PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

Correctional Service Canada

DONNACONA ESTABLISHMENT
FIRING RANGE CONSTRUCTION

SPECIFICATION FOR TENDER – ISSUE SR5

May 2017

N/Réf. 638589 V/Réf. R079407.001

Infrastructures

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N/Ref. 638589 V/Ref. R079407.001

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Infrastructure Engineering – East of Canada

Infrastructures

List of Modifications

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CIVIL ENGINEERING

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2017-05-11

ELECTRICITY AND INSTRUMENTATION

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2017-05-09

STRUCTURAL

Prepared and verified by :

2017-05-10

Dominic Samson, Eng.

BUILDING MECHANICAL

Prepared and verified by :

Jean Rioux, Eng.

ARCHITECTURE

Prepared and verified by :

Stephan Gilbert, arch.

END OF SECTION

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Specification

END OF SECTION

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 The construction project of a firing range at the Donnacona penal establishment includes, but is not limited to, the following work :

1.2 SITE PREPARATION

.1 Demolish and/or move the existing structures on the site of the future firing range.

.2 Excavate the existing fill, topsoil, debris and other unfit soil and carry them to the deposit zone indicated on the drawings.

.3 Fence off the access to the firing range.

1.3 FIRING RANGE

.1 Construct the exterior 50m firing range with 8 shooting stalls, without columns.

.2 Mark target lines (at 3 m, 5 m, 7 m, 10 m, 15 m, 20 m, 25 m, 35 m, 45 m and 50 m).

1.4 BULLET TRAP BUILDING

.1 Construct a bullet trap building according to the section 2.1 of « Range Design and Construction Guidelines » for a type II range.

.2 Supply and install a prefabricated bullet trap of the type « Total Containment Trap ™ » and a stop roof.

1.5 SHOOTING RAMP

.1 Construct a shooting stall shelter for the three (3) shooting positions: standing, kneeling, lying.

.2 Include loop-holes and anti-cartridge protections as well as all the necessary furniture.

.3 Use acoustic materials in the construction of the shooting ramp to attenuate noise from shooting.

.4 Provide a space for storage of the target holders.

.5 Install a system of radiant heating.

.6 Supply and installation of portable fire extinguishers.

.7 Properly light the arms inspection tables.

.8 Include target holders and targets.

1.6 PARTIAL OCCUPATION OF PLACES BY DEPARTMENTAL REPRESENTATIVE

.1 Establish a timetable in order to permit the occupancy of the premises by the Departmental Representative to the substantial completion of all the work covered by the contract.

1.7 MODIFICATIONS, ADDITIONS OR REPAIRS TO THE EXISTING BUILDING

.1 Perform the work with the least possible interference with the operation of the work area and the normal use of the premises. Make the necessary arrangements with the Departmental Representative to facilitate the execution of the work.

.2 For transportation of workers, materials and materials, use only designated path and location.

.3 Protect the designated facilities to the satisfaction of the Departmental Representative

.4 Assume equipment safety and responsibility for damage caused by works and overloads imposed on existing equipment.

1.8 TRAINING BUILDING

.1 Construct a training room for 12 persons.

.2 Provide storage space for equipment (goggles, bullet-proof vests, etc.).

.3 Include kitchen, janitor's room, two washrooms, a storage space for documents and equipment, and a mechanical room.

.4 Install mechanical systems (fire extinguishers, plumbing, ventilation/air conditioning, automatic regulation, lighting, etc.).

.5 Install heating system.

.6 Install electrical distribution system.

.7 Install fire-alarm system.

.8 Install intrusion alarm system.

.9 Provide telephone, Internet connection and wiring needed for audiovisual equipment.

1.9 EXTERIOR LAYOUT

.1 .Construct an asphalted parking space for 12 people.

.2 .Paving the path between the existing paved road and parking area, the training room and the shooting ramp.

.3 .Construct a graveled turn-around area for semi trucks.

.4 .Construct a road for access to the potable water pumping station.

