel, light brown. Presence of organic matter (roots)			A					C10, HAP, MX
	89,49									
	0,30	Sand, some silt and gravel, dark brown. Presence of debris.		CF-01	B	H	95	22	6-10-12-12	C10, PAH, MX
		Presence of cobbles at 0.61m.								
1				CF-02		N	45	41	9-28-13-13	C10, PAH, MX
5				CF-03		B	50	8	8-4-4-6	C10, PAH, MX, DUP3
	87,82				A					C10, PAH, MX
2	1,98	Pieces of altered roc		CF-04	B	B	55		28-30 50/4'	
	87,51									
	2,29	Roc. Clayey limestone with black shale layers of very poor quality.		CR-05		NQ	100			
				CR-06		NQ	46	0		

WATER LEVEL (m): 2,43

WELL INSTALLATION: 2,430

Remark(s):

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-108-21**

DEPTH (m)	DEPTH - pi	STRATIGRAPHY: LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	STRATIGRAPHY: SYMBOLS	SAMPLES: TYPE NO	SAMPLES: SUB - SAMPLE	SAMPLES: STATE	SAMPLES: RECOVERY %	SAMPLES: N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
					CR-07		NQ	100	0					
					CR-08		NQ	100	12					
4					CR-09		NQ	100	0					
		85,59 / 4,21	End of borehole at 4.21 m.											
	15													
5														
6	20													
7														

GRAPHIC:
▲ : N (standard pen.)
△ : Nc (dyn. pen.)
● : Cu (lab)
▽ : Cur (lab)
× : Cu (site)
+ : Cur (site)
w_p w w_l
20 40 60 80

TESTS:
GSA : Grain size analysis
S : Sedimentometry
CA : Chemical analysis
Wn : Water content
Dup : Duplicate sample
Att : Atterberg limits
PAH : PAH analysis
C10 : C10-C50 analysis
MX : 14 metal analysis
UCS : Unixial compressive strength of rock

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

B2

Appendix B2
Previous Borehole Log Report

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-07-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM (NAD83)	X: Y: Z:
Applicant :	**Public Services and Procurement Canada (PSPC)**		
Location :	**Place George V, Québec**		
Drilling contractor:	**Lithosfor**	Project No. :	**Q213080A-E**
Type of drill:	**Géoprobe**	Localization figure No. :	
Borehole diameter :	Inclination : **90** Azimuth :	Drilling start date :	**2021-06-18**
Executed by :	**S. Bilodeau** Core diameter:		
Compiled by :	**Juan S. Sanchez** Verified by : **Dominique Beaulieu**	Total borehole depth :	**1,28 m**

SAMPLE TYPE		TERMINOLOGY		ROC QUALITY DESIGNATION		COMPACTION	INDEX "N"	GROUNDWATER
SS	Split Spoon	"Traces"	1-10%	% RQD	QUALIFICATIVE	Very loose	0-4	Date: Date:
DC	Diamond rock core	"Some"	10-20%	<25	Very poor	Loose	4-10	
MA	Manual sampling	adjective (...y)	20-35%	25-50	Poor	Compact	10-30	Depth (m): Depth (m):
AS	Auger	"and"	35-50%	50-75	Fair	Dense	30-50	
ST	Shelby tube			75-90	Good	Very dense	>50	
TW	Thin wall sampler			90-100	Excellent			

SAMPLE STATE	SYMBOLS	SOIL CLASSIFICATION		CONSISTENCY	SHEAR STRENGTH (Cu)
Remoulded	N: Standard penetration value	Clay	< 0,002 mm	Very soft	<12 kPa
Intact (thin wall sampler)	R: Refusal (N > 100)	Silt	0,002 à 0,080 mm	Soft	12-25 kPa
Lost	WoH: Weight of Hammer / 61 cm	Sand	0,080 à 5 mm	Firm	25-50 kPa
Core (diamond rock core)	R.Q.D: Rock quality designation	Gravel	5 à 80 mm	Stiff	50-100 kPa
	% R.Q.D = Σ Cores > 4 po. (10 cm) / Drilled length	Cobbles	80 à 300 mm	Very stiff	100-200 kPa
		Boulders	> 300mm	Hard	>200 kPa

DEPTH (m)	DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
		0,00	Level											
		0,00	Fill : Gravelly sand, some silt. Presence of cobbles and/or boulders and bedrock fragments		F-07-01									CA
					F-07-02									CA
1					F-07-03									
		-1,28												
		1,28	Refusal on possible bedrock at 1.28 m											
	5													
2														

GRAPHIC: ▲ : N (standard pen.); △ : Nc (dyn. pen.); ● : Cu (lab); ▽ : Cur (lab); × : Cu (site); + : Cur (site); w_p w w_l; 20 40 60 80

TESTS: GSA : Grain size analysis; S : Sedimentometry; CA : Chemical analysis; Wn : Water content; Dup : Duplicate sample; Att : Atterberg limits; PAH : PAH analysis; C10 : C10-C50 analysis; MX : 14 metal analysis; UCS : Unixial compressive strength of rock

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-08-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM (NAD83)	X: Y: Z:
Applicant :	**Public Services and Procurement Canada (PSPC)**		
Location :	**Place George V, Québec**		
Drilling contractor:	**Lithosfor**	Project No. :	**Q213080A**
Type of drill:	**Géoprobe**	Localization figure No. :	
Borehole diameter :	Inclination : **90** Azimuth :	Drilling start date :	**2021-06-18**
Executed by :	**S. Bilodeau** Core diameter:		
Compiled by :	**Juan S. Sanchez** Verified by : **Dominique Beaulieu**	Total borehole depth :	**1,15 m**

SAMPLE TYPE		TERMINOLOGY		ROC QUALITY DESIGNATION		COMPACTION	INDEX "N"	GROUNDWATER	
SS	Split Spoon	"Traces"	1-10%	% RQD	QUALIFICATIVE	Very loose	0-4	Date:	Date:
DC	Diamond rock core	"Some"	10-20%	<25	Very poor	Loose	4-10	Depth (m):	Depth (m):
MA	Manual sampling	adjective (...y)	20-35%	25-50	Poor	Compact	10-30		
AS	Auger	"and"	35-50%	50-75	Fair	Dense	30-50		
ST	Shelby tube			75-90	Good	Very dense	>50		
TW	Thin wall sampler			90-100	Excellent				

SAMPLE STATE	SYMBOLS	SOIL CLASSIFICATION		CONSISTENCY	SHEAR STRENGTH (Cu)
Remoulded	N: Standard penetration value	Clay	< 0,002 mm	Very soft	<12 kPa
Intact (thin wall sampler)	R: Refusal (N > 100)	Silt	0,002 à 0,080 mm	Soft	12-25 kPa
Lost	WoH: Weight of Hammer / 61 cm	Sand	0,080 à 5 mm	Firm	25-50 kPa
Core (diamond rock core)	R.Q.D: Rock quality designation	Gravel	5 à 80 mm	Stiff	50-100 kPa
	% R.Q.D = Σ Cores > 4 po. (10 cm) / Drilled length	Cobbles	80 à 300 mm	Very stiff	100-200 kPa
		Boulders	> 300mm	Hard	>200 kPa

DEPTH (m)	DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
		0,00	Level											
		0,00	Fill : stone dust		F-08-01									CA
		-0,05	Fill : Gravelly sand, some silt. Presence of cobbles and/or boulders and bedrock fragments											
		0,05			F-08-02									CA, DUP-B
			Moist at 0.55 m.											
					F-08-03									CA
1		-1,15												
		1,15	Refusal on possible bedrock at 1.15 m.											
	5													
2														

GRAPHIC: ▲ : N (standard pen.); △ : Nc (dyn. pen.); ● : Cu (lab); ▽ : Cur (lab); × : Cu (site); + : Cur (site); w_p w w_l; 20 40 60 80

TESTS: GSA : Grain size analysis; S : Sedimentometry; CA : Chemical analysis; Wn : Water content; Dup : Duplicate sample; Att : Atterberg limits; PAH : PAH analysis; C10 : C10-C50 analysis; MX : 14 metal analysis; UCS : Unixial compressive strength of rock

Remark(s):

Production date 2021-11-16

Cima_Log_en.sty

Consultant : CIMA+

Client : **Public Services and Procurement Canada (PSPC)**

BOREHOLE LOGGING

Borehole N° **F-09-21**

Project name:	**Restoration of Place George-V**	Coordinates (m) MTM (NAD83)	X: Y: Z:
Applicant :	**Public Services and Procurement Canada (PSPC)**		
Location :	**Place George V, Québec**		
Drilling contractor:	**Lithosfor**	Project No. :	**Q213080A**
Type of drill:	**Géoprobe**	Localization figure No. :	
Borehole diameter :	Inclination : **90** Azimuth :	Drilling start date :	**2021-06-18**
Executed by :	**S. Bilodeau** Core diameter:		
Compiled by :	**Juan S. Sanchez** Verified by : **Dominique Beaulieu**	Total borehole depth :	**1,50 m**

SAMPLE TYPE
- SS Split Spoon
- DC Diamond rock core
- MA Manual sampling
- AS Auger
- ST Shelby tube
- TW Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION	INDEX "N"
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: Date:
Depth (m): Depth (m):

SAMPLE STATE
- Remoulded
- Intact (thin wall sampler)
- Lost
- Core (diamond rock core)

SYMBOLS
- N: Standard penetration value
- R: Refusal (N > 100)
- WoH: Weight of Hammer / 61 cm
- R.Q.D: Rock quality designation
- % R.Q.D = Σ Cores > 4 po. (10 cm) / Drilled length

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 à 0,080 mm
Sand	0,080 à 5 mm
Gravel	5 à 80 mm
Cobbles	80 à 300 mm
Boulders	> 300mm

CONSISTENCY	SHEAR STRENGTH (Cu)
Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