.5 .Construct a concrete slab for installation of a propane tank facility near the shooting ramp.

.6 .Construct a concrete slab for installation of a waste container near the canvas shelter.

.7 Construct a concrete bases for installation of a sign along the access road and for the installation of two (2) flagpoles.

.8 Supply and installation of 3 signs, two flagpoles and three (3) flags: one Canadian flag, one green flag and one red flag.

1.10 CONNECTION TO EXISTING WATER AND DOMESTIC SEWER NETWORKS

.1 Provide all services necessary for the operation of facilities (electricity, drinking water, domestic and storm sewer) from the nearest point of the Establishment.

1.11 CONNECTION TO VARIOUS NETWORK

.1 Provide connections to various existing network located in the services building (building "Z") for the repatriation of fire alarm signals, intrusion alarm signals and telephone and computer network.

1.12 PRACTICE CELLS

.1 Construction of two (2) cells of concrete blocks near the shooting range to carry-out cell extraction and tear gas exercises.

1.13 ODOUR TREATMENT

.1 Set-up an odor treatment system for the nearby sewage pumping station. Include all the required equipment including an insulated shed to protect the tank. Providing a heating and lighting system inside. Electrical supply to the shed must be from the existing pumping station. The shed must be installed on a concrete slab to be built by the Contractor.

1.14 LOCATION

.1 The firing range is located at the Donnacona penal Institution located about 4 km east of the urban area of Donnacona, between Highway 138 and Highway 40. The address is 1538, Route 138 in Donnacona. The Institution, as well as the future firing range, is not visible from Highway 138, is surrounded by woodland. We can locate the site at the following center coordinates:

.1 46 41'25'' latitude north.

.2 71 41'30'' longitude east

.2 Specifically, the firing range will be located west of the penal institution (see diagram R-079407-001-C02-PN-REL).

.3 The range will be oriented northeast to limit glare of the shooters by the sun.

1.15 WORK SEQUENCE

.1 Execution of Work must address numerous technical, safety and environmental constraints.

.2 Contractor must consult Section 01 32 16.07 concerning construction progress schedule.

1.16 CONTRACTOR USE OF PREMISIS

.1 Use of the premises by Contractor is restricted to areas needed for execution of the work and access to allow for the uninterrupted use of the Donnacona penal institute, which is highly secured..

.2 Contractor is invited to consult Section 01 52 00 – Construction Facilities concerning use of premises and available terrain.

.3 Contractor must coordinate use of premises as directed by the Correctional Service Canada

.4 Contractor must take all safety measures and precautions needed to protect people, property and structures from accident or damage during work

1.17 EXISTING SERVICES

.1 Contractor is responsible for locating existing services on premises.

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

.3 Where work involves connecting into or adding to existing services, give 48 hours' notice for necessary interruption of electrical or mechanical service throughout course of Work. Minimize duration of interruptions. Carry out Work at times as directed by governing authorities with minimum disturbance to operator activities.

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

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

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

1.18 DOCUMENTS REQUIRED

.1 Maintain at job site one copy each document as follows:

.1 Contract Drawings

.2 Specifications

.3 Addenda

.4 Reviewed Shop Drawings

.5 List of Outstanding Shop Drawings

.6 Change Orders

.7 Other Modifications to Contract

.8 Field Test Reports

.9 Copy of Approved Work Schedule

.10 Health and Safety Plan and Other Safety Related Documents

.11 Other documents as specified

1.19 TYPE OF CONTRACT

.1 The work must be the subject of a lump-sum contract. A price schedule is attached as an example of a cost breakdown of this project.

PART 2 PRODUCT

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

PART 1 GENERAL

1.1 CONSTRUCTION CONSTRAINTS

.1 Execution of Work for Project must take into account several different constraints, specifically the following :

.1 Access based on climatic conditions;

.2 Environmental constraints;

1.2 EMERGENCIES

.1 Departmental Representative may interrupt Work at any time in emergency situations if, in their opinion, such interruption is necessary to protect life, structures or surrounding property or in any other event of force majeure, without possible claim on part of Contractor.

.2 Contractor takes Work constraints into account, as no compensation is given for extra hours or for Work performed outside normal Work hours (evenings, nights, weekends).

.3 During Work, Contractor ensures that Work site installation and storage of materials do not in any way compromise safety of equipment and users.

1.3 ACCESS TO WORK SITE AND CONTRACTOR SITE

.1 If Contractor causes damage to roads or facilities, Contractor bears entire responsibility to fix or replace them at own expense and to full satisfaction of Departmental Representative.

1.4 CLEANING AND UPKEEP OF PREMISES AND ENVIRONMENTAL PROTECTION

.1 Contractor must at all times keep premises free of all accumulation of materials, rubbish, waste and debris, and must do a full final clean-up, to satisfaction of Departmental Representative, during and at end of Work.

.2 Contractor is responsible for transporting rubbish, waste and debris to appropriate locations.

1.5 WINTER CONDITIONS

.1 Snow removal of construction zone is responsibility of Contractor. Contractor is also responsible for snow removal on all access ways outside existing roads.

.2 Departmental Representative is responsible for snow removal required up to the buildings where the work is being carried out

1.6 WORK ON WEEKENDS

.1 If Contractor intends to work on Saturdays, Sundays, statutory holidays or at night, written notification must be given to Departmental Representative at least 5 working days in advance.

1.7 INSPECTION OF PREMISES

.1 Contractor's decision to partially or completely commence Work implies acceptance of existing conditions as satisfying. If Contractor performs Work on defective surfaces or in unsatisfactory conditions, corrections or redoing of Work will be at Contractor's expense.

1.8 BLASTING

.1 No blasting of any kind is permitted.

1.9 ENVIRONMENTAL CONSTRAINTS

.1 Since the work takes place near a penal institution the contractor, subcontractors, suppliers and other persons to access the work site must go through the security process established by the Donnacona institution. All must submit to the "Security Requirement" in section 01 35 13.

.2 A safety investigation should be made on each of the workers on the site (contractor and subcontractor). Acceptance of workers is mandatory and the Institution is entitled to refuse access to anyone on the results of this investigation. For this verification, any person working on the site must complete the CPIC security form in the Appendix.

.3 A recording station will be established at the site entrance. The registration of all persons accessing the site is mandatory.

1.10 SURVEYING

.1 Contractor is responsible for implementing different structures according to Departmental Representative's plans. Contractor must report on existing material around perimeters of structures to validate attachment to existing material. Contractor must also notify Departmental Representative of any unexpected circumstances or anomalies detected and plan for time required for potential verification by Departmental Representative.

PART 2 PRODUCT

2.1 NOT US

.1 Not used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 GENERAL

.1 Site meetings are held every two (2) weeks.

.2 Meetings are led and facilitated by Departmental Representative.

.3 Contractor must present updated work schedule at every meeting.

.4 Meeting attendance

.1 Meeting attendance is mandatory for official representative of Contractor and Work site superintendents. If absent, Contractor must abide by decisions made during meeting and may not question points discussed and resolved.

PART 2 PRODUCT

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

PART 1 GENERAL

1.1 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar (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 work weeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in Project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout Project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project Work in relation to established milestones.

1.2 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 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit to Departmental Representative, within 10 working days of Award of Contract, Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

1.4 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.

.1 Award of Contract:

.2 Commencement of Work (mobilization): 1 week

.3 End of Work and provisional acceptance: 23 weeks

1.5 CONSTRAINTS

.1 When planning Work, Contractor must consider the following elements:

.1 Weather conditions;

.2 Availability and delivery times for the bullet trap, architectural elements such as doors and windows and other equipment required;

.3 Deadlines to complete the work.

.2 For more information, see Section 01 14 00 – Work Restrictions.