TESTS
- GSA : Grain size analysis
- S : Sedimentometry
- CA : Chemical analysis
- Wn : Water content
- Dup : Duplicate sample
- Att : Atterberg limits
- PAH : PAH analysis
- C10 : C10-C50 analysis
- MX : 14 metal analysis
- UCS : Unixial compressive strength of rock

DEPTH (m)	DEPTH - pi	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	GRAPHIC (▲ N (standard pen.), △ Nc (dyn. pen.), ● Cu (lab), ▽ Cur (lab), × Cu (site), + Cur (site); w_p w w_l; 20 40 60 80)	WATER LEVEL (m)	WELL INSTALLATION	TESTS
		0,00	Level											
		0,00	Fill : Gravelly sand, some silt. Presence of cobbles and/or boulders and bedrock fragments		F-09-01									CA, DUP-C
		-0,75												
1		0,75	Fill : Gravelly sand, some silt. Presence of cobbles and/or boulders and bedrock fragments. Presence of bricks (<5%)		F-09-02									CA
		-1,40												
		1,40	Bedrock fragments.		F-09-03									
	5	-1,50 / 1,50	Refusal on possible bedrock at 1.5 m.											
2														

Remark(s):

C

Appendix C
Geotechnical Laboratory Tests Results

Englobe

505, boul. du Parc-Technologique, bur. 200
Québec, G1P 4S9
Téléphone: (418) 781-0191

Testing on Soils, Aggregates and Other Materials

Client : **CIMA+**
Project : **Cima +; Lab analysis**
Location : **Lab analysis**

Project # : **02102513.002-0200-0201**
Client ref. **Q2021-010518**
Report # : **1** **Rev. 0**
Page 1 of 1

SAMPLING

Source :
Sampling # : 1 Your sample # :
Borehole # : F-102-21, CF-01A
Depth : o.00 à 0.30m
Location :

Sampled by : the client
Sampling date :
Date received : 2021-09-22
Relative density of particles < 2 mm : 2.700(estimated)

Sieve analysis (NQ 2501-025)		Sedimentation analysis (NQ 2501-025)	
Sieve	% passing	Equivalent diameter	% passing
112 mm			
80 mm			
56 mm			
40 mm		34,7 µm	21,5
28 mm		22,0 µm	20,5
20 mm	100	12,8 µm	19,7
14 mm	94	9,1 µm	17,8
10 mm	91	6,5 µm	15,0
5 mm	85	4,6 µm	12,1
2 mm	78	3,3 µm	10,1
1,25 mm	73	2,3 µm	8,3
0,630 mm	63	1,4 µm	7,3
0,315 mm	46		
0,160 mm	30		
0,080 mm	21,7		

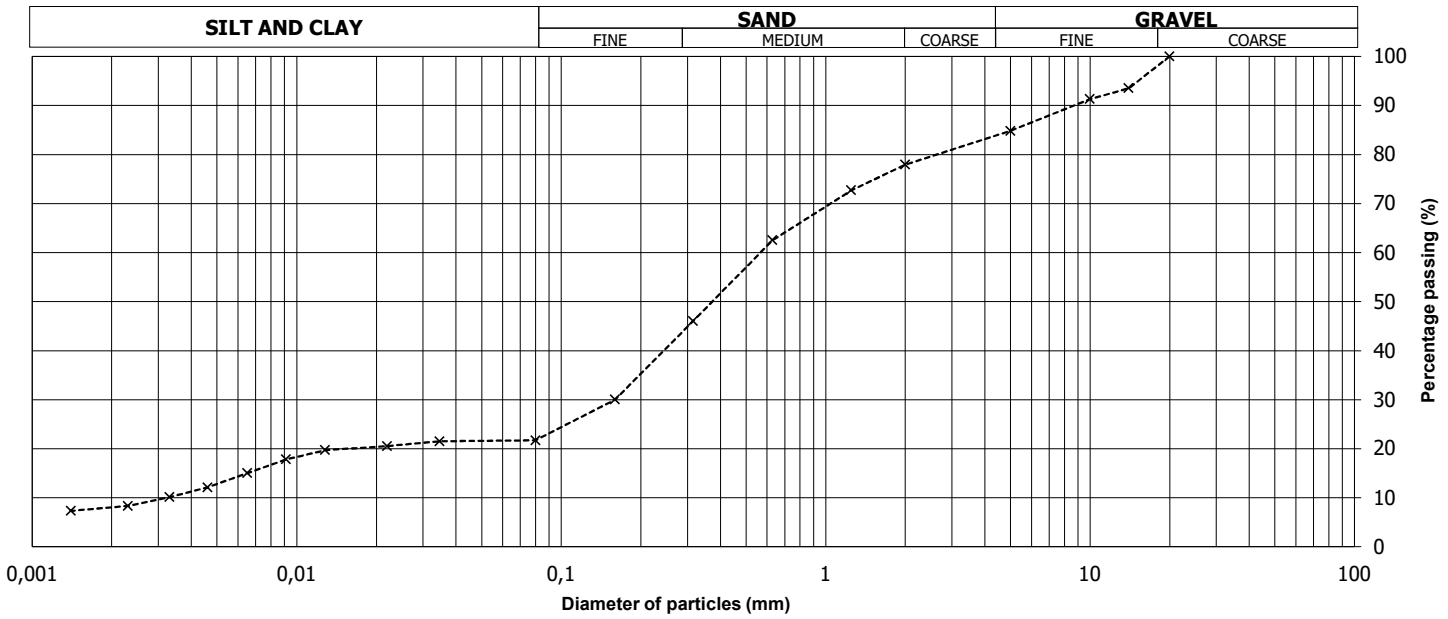
OTHER TESTING	RESULT

REMARKS

The collection and transport of the sample was carried out by a representative of the client.

Proportions from sieve analysis

Cobble :	0,0	Sand:	63,1
Gravel :	15,2	Silt :	13,7
		Clay :	8,0



D_{10} : 0,003 D_{30} : 0,160 D_{60} : 0,567

Prepared by :	Date :	Approved by :	Date :
Asmae El Aychi, tech.	2021-10-06	Frédéric Talbot	2021-10-07

EQ-09-IM-231 rev. 01 (19-04)

Englobe

505, boul. du Parc-Technologique, bur. 200
Québec, G1P 4S9
Téléphone: (418) 781-0191

Testing on Soils, Aggregates and Other Materials

Client : CIMA+
Project : Cima +; Lab analysis
Location : Lab analysis

Project # : 02102513.002-0200-0201
Client ref. :
Report # : Q2021-010518 2 **Rev.** 0
Page 1 **of** 1

Sampling

Sampling # : 2
Your sampling # :
Material :
Source; location :

Sampling location : F-102-21, CF-02A; 0.30 to 0.61m

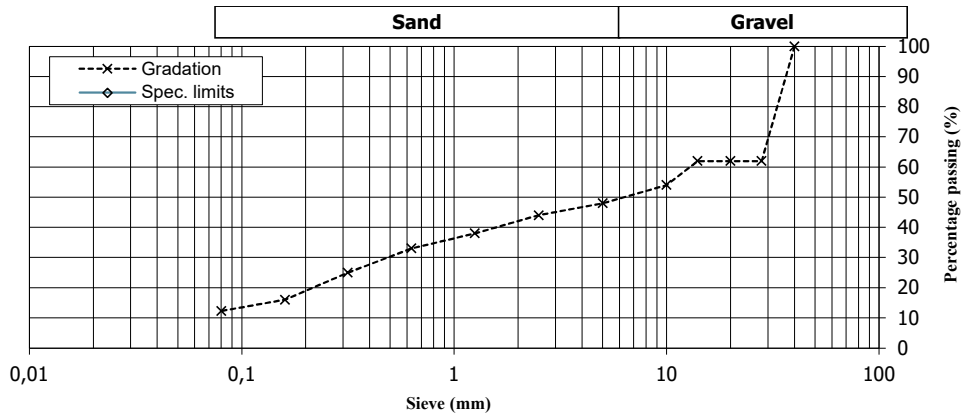
Specification # 1

Reference :
Use :
Calibre :
Class :

Sampling date :
By : the client
Date received : 2021-09-22

Sieve analysis (NQ 2501-025)

SIEVE (mm)	% PASSING REQUIREMENTS	% PASSING RESULT
112		
80		
56		
40		100
28		62
20		62
14		62
10		54
5		48
2,5		44
1,25		38
0,630		33
0,315		25
0,160		16
0,080		12,3



Cu : Cc : FM : 3,96 D_{10} : D_{30} : 0,479 D_{60} : 12,871

Maximum dry density kg/m³	Optimum moisture %	Retained 5 mm %

Proportions from sieve analysis (%)

Cobble : 0,0 Sand : 35,8
Gravel : 51,9 Silt and clay : 12,3

Other testing	Required	Result

Remarks

The collection and transport of the sample was carried out by a representative of the client.

RESULTS WITH AN ASTERISK DO NOT MEET REQUIREMENTS.