1.6 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule at every site meeting reflecting activity changes and completions, as well as activities in progress.

.2 Once a month, include as part of Project Schedule a 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.

1.7 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 PRODUCT

Not used.

PART 3 EXECUTION

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 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.

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

.6 Verify field measurements and affected adjacent Works are co-ordinated.

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

.8 The fact that the documents and samples submitted are reviewed by the Departmental Representative does not release the Contractor from his responsibility to transmit documents meeting the requirements of the contract documents.

.9 Keep one (1) reviewed copy of each submission on site.

.10 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 document;
- .5 Other pertinent data.

1.2 REQUIRED CONTRACTOR DOCUMENTS

.1 List of documents required from Contractor over course of Work is found in Appendix A. This list is not restrictive.

.2 Contractor must also consult following sections:

- .1 26 05 00 Electrical – Common Work Results for Electrical
- .2 26 05 00, Appendix A Required Contractor Documents
- .3 26 05 00, Appendix B Shop Drawings – Presentation Data
- .4 26 05 00, Appendix C Certificate of Compliance (End of Work)

.5 26 05 00, Appendix D Record of Shop Drawings

1.3 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit to Departmental Representative documents required by organization with jurisdiction over workers' compensation.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "Shop Drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Quality: provide original Shop Drawings by email in PDF format. Shop Drawings will not be accepted by fax for reasons of clarity.

.3 Submit drawings stamped and signed by professional engineer registered or licensed in Quebec.

.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 Adjustments made to Shop Drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Accompany submittals with presentation data (see Appendix B) summarizing following information:

.1 Date and revision dates;

.2 Project title and number;

.3 Name and address of Contractor, subcontractor, supplier and manufacturer;

.4 Identification and quantity of each Shop Drawing, Product Data and Sample;

.5 Other pertinent data.

.7 Contractor will be responsible for reproducing Shop Drawing presentation data and Shop Drawings in sufficient quantities for all subcontractors and suppliers, and for providing an additional copy to Departmental Representative, an additional copy to Architect and additional copies for operating and maintenance manuals.

.8 Shop Drawings will be reviewed only if submitted according to described procedure.

.9 Before sending Shop Drawings to Departmental Representative for verification, Contractor must:

.1 Number each page;

.2 Point out all equipment and/or accessories included in Shop Drawings;

.3 Verify that Shop Drawings are in accordance with plans and specifications with regard to quality, characteristics and outline.

.10 Departmental Representative will have 10 working days from date of receipt of documents at their office to verify Shop Drawings.

.11 Verification of Shop Drawings by Departmental Representative is an intermediate quality control step and will not constitute a change order to Contract Documents.

.1 Departmental Representative will verify drawings submitted by Contractor only with regard to overall layout of equipment. Contractor's or supplier's responsibility for accuracy of documents or their compliance with Contract Documents and Work site conditions is not relieved by Engineer's review. Notes made by Departmental Representative on drawings are not restrictive.

.12 Following four (4)notes may be found on Departmental Representative's verification stamp:

.1 NO CORRECTION NOTED means Contractor may proceed according to drawing;

.2 MAKE INDICATED CORRECTIONS means Contractor may proceed according to drawing, taking into consideration notes added by Departmental Representative; copy of drawing becomes official copy, and Contractor is not required to resubmit drawing;

.3 RESUBMIT means information on drawing is incomplete or drawing is incomplete, illegible, etc., and information does not allow Departmental Representative to determine compliance with plans and specifications; in such case, Departmental Representative may indicate on drawing points that Contractor must specify or complete before resubmitting drawing;

.4 NOT ACCEPTED means drawing includes materials or structures that are not in compliance with plans and specifications; in such case, Contractor must provide Departmental Representative with another drawing as per requirements of plans and specifications.

.13 Make changes to Shop Drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.14 Submit 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.

.15 Keep one (1) reviewed copy of Shop Drawings and Appendix B, Shop Drawings – Presentation Data, on site, and make available at all times for reference purposes.

.16 Submit 1 electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental 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 accordance with specified requirements.

.2 Testing must have been within 3 years of date of Contract award for project.

.17 Submit one (1) electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project Contract complete with project name.

.18 Submit one (1) electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental 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.

.19 Submit one (1) electronic copy of manufacturer's field reports for requirements requested in specification Sections and as requested by Departmental Representative.

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

.21 Submit 1 electronic copy of operation and maintenance data for requirements requested in specification Sections and as requested by Engineer.

.22 Delete information not applicable to project.

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

.24 If, upon review by Departmental Representative, no errors or omissions are discovered in Shop Drawings 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 work may proceed.

.25 Review of Shop Drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.

.1 This review will not mean that Departmental Representative approves detailed design inherent in Shop Drawings, responsibility for which will remain with Contractor submitting same, and such review will not relieve Contractor of responsibility for errors or omissions in Shop Drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.5 SAMPLES

.1 Contractor must submit for Departmental Representative's approval manufacturer standardized Samples reasonably required by Departmental Representative. Label Samples with origin and intended use in Work, in accordance with requirements of Contract Documents.

.2 Contractor must provide specified Samples of complex or sized products or elements.

.3 Do not order, purchase or produce products or materials before receiving written approval of Samples required in specifications.

.4 Products and structures must be similar to approved Samples.

1.6 TESTING AND PROPORTIONING

.1 Contractor must provide test results and mix proportioning requested by Departmental Representative.

.2 In particular, no pouring of concrete or placement of pavement will be authorized before Contractor proves compliance of materials.

1.7 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic and hard copy of colour digital photography in fine resolution monthly with progress statement, as directed by Engineer.

.2 Project identification: name and number of project and date of exposure indicated.

1.8 AS-BUILT DRAWINGS

.1 Site Records

.1 Provide one (1) set of drawings and mark changes as Work progresses.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Keep drawings on site and make available for reference purposes and inspection.

.2 As-Built Drawings

.1 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW STRUCTURES AND SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.2 Submit drawings to Departmental Representative for approval and make corrections as directed.

.3 Submit completed reproducible as-built drawings with operating and maintenance manual.

.4 Submit one (1) copy of each as-built drawing and incorporate it into final report on testing, adjusting and balancing of systems and installations.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

PART 1 – REQUIRED DOCUMENTS AT START OF WORK SITE

.1 These requirements must be met prior to first application for payment.

.1 List of suppliers with addresses and contact persons

.2 List of machinery used

.3 List of hourly rates for labour and machinery

.4 List of staff assigned to project and their contact information

.5 Work schedule

.6 Safety program

.7 Opening of work site to CNESST

PART 2 - DOCUMENTS REQUIRED WHILE WORK IS IN PROGRESS AND UNTIL INTERIM ACCEPTANCE

.1 These requirements must be met prior to application for interim acceptance (prerequisite for acceptance) for acceptance with reservations.

.1 List of Shop Drawings

.2 Shop Drawings

.3 Test reports (ex. septic tanks leak testing)

.4 Manufacturer's instructions

.5 Factory testing and verification documentation

.6 *In situ* testing and verification program

.7 Documentation of testing

.8 Start-up and commissioning programs

.9 Operating manuals

.10 Manufacturer's manuals

.11 As-built plans

.12 Personnel training program

.13 Parts list

PART 3 - DOCUMENTS REQUIRED FOR FINAL ACCEPTANCE OF WORK

.1 These requirements must be met prior to final acceptance of Work.

.1 List of deficiencies 100 % remedied and initialed by Departmental Representative.