Prepared by : Asmae El Aychi, tech. **Date :** 2021-10-06

Approved by : Frédéric Talbot **Date :** 2021-10-07

Englobe

505, boul. du Parc-Technologique, bur. 200
Québec, G1P 4S9
Téléphone: (418) 781-0191

Testing on Soils, Aggregates and Other Materials

Client : **CIMA+**
Project : **Cima +; Lab analysis**
Location : **Lab analysis**

Project # : **02102513.002-0200-0201**
Client ref. **Q2021-010518**
Report # : **3** **Rev. 0**
Page 1 of 1

SAMPLING

Source :
Sampling # : 3 Your sample # :
Borehole # : F-104-21, CF-01
Depth : 0.00 to 0.41m
Location :

Sampled by : the client
Sampling date :
Date received : 2021-09-22
Relative density of particles < 2 mm : 2.700(estimated)

Sieve analysis		Sedimentation analysis (NQ 2501-025)	
Sieve	% passing	Equivalent diameter	% passing
112 mm			
80 mm			
56 mm			
40 mm	100	34,6 µm	18,7
28 mm	95	22,1 µm	16,3
20 mm	85	12,9 µm	14,1
14 mm	82	9,2 µm	12,4
10 mm	80	6,5 µm	10,1
5 mm	72	4,6 µm	8,4
2 mm	66	3,3 µm	6,9
1,25 mm	61	2,3 µm	6,1
0,630 mm	54	1,4 µm	5,3
0,315 mm	44		
0,160 mm	30		
0,080 mm	19,8		

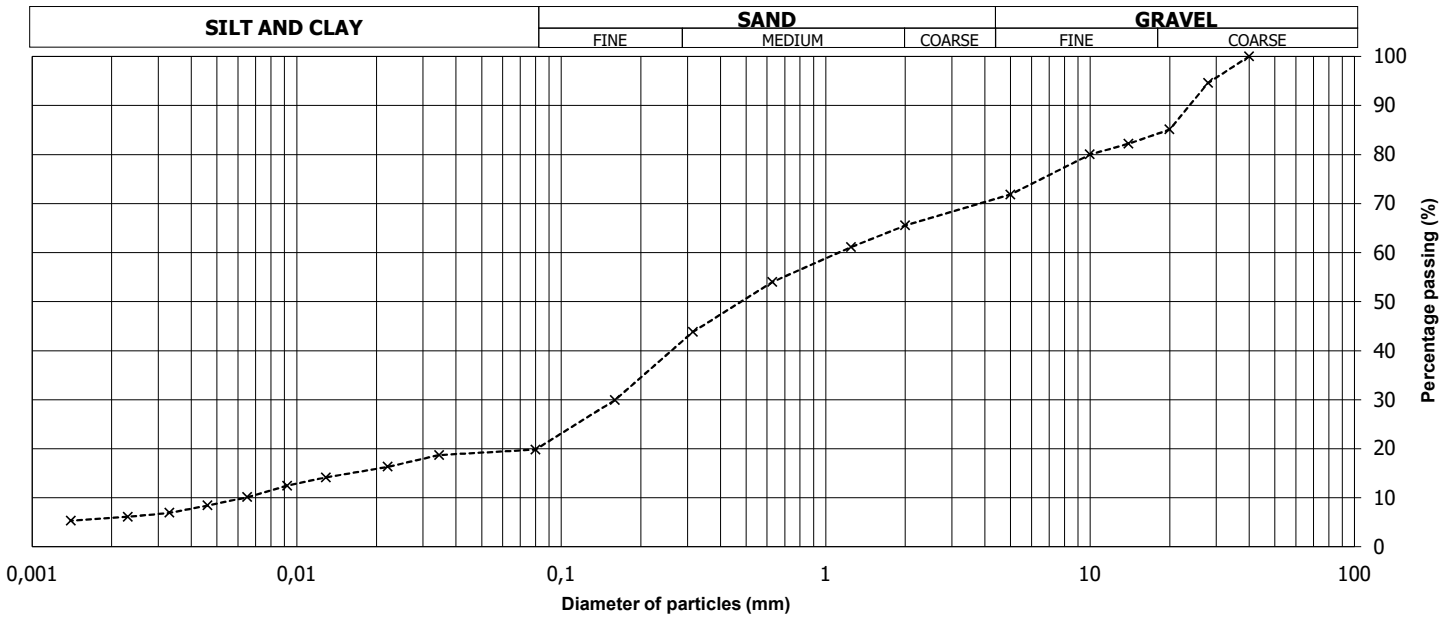
OTHER TESTING	RESULT

REMARKS

The collection and transport of the sample was carried out by a representative of the client.

Proportions from sieve analysis

Cobble :	0,0	Sand:	52,0
Gravel :	28,2	Silt :	14,0
		Clay :	5,8



D_{10} : 0,006 D_{30} : 0,161 D_{60} : 1,124

Prepared by :	Date :	Approved by :	Date :
Asmae El Aychi, tech.	2021-10-06	Frédéric Talbot	2021-10-07

EQ-09-IM-231 rev. 01 (19-04)

Englobe

505, boul. du Parc-Technologique, bur. 200
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Testing on Soils, Aggregates and Other Materials

Client : CIMA+
Project : Cima +; Lab analysis
Location : Lab analysis

Project # : 02102513.002-0200-0201
Client ref. :
Report # : Q2021-010518 4 **Rev.** 0
Page 1 **of** 1

Sampling

Sampling # : 4
Your sampling # :
Material :
Source; location :

Sampling location : F-105-21, CF-01B; 0,05 to 0,61m

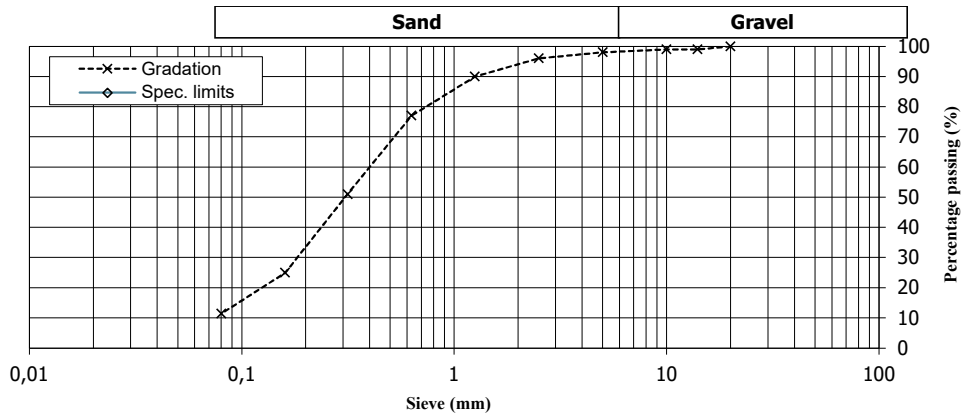
Specification # 1

Reference :
Use :
Calibre :
Class :

Sampling date :
By : the client
Date received : 2021-09-22

Sieve analysis (NQ 2501-025)

SIEVE (mm)	% PASSING REQUIREMENTS	% PASSING RESULT
112		
80		
56		
40		
28		
20		100
14		99
10		99
5		98
2,5		96
1,25		90
0,630		77
0,315		51
0,160		25
0,080		11,4



Cu : Cc : FM : 1,63 D_{10} : D_{30} : 0,181 D_{60} : 0,405

Maximum dry density kg/m³	Optimum moisture %	Retained 5 mm %

Proportions from sieve analysis (%)

Cobble : 0,0 Sand : 86,3
Gravel : 2,3 Silt and clay : 11,4

Other testing	Required	Result

Remarks

The collection and transport of the sample was carried out by a representative of the client.

RESULTS WITH AN ASTERISK DO NOT MEET REQUIREMENTS.

Prepared by : Asmae El Aychi, tech. **Date :** 2021-10-06

Approved by : Frédéric Talbot **Date :** 2021-10-07

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Testing on Soils, Aggregates and Other Materials

Client : CIMA+
Project : Cima +; Lab analysis
Location : Lab analysis

Project # : 02102513.002-0200-0201
Client ref. :
Report # : Q2021-010518 5 **Rev.** 0
Page 1 **of** 1

Sampling

Sampling #	:	5
Your sampling #	:	
Material	:	
Source; location	:	
Sampling location	:	F-101-21, CR-04; 2,57 to 3,35m

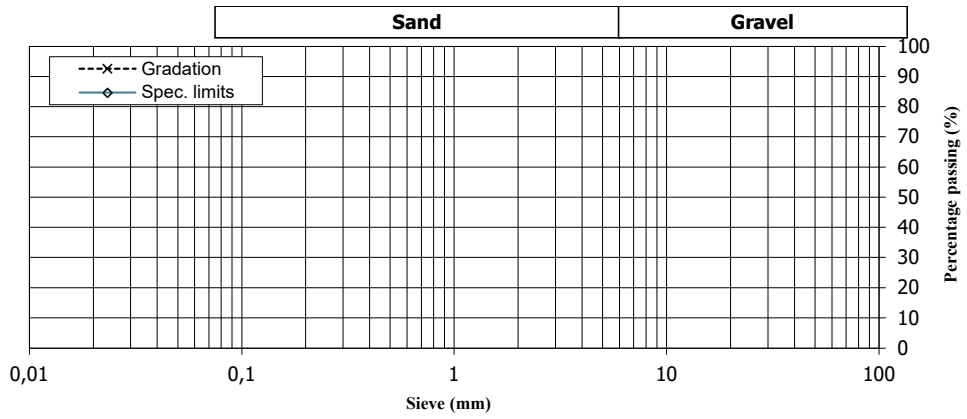
Specification # 1

Reference	:	
Use	:	
Calibre	:	
Class	:	

Sampling date	:	
By	:	the client
Date received	:	2021-09-22

Sieve analysis

SIEVE (mm)	% PASSING REQUIREMENTS	% PASSING RESULT



Cu : Cc : FM : D_{10} : D_{30} : D_{60} :

Maximum dry density kg/m³	Optimum moisture %	Retained 5 mm %

Proportions from sieve analysis (%)

Cobble :	Sand :
Gravel :	Silt and clay :

Other testing	Required	Result
Uniaxial compression strength on rock core samples (MPa)		47,1

Remarks

The collection and transport of the sample was carried out by a representative of the client.

RESULTS WITH AN ASTERISK DO NOT MEET REQUIREMENTS.