END OF APPENDIX A

GENERAL CONTRACTOR OR PROJECT MANAGER:	
Responsible person:	
Telephone: ( )	Email:

SPECIALTY CONTRACTOR: Address:	
Responsible person:	
Telephone: ( )	Email:

SPECIALTY (discipline):	
Shop drawing No.:	**No. of Pages:**
Deadline for delivery (after verification):	
DESCRIPTION OF SHOP DRAWING:	
Reference to the plan:	
Reference to the specifications: Section: Subsection: Page:	

DISTRIBUTOR: Address:	
Responsible person:	
Telephone: ( )	Fax: ( )
PRODUCT SUBMITTED:	**DRAWING ISSUED FOR:**

☐ As is ☐ Equivalent ☐ Substitution	☐ Verification ☐ Information ☐ Coordination ☐ Other:

REVISION	**DATE OF ISSUE**

NOTE:

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Verification of compliance

Nature and scope of the verification

☐ Compliance with plans and specifications
☐ Other:

This verification does not constitute a complete and detailed verification of the design.

☐ No correction noted
☐ Make the indicated corrections
☐ Correct and resubmit
☐ Not accepted

Signature ☐ Engineer ☐ Other _____ Date _____

Name _____ OIQ member No _____

The verification of this document is restricted to the indicated nature and scope. It does not release the person or business that prepared it from any obligations of any kind

PART 1 GENERAL

1.1 PURPOSE

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

1.2 DEFINITIONS

.1 "Contraband" means:

.1 an intoxicant, including alcoholic beverages, drugs and narcotics,

.2 a weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization,

.3 an explosive or a bomb or a component thereof,

.4 currency over any applicable prescribed limit 25.00 $, and

.5 any item not described in paragraphs (1) to (4) that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization

.2 “Unauthorized Smoking Items” means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing or snuffing tobacco, cigarette making machines, matches and lighters.

.3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.

.4 "CSC" means Correctional Service Canada.

.5 "Director" means Director or Warden of the Institution as applicable or their representative.

.6 "Construction employees" means persons working for the general contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.

.7 “Departmental Representative” means the Public Works and Government Services Canada (PWGSC) or the Correctional Service Canada (CSC) project manager depending on project.

.8 "Perimeter" means the fenced or walled area of the institution that restrains the movement of the inmates.

.9 "Construction zone" means the area as shown on the contract drawings where the contractor will be allowed to work. This area may or may not be isolated from the security area of the institution.

1.3 PRELIMINARY PROCEEDINGS

.1 Prior to the commencement of work, the contractor shall meet with the Director to:

.1 Discuss the nature and extent of all activities involved in the Project.

.2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.

.2 The contractor will:

.1 Ensure that all construction employees are aware of the CSC security requirements.

.2 Ensure that a copy of the CSC security requirements is always prominently on display at the job site.

.3 Co-operate with institutional personnel in ensuring that security requirements are observed by all construction employees.

1.4 CONSTRUCTION EMPLOYEES

.1 Submit to the Director a list of the names with date of birth of all construction employees to be employed on the construction site and a security clearance form for each employee.

.2 Allow two (2) weeks for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at the institution where the project is taking place.

.3 The Director may require that facial photographs may be taken of construction employees and these photographs may be displayed at appropriate locations in the institution or in an electronic database for identification purposes. The Director may require that Photo ID cards be provided for all construction workers. ID cards will then be left at the designated entrance to be picked upon arrival at the institution and shall be displayed prominently on the construction employees clothing at all time while employees are at the institution.

.4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.

.5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:

.1 appear to be under the influence of alcohol, drugs or narcotics.

.2 behave in an unusual or disorderly manner.

.3 are in possession of contraband.

1.5 VEHICULES

.1 All unattended vehicles on CSC property shall have windows closed; doors and trunks shall be locked and keys removed. The keys shall be securely in the possession of the owner or an employee of the company that owns the vehicle.

.2 The director may limit at any time the number and type of vehicles allowed within the Institution.

.3 Drivers of delivery vehicles for material required by the project shall not require security clearances but must remain with their vehicle the entire time that the vehicle is in the Institution. The director may require that these vehicles be escorted by Institutional staff or Commissionaires while in the Institution.