Prepared by :	Date :	Approved by :	Date :
Asmae El Aychi, tech.	2021-10-06	Frédéric Talbot	2021-10-07

Englobe

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Québec, G1P 4S9
Téléphone: (418) 781-0191

Testing on Soils, Aggregates and Other Materials

Client : CIMA+
Project : Cima +; Lab analysis
Location : Lab analysis

Project # : 02102513.002-0200-0201
Client ref. :
Report # : Q2021-010518 6 **Rev.** 0
Page 1 **of** 1

Sampling

Sampling # : 6
Your sampling # :
Material :
Source; location :

Sampling location : F-103-21, CR-02; 0.08 to 1.73m

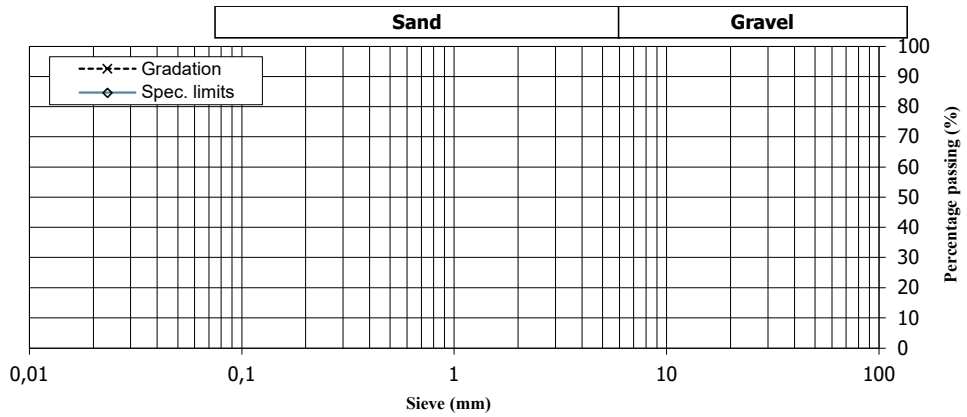
Specification # 1

Reference :
Use :
Calibre :
Class :

Sampling date :
By : the client
Date received : 2021-09-22

Sieve analysis

SIEVE (mm)	% PASSING REQUIREMENTS	% PASSING RESULT



Cu : Cc : FM : D_{10} : D_{30} : D_{60} :

Maximum dry density kg/m³	Optimum moisture %	Retained 5 mm %

Proportions from sieve analysis (%)

Cobble : Sand :
Gravel : Silt and clay :

Other testing	Required	Result
Uniaxial compression strength on rock core samples (MPa)		71,1

Remarks

The collection and transport of the sample was carried out by a representative of the client.

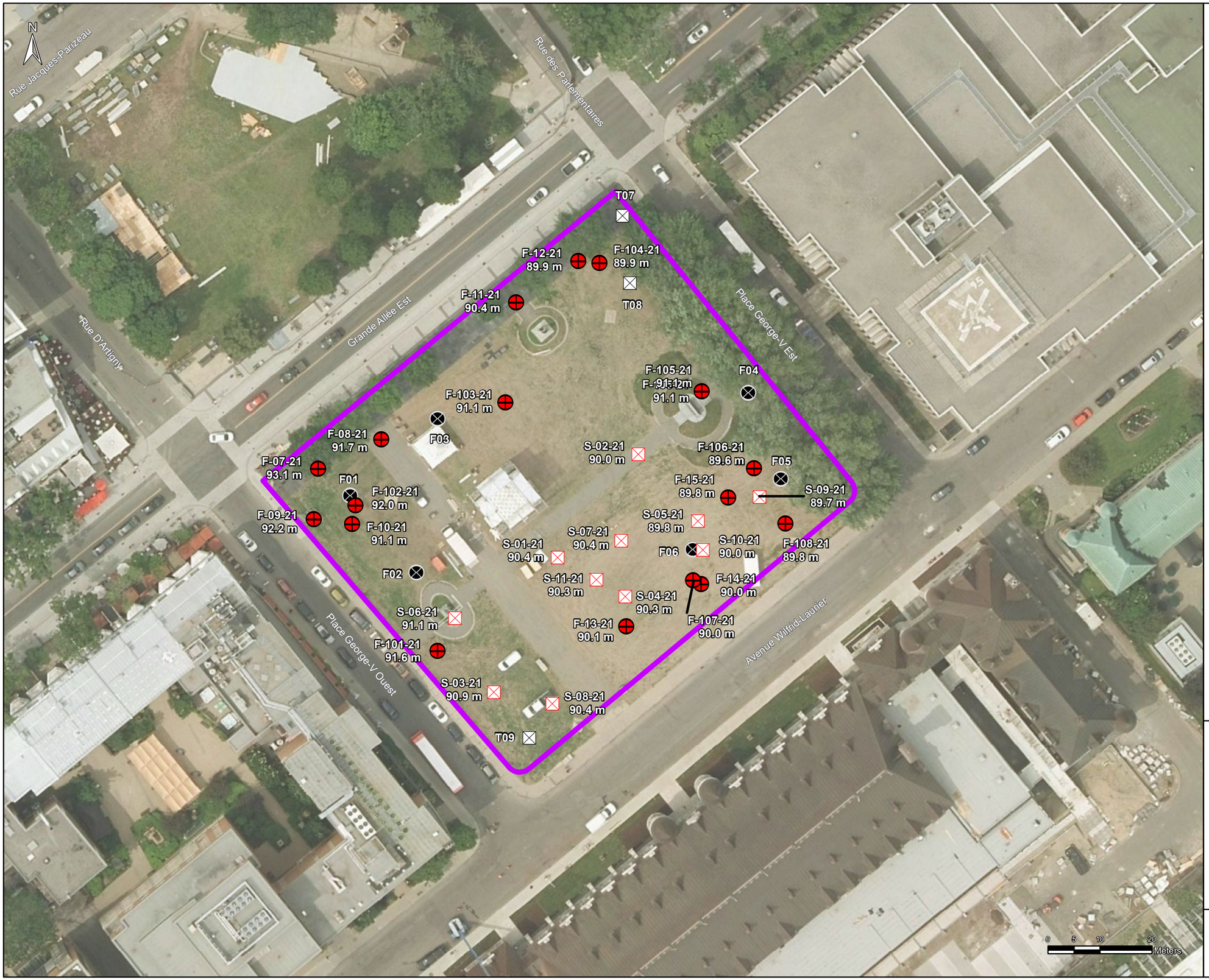
RESULTS WITH AN ASTERISK DO NOT MEET REQUIREMENTS.

Prepared by : Asmae El Aychi, tech. **Date :** 2021-10-06

Approved by : Frédéric Talbot **Date :** 2021-10-07

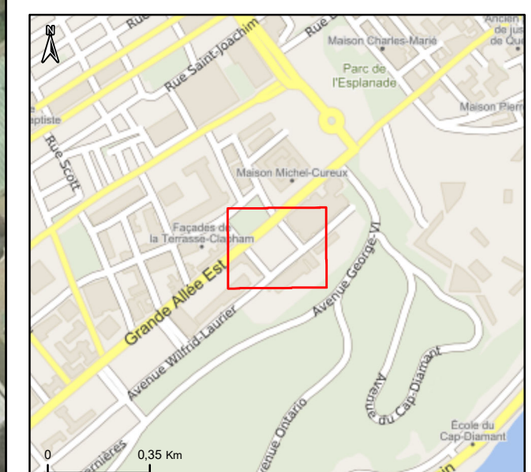
D

Appendix D
Borehole Location Plan



Location

- Study site
- Borehole - 2021 (F-XX-21) (Elevation)
- Hand-auger survey - 2021 (S-XX-21) (Elevation)
- Borehole - 2020 (FXX)
- Trench - 2020 (TXX)



Public Services and Procurement Canada | Services publics et Approvisionnement Canada

GEOTECHNICAL INVESTIGATION: PLACE GEORGE-V RESTORATION PROJECT

Map 1: Survey Location

Q213080A

November 2021

Scale: 1:700
Projection: NAD 1983 MTM zone 7
File: Q213080A_Forage_v2_EN.mxd
Reference: CIMA+, 2021 (projet QR0272A) ; CIMA+, 2021 (projet Q213080A) ; Service d'imagerie du gouvernement du Québec
Prepared par : Anne-Marie Wagner
Verified par : Emmanuel Charois, ing. PMP

CIMA+

E

Appendix E
Pictures of the Rock Sample

F-101-21 CR-04 à CR-07 (sec)

F-101-21 CR-08 et CR-09 (sec)

F-102-21 CR-03 à CR-05 (mouillé)

F-103-21 CR-03 à CR-05 (sec)

F-104-21 CR-03 à CR-05 (sec)

F-105-21 CR-04 à CR-06 (sec)

F-106-21 CR-05 à CR-07 (sec)

F-107-21 CR-04 à CR-06 (mouillé)

F-108-21 CR-05 à CR-09 (sec)

Services publics et Approvisionnement Canada | Public Services and Procurement Canada

ENVIRONMENTAL MONITORING FORM

PROJECT IDENTIFICATION		
Proponent:	Public Services and Procurement Canada	
Project Title :	***Restauration de la Place George-V, Québec***	
Date of Work Completed :		
Date of Environmental Monitoring :		
Environmental Monitoring Activities completed :	☐	Site Visit as part of the Scope of Work
	☐	Other (specified)
	☐	Environmental Emergency

CONSTRUCTION SITE MONITORING COMPLETED BY :	
Site Supervisor Name :	
Title :	
Company:	
Telephone no :	

I certify that the information provided below is exact and complete and that it corresponds to my interpretation of the scope of work.

Signature :	_____	Date :	_____
Name :			

MITIGATION MEASURES		PROVIDE		MEASURES IMPLEMENTED		
		Photo (s)	Document (s)	yes	no	COMMENTS (If measures are not implemented, please provide explanations)
Risk of soil erosion/compaction due to the passage of machinery and the storage of materials The planned work will require the use of machinery, particularly for the transportation of materials to the site.						
1	Prior to the work, mark out the work area and have the Supervisor approve the storage areas. Ensure that the delineations are functional and visible throughout the work.					
2	Minimize the number and size of storage areas to limit encroachment into the natural environment.					
3	Limit storage of materials and other items to pre-approved areas.					
4	Restore storage areas and access roads to their original condition.					

	MITIGATION MEASURES	PROVIDE		MEASURES IMPLEMENTED		
		Photo (s)	Document (s)	yes	no	COMMENTS (If measures are not implemented, please provide explanations)
Risk of soil erosion and overloading of the stormwater system						
5	Implement a stormwater management and retention system and connect it to the City of Québec's network; the proposed works must comply with the City of Québec's requirements and provincial regulations.					
6	Encourage the implementation of green infrastructure (swales, bioretention areas, rain gardens, etc.) aimed at infiltrating stormwater in order to reduce the volume of runoff captured by the network and conveyed to overflow structures.					
7	Where applicable, green infrastructure shall be designed in accordance with CSA W200:18 and CSA W201:18 as well as the MELCC "Stormwater Management Guide".					
Risk of damage to mature trees and their root systems						
8	Remove the Norway maple tree along George V Street East prior to the start of construction and replace it upon completion of the work.					
9	Effectuer pendant les travaux un suivi de l'état de santé des deux ormes caractérisés par un niveau de dépérissement moyen de leur cime. Si leur condition générale se détériore, l'abattage et le remplacement devront être considérés.					
10	Monitor the health of the two elm trees characterized by a moderate level of crown dieback during the work. If their general condition deteriorates, felling and replacement should be considered.					
11	Provide for the implementation of additional tree protection measures to be established in the field by the Department representative in collaboration with the urban forestry expert.					
Excavation and disposal of contaminated soil can reduce surface and groundwater quality						
12	Dispose of soils with contamination levels above the CCME commercial criteria to a MELCC approved contaminated soil treatment facility.					

	MITIGATION MEASURES	PROVIDE		MEASURES IMPLEMENTED		
		Photo (s)	Document (s)	yes	no	COMMENTS (If measures are not implemented, please provide explanations)
13	Manage contaminated soils beyond criterion A of the MELCC's established policy according to the Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés and according to the MELCC's Regulation respecting contaminated soil storage and contaminated soil transfer stations					
14	Manage contaminated water at the bottom of excavations, where applicable, in accordance with municipal and provincial standards.					
15	A vacuum tanker may be required if the contaminated water is to be disposed of at an authorized treatment facility.					
16	At the end of the excavation work, characterize the soils of the excavation walls and bottoms according to the methodologies proposed in the MELCC characterization guides.					
17	Provide additional soil characterization in the polygon delineated around borehole F-07 (see CIMA+ map 4 in the appendix of the specifications) in order to clarify the actual extent of lead contamination at this location during the excavation work.					
Risk of petroleum product spills and introduction of exotic invasive plant species through the use of machinery						
18	The machinery used shall be clean and free of exotic invasive plant species when it arrives on the site and shall be maintained in that condition thereafter.					
19	The contractor shall ensure the use of equipment in good working order having undergone the required maintenance, in order to limit the risks of accidents.					
20	Vehicles and equipment used must be in good working order and must not leak oil or fuel; vehicles with leaks will not be allowed to enter the site.					
21	Machinery shall operate within the proposed limits of the right-of-way.					
22	Establish an emergency procedure and communication protocol for environmental incidents.					

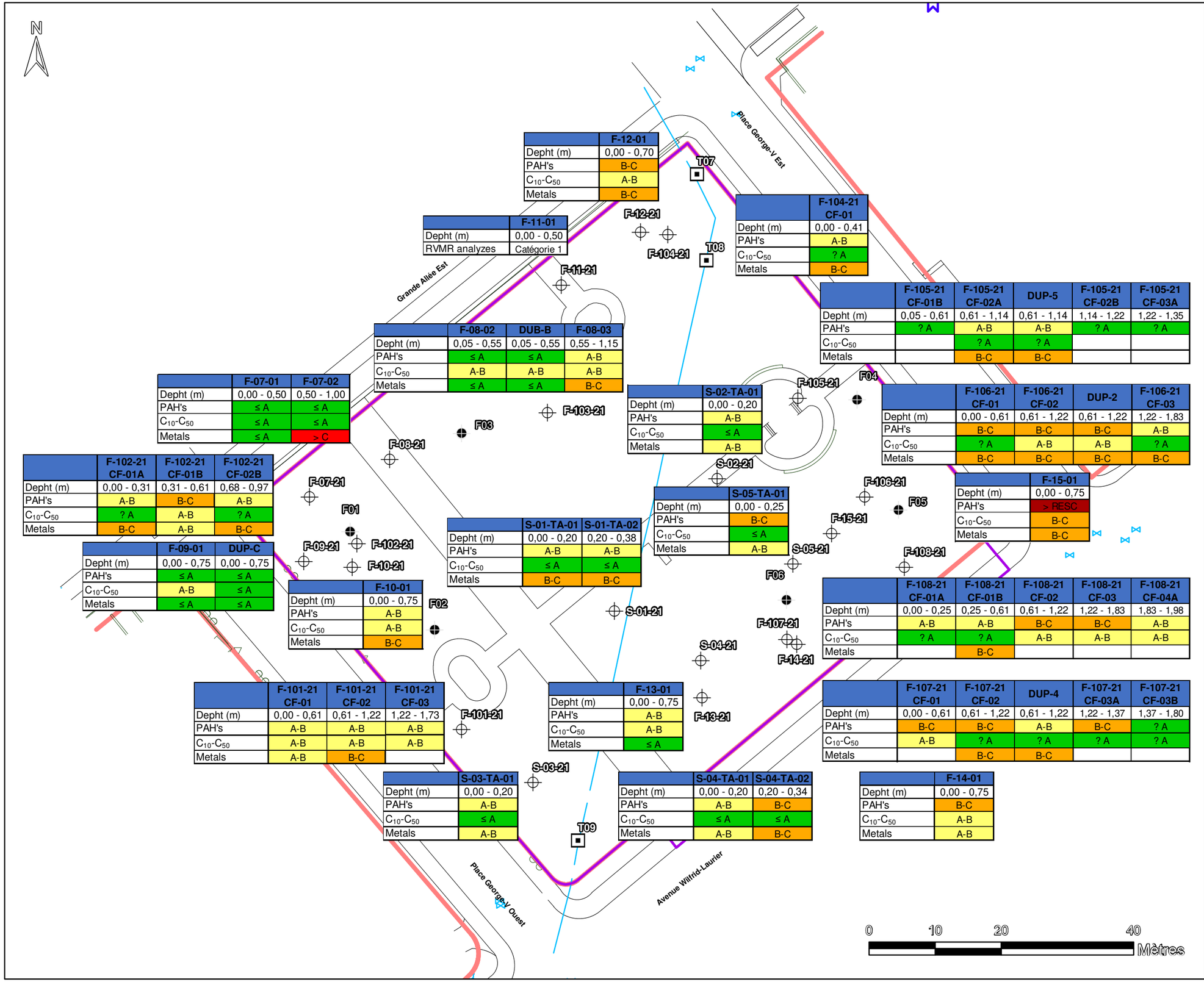
	MITIGATION MEASURES	PROVIDE		MEASURES IMPLEMENTED		
		Photo (s)	Document (s)	yes	no	COMMENTS (If measures are not implemented, please provide explanations)
23	Keep, on site, enough petroleum product recovery kit and ensure that the employees present know and understand the methods of intervention in the event of a minor spill.					
24	Les quantités minimums d'essence seront conservées sur place.					
Disturbance of avian and terrestrial wildlife during construction due to increased noise levels and movement of personnel and equipment Construction activities could disturb surrounding avian and terrestrial wildlife.						
25	Construction activities could disturb surrounding avian and terrestrial wildlife. To minimize disturbance caused by increased noise levels, turn off engines of vehicles, machinery and equipment when not in use.					
26	In addition, limit the movements of personnel and machinery to the work area, which will be marked out beforehand to minimize disturbance to wildlife.					
Production of residual and waste material						
27	Any residual material produced during the work shall be collected and disposed of according to its nature. The contractor shall ensure that no debris is left on the work site.					
28	Sort and store according to whether they are recoverable materials or residual materials destined for disposal as defined in the Regulation respecting the landfilling and incineration of residual materials or residual hazardous materials as defined in the Regulation respecting hazardous materials in force.					
29	Recover or reuse residual materials when possible or transport them off-site and dispose of them according to the regulations in effect. Waste disposed of off-site will be transported to a location authorized by the MELCC.					
30	Keep the site free of waste or dispose of it temporarily in waterproof containers intended for this purpose.					
31	Dispose of all waste according to regulations. The latter cannot be burned or buried on site.					

	MITIGATION MEASURES	PROVIDE		MEASURES IMPLEMENTED		
		Photo (s)	Document (s)	yes	no	COMMENTS (If measures are not implemented, please provide explanations)
32	No new hazardous materials shall be discarded. At the end of the work, the contractor must take back all his unused hazardous materials in order to leave the site perfectly clean.					
33	The contractor shall remove from the site all waste materials, hazardous waste materials, temporary installations, tools, equipment, machinery and materials on the site in order to leave it perfectly clean.					
Soil excavation may result in the degradation or loss of potential archaeological remains.						
34	Carry out archaeological monitoring of the excavation work according to the instructions in the specifications and on the AP02 plan.					
35	Provide for the participation of two Aboriginal representatives in the inventory and archaeological excavation work: a Huron excavation technician from Nionwentsïo and another from the Innu of Pekuakamiulnuatsh Takunikan.					
36	Inform Parks Canada of the discovery of any archaeological property or site.					
The project has the potential for environmental incidents and malfunctions that could result in the accidental release of hazardous materials						
37	All waste will be disposed of in accordance with regulations and cannot be burned or buried on site.					
38	Observe the prohibition against discharging hydrocarbons, solvents, thinners or any hazardous substances into waterways and storm and sanitary sewers.					
39	The contractor will be required to develop an environmental contingency plan describing the actions that will be taken in the event of an environmental incident.					
40	Prior to the commencement of work, the person in charge of the site will identify an area for the maintenance of machinery, storage and handling of hazardous materials. This site must be at least 30 m from a watercourse or water body.					

	MITIGATION MEASURES	PROVIDE		MEASURES IMPLEMENTED		
		Photo (s)	Document (s)	yes	no	COMMENTS (If measures are not implemented, please provide explanations)
41	Characterize and dispose of soil, fill material, sediment or water contaminated by an accidental spill in accordance with regulations.					
42	In the event of a spill, report the incident to the responsible authorities and respond promptly. Contact Environment Canada Emergency Services (1-866-283-2333) and MELCC Land (1-866-694-5454).					
The presence of the work site in an area frequented by the public for recreational and tourist purposes could lead to accidents. Measures will have to be implemented to ensure the safety of the public and the personnel working on the site.						
43	Establish required signage around the site for personnel, pedestrian and vehicle traffic.					
44	Comply with municipal and provincial requirements for excavation safety standards and worker protection including the Construction Safety Code administered by the Commission de la santé et de la sécurité au travail.					
45	Ensure continuous access for emergency services.					

Commentaires (observations sur le terrain, mauvaise gestion des déchets, présence d'huiles usées, fuites sur la machinerie, travaux réalisés pas pris en compte dans l'évaluation environnementale, etc. - tout détail n'étant pas mentionné dans les mesures d'atténuation) :

Photo (nº)		Mesure d'atténuation concernée (nº)	Photo (nº)		Mesure d'atténuation concernée (nº)
1			16		
2			17		
3			18		
4			19		
5			20		
6			21		
7			22		
8			23		
9			24		
10			25		
11			26		
12			27		
13			28		
14			29		
15			30		



	F-12-01
Depht (m)	0,00 - 0,70
PAH's	B-C
C_{10}-C_{50}	A-B
Metals	B-C

	F-11-01
Depht (m)	0,00 - 0,50
RVMR analyzes	Catégorie 1

	F-104-21 CF-01
Depht (m)	0,00 - 0,41
PAH's	A-B
C_{10}-C_{50}	? A
Metals	B-C

	F-105-21 CF-01B	F-105-21 CF-02A	DUP-5	F-105-21 CF-02B	F-105-21 CF-03A
Depht (m)	0,05 - 0,61	0,61 - 1,14	0,61 - 1,14	1,14 - 1,22	1,22 - 1,35
PAH's	? A	A-B	A-B	? A	? A
C_{10}-C_{50}		? A	? A		
Metals		B-C	B-C		

	F-08-02	DUB-B	F-08-03
Depht (m)	0,05 - 0,55	0,05 - 0,55	0,55 - 1,15
PAH's	≤ A	≤ A	A-B
C_{10}-C_{50}	A-B	A-B	A-B
Metals	≤ A	≤ A	B-C

	F-07-01	F-07-02
Depht (m)	0,00 - 0,50	0,50 - 1,00
PAH's	≤ A	≤ A
C_{10}-C_{50}	≤ A	≤ A
Metals	≤ A	> C

	S-02-TA-01
Depht (m)	0,00 - 0,20
PAH's	A-B
C_{10}-C_{50}	≤ A
Metals	A-B

	F-106-21 CF-01	F-106-21 CF-02	DUP-2	F-106-21 CF-03
Depht (m)	0,00 - 0,61	0,61 - 1,22	0,61 - 1,22	1,22 - 1,83
PAH's	B-C	B-C	B-C	A-B
C_{10}-C_{50}	? A	A-B	A-B	? A
Metals	B-C	B-C	B-C	B-C

	F-102-21 CF-01A	F-102-21 CF-01B	F-102-21 CF-02B
Depht (m)	0,00 - 0,31	0,31 - 0,61	0,68 - 0,97
PAH's	A-B	B-C	A-B
C_{10}-C_{50}	? A	A-B	? A
Metals	B-C	A-B	B-C

	S-05-TA-01
Depht (m)	0,00 - 0,25
PAH's	B-C
C_{10}-C_{50}	≤ A
Metals	A-B

	F-15-01
Depht (m)	0,00 - 0,75
PAH's	> RESC
C_{10}-C_{50}	B-C
Metals	B-C

	S-01-TA-01	S-01-TA-02
Depht (m)	0,00 - 0,20	0,20 - 0,38
PAH's	A-B	A-B
C_{10}-C_{50}	≤ A	≤ A
Metals	B-C	B-C

	F-09-01	DUP-C
Depht (m)	0,00 - 0,75	0,00 - 0,75
PAH's	≤ A	≤ A
C_{10}-C_{50}	A-B	≤ A
Metals	≤ A	≤ A

	F-10-01
Depht (m)	0,00 - 0,75
PAH's	A-B
C_{10}-C_{50}	A-B
Metals	B-C

	F-108-21 CF-01A	F-108-21 CF-01B	F-108-21 CF-02	F-108-21 CF-03	F-108-21 CF-04A
Depht (m)	0,00 - 0,25	0,25 - 0,61	0,61 - 1,22	1,22 - 1,83	1,83 - 1,98
PAH's	A-B	A-B	B-C	B-C	A-B
C_{10}-C_{50}	? A	? A	A-B	A-B	A-B
Metals		B-C			

	F-101-21 CF-01	F-101-21 CF-02	F-101-21 CF-03
Depht (m)	0,00 - 0,61	0,61 - 1,22	1,22 - 1,73
PAH's	A-B	A-B	A-B
C_{10}-C_{50}	A-B	A-B	A-B
Metals	A-B	B-C	

	F-13-01
Depht (m)	0,00 - 0,75
PAH's	A-B
C_{10}-C_{50}	A-B
Metals	≤ A

	F-107-21 CF-01	F-107-21 CF-02	DUP-4	F-107-21 CF-03A	F-107-21 CF-03B
Depht (m)	0,00 - 0,61	0,61 - 1,22	0,61 - 1,22	1,22 - 1,37	1,37 - 1,80
PAH's	B-C	B-C	A-B	B-C	? A
C_{10}-C_{50}	A-B	? A	? A	? A	? A
Metals		B-C	B-C		

	S-03-TA-01
Depht (m)	0,00 - 0,20
PAH's	A-B
C_{10}-C_{50}	≤ A
Metals	A-B

	S-04-TA-01	S-04-TA-02
Depht (m)	0,00 - 0,20	0,20 - 0,34
PAH's	A-B	B-C
C_{10}-C_{50}	≤ A	≤ A
Metals	A-B	B-C

	F-14-01
Depht (m)	0,00 - 0,75
PAH's	B-C
C_{10}-C_{50}	A-B
Metals	A-B

Legend

- Study Site
- Lot limits
- Approximate location of an underground municipal pipe
- Borehole - 2021
- Borehole - 2020
- Test pit - 2020

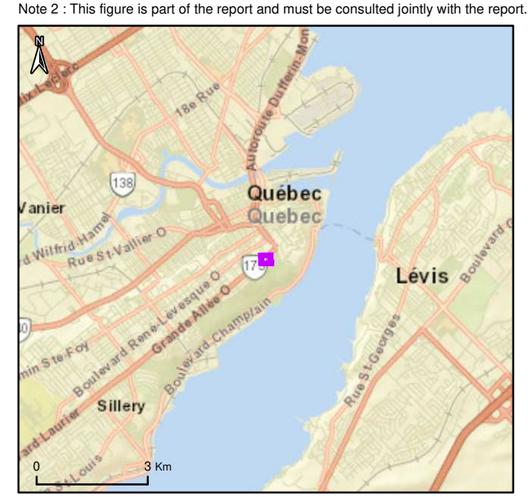
The classification of the granular residual matter is based on the *Règlement concernant la valorisation des matières résiduelles* (RVMR)

Environmental classification according to the *Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés* of the MELCC (2021)

≤ A	A - B	B - C	> C	> RESC

Note 1 : The results presented on this figure correspond to those obtained from the laboratory and do not consider the interpretation that the irregular obtained concentrations in As, Ba, Co, Mo, Ni and Zn are from a natural origin. Thus, they are considered linked to the Criteria A. The figure 4 must be consulted to obtain the environmental quality of the soils that will be xcavated during the future restauration.

Note 2 : This figure is part of the report and must be consulted jointly with the report.



Public Works and Government Services Canada

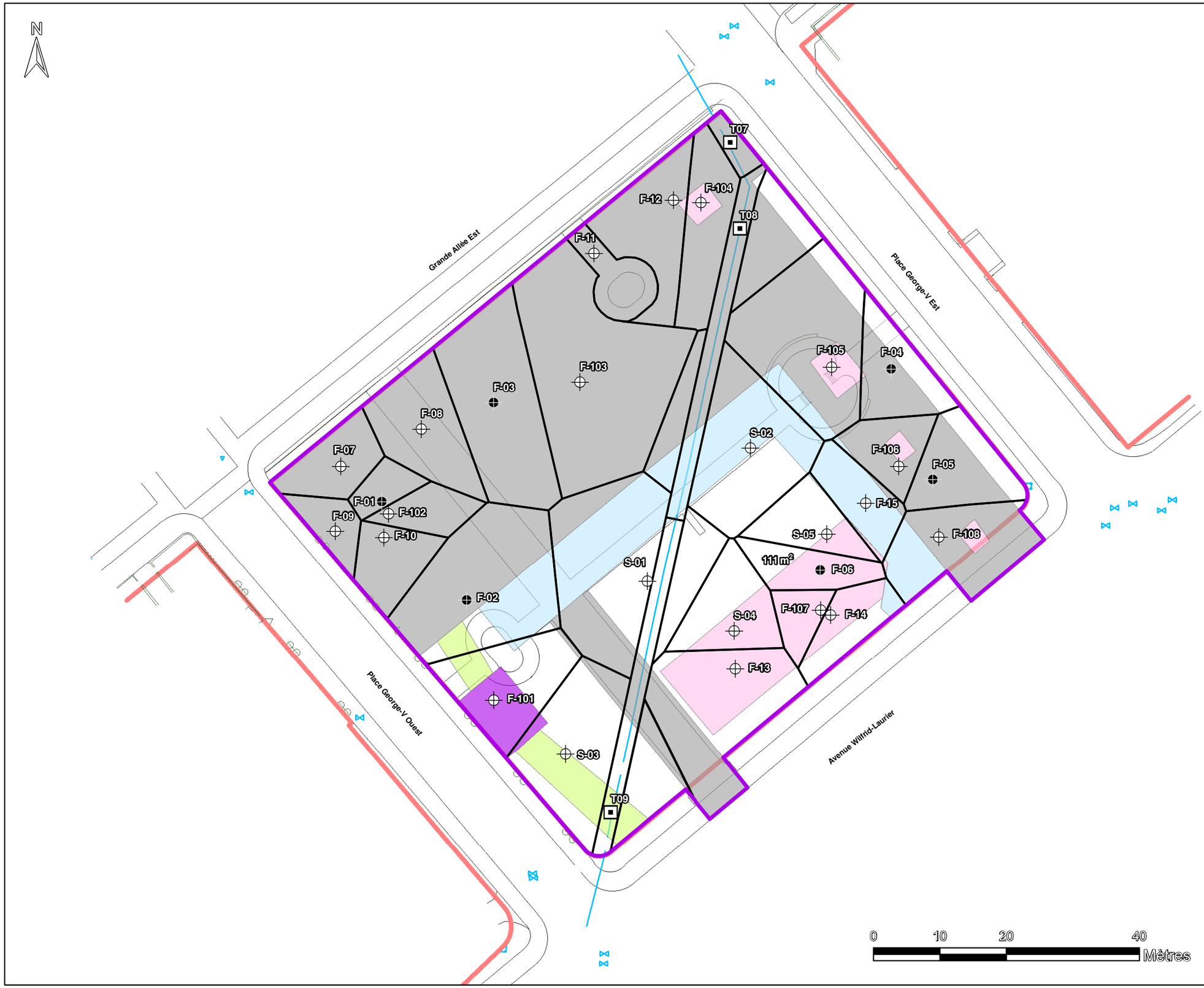
ENVIRONMENTAL SITE CHARACTERIZATION - PLACE GEORGES V

Carte 2 : Borehole location and soil analytical results

QR0287A
December 2021

Scale: 1:550
Projection: NAD 1983 SCRS MTM zone 7
File: QR0287A_Carte2_Sondages_ENG.mxd
Source: CIMA+
Prepared by: Anne-Marie Wagner
Verified by: Philippe Saint-Germain

CIMA+

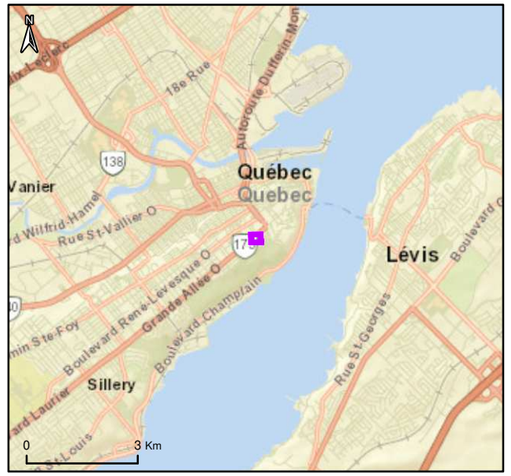


Legend

- Study Site
- Lot limits
- Approximate location of an underground municipal pipe
- Borehole – 2020
- Borehole - 2021
- Test pit – 2020
- Extent of the contamination

Excavation depth

- 0 m
- 0,85 m
- 1.0 m
- 1,2 m
- 2,5 m
- 4,5 m



Public Works and Government Services Canada

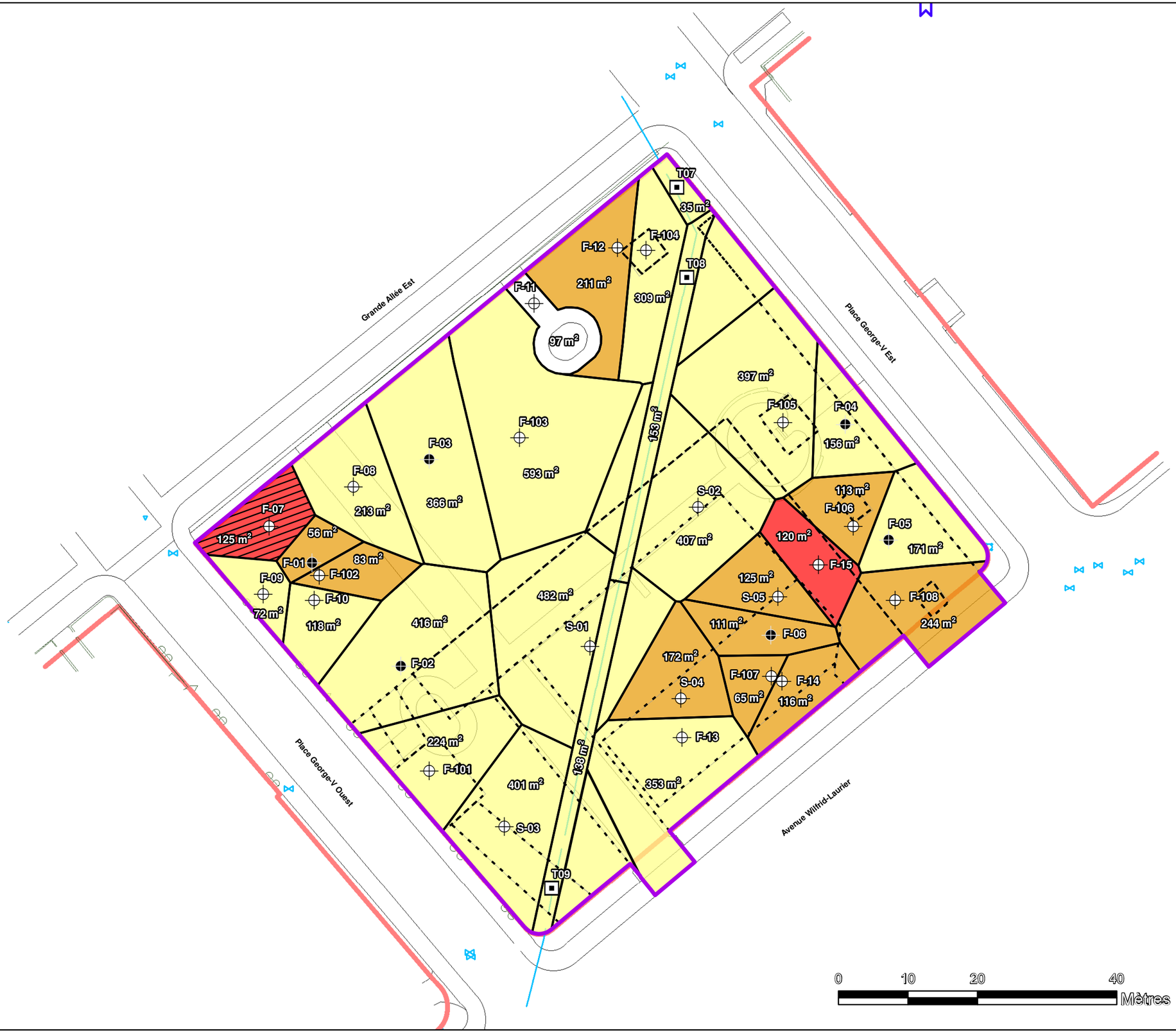
ENVIRONMENTAL SITE CHARACTERIZATION - PLACE GEORGES V

Carte 3 : Area and depth of the excavations

QR0287A
December 2021

Scale: 1:550
Projection: NAD 1983 SCRS MTM zone 7
File: QR0287A_Carte3_Profondeur_ENG.mxd
Source: CIMA+
Prepared by : Anne-Marie Wagner
Verified by : Philippe Saint-Germain

CIMA+

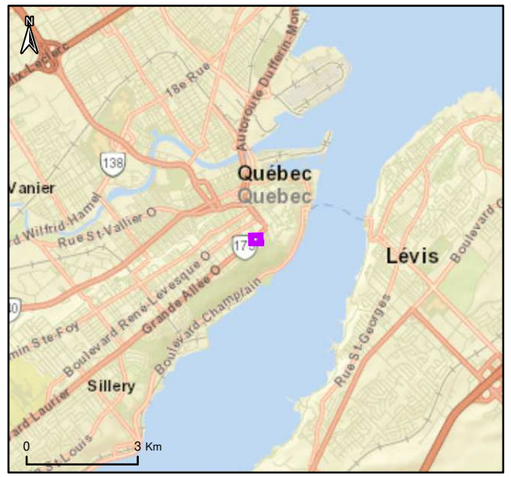


Legend

- Study Site
- Lot limits
- Approximate location of an underground municipal pipe
- Borehole – 2020
- Borehole - 2021
- Test pit – 2020
- Extent of the contamination
- Contamination area to be confirmed during the excavation work
- Excavation area limits

Environmental classification according to the *Guide d'intervention - Protection des sols et réhabilitation des terrains contaminés* of the MELCC (2021)

	≤ A		A - B		B - C		> C		> RESC



Public Works and Government Services Canada

ENVIRONMENTAL SITE CHARACTERIZATION - PLACE GEORGES V

Carte 4 : Interpreted contaminated soil extent

QR0287A
December 2021

Scale: 1:550
Projection: NAD 1983 SCRS MTM zone 7
File: QR0287A_Carte4_EtendueContam_ENG.mxd
Source: CIMA+
Prepared by : Anne-Marie Wagner
Verified by : Philippe Saint-Germain

CIMA+

A guide to filling out the Mulitple Building Item (Equipment) Data

	Color Legend		
	Mandatory	Information required in all cases	
	Mandatory if relevant	Mandatory only if it is relevant to this type of equipment, covered by a warranty, etc.	
	Automatic	No entry required; table of equivalencies or concatened information	

	Entry Table		
Tab: Building			
Cells	Title	Content description	
B3	Entry Date	Enter the current date (Normally TODAY)	
B4	Requester (Name)	Name of the person completing form	
B5	Email	Email from the person completing form	
B6	Phone Number	Applicant's contact phone number	
B8	Project Number	Enter the Project Number, if applicable	
B9	Decommissioning Project Number	Enter the Decommissioning Project Number, if applicable	
B10	BGIS Building Number	BGIS Building Number e.g. GOC00XXX Enter the number or click on the cell drop-down menu to choose the building. The address will fill automatically	
Tab: DCMF			
Row	Field name	Quick-entry tips	
A	Status (New, Replacement, Removed, Update)	Select one of the drop-down menu options	
B	Building Item Number replaced, removed or to update (Old BGIS Number)	Old equipment number (equipment that has been replaced or equipment that has been removed) or equipment number that you want to update information	Removal of equipment that was on site only
C	Removal Date (YYYY-MM-DD)	Enter the date of removal of the old equipment if applicable	
D	Planned Decommissioned Date (YYYY-MM-DD)	Enter the planned date of decommissioning of the old equipment if applicable	
E	Actual Decommissioned Date (YYYY-MM-DD)	Enter the actual date of decommissioning of the old equipment if applicable	
F	Removal Status	Click on the cell a drop-down menu to choose the one that matches if applicable	
G	By (Company Name)	Enter the name of the company responsible for removing the equipment if applicable	
H	Criticality	Select the criticality level of the drop-down menu (Normally 3 - Not critical)	
I	Legionnaires' risk level	Select the risk level for legionella from the drop-down menu. Often "0 - Not applicable"	
J	Heritage (Historical or heritage-related equipment)	Does this equipment have a historical appeal or is it heritage-related? Yes or No	Is not related to the historical or heritage nature of the building
K	System type	Select the type of system in the drop-down menu, Ex: (25 - Refrigeration).	Not directly linked to PSPC CMMS number
L	Building Item (Equipment) Type	Select the type of equipment, Ex: (414 - Heat Pump - Under 5.4 Tons).	
M	Unit Number	Enter the No. Unit, in the case of an ex replacement: (25-407-6), the No. Unit will be 6.1 (CMMS Label) will automatically fill with 25-407-6.1. Maximum of 6 digits.	
N	PSPC equipment type	Automatic - no entry needed	
O	CMMS Label Number (PSPC Field Item Number)	Automatic - no entry needed	
P	Label placed on equipment	Has the CMMS label been attached to the equipment: Yes or No	
Q	Optional description	Optional description (If the description in column P is too long or if there is a specific registration methodology for this building) Max 64 characters.	This information (short) is normally transcribed with the equipment description and location
R	French Equipment description	Automatic - no entry needed	
S	Belongs to (Parent or System) Equipment No.	Enter the parent equipment number if applicable.	
T	Specific Building	For the large sites or Complexes since more than one building may exist, click on the cell a drop-down menu to choose the specific building/structure. i.e.: Main, Shed, Guardhouse, etc.	
U	Floor	Select the drop-down menu floor. Contact CMMS if none is suitable	
V	General Location (Local) (Client Location Field in RS)	Local Description, maximum 35 characters Ex: (Mechanical Room, 201-B)	Enter a complementary location
W	Specific Location	Ex: Corridor, Near AC-1, Red Dot Tile, Bottom Left, etc.	Enter a specific additional location
X	Manufacturer	Name of equipment manufacturer	
Y	Model Number	Equipment model number as known by manufacturer	
Z	Model name	Only if there is a model number. Ex: Elbow 90	

AA	Serial Number	Serial Equipment Number (Enter N/A if not applicable to this equipment)	
AB	Manufacturing date	If known, enter the date of manufacture; e.g.: 2018-06-15 (AAAA-MM-JJ) (If the month is not known to record 01, if the day is not known to register 01)	
AC	The expiry date of the certificate issued for this equipment	Certificate expiry date if a certificate has been issued for this equipment	
AD	Owner	Usually PSPC or Tenant. Select from dropdown menu.	
AE	Installation date	The date on which this equipment was installed	
AF	Name of Warrantor (Company)	If it has a warranty, what is the name of the company that covers the warranty	
AG	Warranty / Terms	Terms of warranty	
AH	Warranty expiry date (Parts and labor)	Expiration date of the parts and labour warranty	
AI	Warranty expiry date (Parts only)	Expiration date of the warranty of the parts if it is higher than that of parts and labour	
AJ	Start date of maintenance by BGIS if maintained by the installer	If the equipment is maintained by a third party when does BGIS begin maintenance	
AK	Purchase price	Purchase price without equipment taxes	
AL	GST / HST	Amount of GST / HST 13% (Need to enter % in cell X2 of Data tab for this cell to calculate)	
AM	PST	Amount of PST, if applicable (Need to enter % in cell X3 of Data tab for this cell to calculte)	
AN	Purchase date	Time of purchase of the equipment	
AO	Purchased from (Company)	The equipment was purchased from which company	
AP	Amount of environmental content	Amount of environmental content (Metric; Kg or Litres) (refer to Conversion tab)	
AQ	Unit of measurement (Kg or Litres)	Kg or Litres metric measurement unit only (refer to Conversion tab)	
AR	Environmental Content	Select the type of environmental content from the drop-down list	
AS	Cooling capacity (Tonnes)	Cooling capacity of equipment in tons	
AT	Environmental documents attached with this request	Were the environmental documents provided with this form, Yes or No	
AU	General Location of Tank	General location of a tank: Outside above ground, Buried exterior, Interior (drop-down cell)	
AV	Installer Company Name (or technician)	Name of the installer company (or technician)	
AW	Installer Liscence Number	Tank installer license number	
AX	Environment Canada Registration Number (8 Characters)	Environment Canada Registration Number. If it is no number, enter "0000,000"	
AY	Transformer tested for PCB?	Yes or no	
AZ	If not, why?	Reason why transformer hasn't it been tested for PCB	
BA	PCB Concentration	Enter PCB concentration and unit of measurement	
BB	Dielectric test: (YYYY-MM-DD)	Date of dielectric test (glued)	
BC	Transformer's vault number	Transformer's vault number	
BD	True Voltage (Ex: 208)	Real voltage to which this device is connected. In the case of an electrical panel or a transformer write the highest	
BE	Amperage FLA	Maximum amperage of this device	
BF	Number of Phases	Number of phases 1 or 3	
BG	Power (hp)	Power in horsepower	
BH	RPM	Number of revolutions per minute	
BI	Tenant Name	Name of Tenant that purchased equipment in occupied space	
BJ	Project Number	Automatic - no entry needed	
BK	Decommissioning Project Number	Automatic - no entry needed	
BL	Number Belts	Number of belts	
	Belt Size	Belt sizes. If more than one, separated with a comma	
BM	Type Belts	Belt type; Direct if there are no belts	
BN	orDirect		
BO	Flow (L/s)	Litres per second (refer to Conversion tab)	
BP	Operating pressure (KPa)	Operating pressure in kPa (refer to Conversion tab)	
BQ	Capacity (UoM)	Capacity and unit of measurement EX:Tank (except those specified for environmental content)	
BR	Filters	Number of filters	
BS	Filter size	Filter size. If more than one, separated with a comma	
BT	Type of Filters	Type of filters	
BU	Comments (Optional)		

	Operations only (if there is no existing maintenance PM Schedule for this type of equipment)		
BU	Group	If there are several groups of these facilities it belongs to which?	
BV	Asset Group Number	GOC... If known	
BW	PM Schedule Number	GOC... If known	
BX	Service provider	Assign maintenance to SP or BGIS member	
BY	Month of Annual PM	Select from pulldown	
BZ	Seasonal	Yes/No	
CA	Start of the season	Months when maintenance is due to begin	Only if seasonal
CB	End of the season	Months when the interview is due to end	
TIPS			
You can make a quick entry			
	Click on the lower right corner of a cell		
	Slide down the number of cells required		
	NOTE: Excel may have the wrong methodology		
	In this case press the CTRL key at the same time		
	Excel will try the other method		
	A manual entry is required if it can not guess		
Use quick entry by column rather than by row			
By column will always work			
By line may well not work as you want			

Standards for Nameplates

There are only 2 sizes of nameplates that can be used for CMMS identification. It is recommended to use the larger size for most applications. White writing on black nameplate is required.

Option 1:

05-370-01

20 mm x 50 mm
Letters height: 10 mm

Option 2:

05-370-01

20 mm x 100 mm

Letters height: 12 mm

Nameplate sizes for electric components used on single-line diagrams:

Examples: Disconnectors, Starters, Panels

1-S1-S6N1

25 mm X 75 mm

Letters height: 12 mm

Standards for Nameplates

Oversized nameplates for primary distribution panels

1-S1-S6N1

50 mm X 150 mm

Letters height: 25 mm

Position identification nameplates in primary distribution panels

1

25 mm X 25 mm

Letters height: 15 mm