.4 If the Director permits trailers to be left inside the secure perimeter of the Institution, these trailer doors will be locked at all times. All windows will be securely locked when left unoccupied. All trailer windows shall be covered with expanded metal mesh. All storage trailers inside and outside the perimeter must be locked when not in use.

1.6 PARKING

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

1.7 SHIPMENTS

.1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the institution's own shipments. The contractor must have his own employees on site to receive any deliveries or shipments. CSC staff will NOT accept receipt of deliveries or shipments of any material equipment or tools for the contractor.

1.8 TELEPHONES

.1 There will be no installation of telephones, Facsimile machines and computers with Internet connections permitted within the perimeter of the institution unless prior approval of the Director is received.

.2 The Director will ensure that approved telephones, Facsimile machine and computers with Internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an Internet connection to unauthorized personnel.

.3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, Smart Phones, telephone used as 2-way radios, are not permitted within the perimeter of the Institution unless approved by the Director. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.

.4 The Director may approve but limit the use of two way radios.

1.9 WORK HOURS

.1 Work hours within the Institution are: Monday to Friday 07:30 to 16:00

.2 Work will not be permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice may be waved by the Director.

1.10 OVERTIME WORK

.1 No overtime work will be allowed without permission of the Director. Give a minimum forty-eight (48) hours advance notice when overtime work on the construction project is necessary and approved. If overtime work is required because of an emergency such the completion of a concrete pour or work to make the construction safe and secure, the contractor shall advise the Director as soon as this condition is known and follow the directions given by the Director. Costs to Canada for such events may be attributed to the contractor.

.2 When overtime work, weekend statutory holiday work is required and approved by the Director, extra staff members may be posted by the Director or his designate, to maintain the security surveillance. The actual cost of this extra staff may be attributed to the contractor.

1.11 TOOLS AND EQUIPMENT

.1 Maintain on site a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required.

.2 Throughout the construction project maintain an up-to-date list of tools and equipment specified above.

.3 Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.

.4 Store all tools and equipment in approved secure locations.

.5 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the contractor.

.6 Scaffolding shall be secured and locked when not erected and when erected, shall be secured in a manner agreed upon with the director.

.7 All missing or lost tools or equipment shall be reported immediately to the Director.

.8 The Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:

.1 At the beginning and conclusion of every construction project.

.2 Weekly, when the construction project extends longer than a one week period.

.9 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day.

.10 If propane or natural gas is used for heating the construction, the institution will require that an employee of the contractor supervise the construction site during non-working hours.

1.12 KEYS

.1 Security Hardware Keys

.1 The Contractor shall arrange with the security hardware supplier/installer to have the keys for the security hardware to be delivered directly to Institution, specifically the Security Maintenance Officer (SMO).

.2 The SMO will provide a receipt to the Contractor for security hardware keys.

.3 The contractor will provide a copy of the above-mentioned receipt to the Departmental Representative.

.2 Other Keys

.1 The contractor will use standard construction cylinders for locks for his use during the construction period.

.2 The contractor will issue instructions to his employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.

.3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:

.1 Prepare an operational keying schedule;

.2 accept the operational keys and cylinders directly from the lock manufacturer;

.3 Arrange for removal and return of the construction cores and install the operational core in all locks.

.4 Upon putting operational security keys into use, the CSC construction escort shall obtain these keys as they are required from the SMO and open doors as required by the Contractor. The Contractor shall issue instructions to his employees advising them that all security keys shall always remain with the CSC construction escort.

1.13 SECURITY HARDWARE

.1 Turn over all removed security hardware to the Director of the Institution for disposal or for safekeeping until required for re-installation.

1.14 PRESCRIPTION DRUGS

.1 Employees of the contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one day supply only into the Institution.

1.15 SMOKING RESTRICTIONS

.1 Contractors and construction employees are not permitted to smoke inside correctional facilities or outdoors within the perimeter of a correctional facility and must not possess unauthorized smoking items within the perimeter of a correctional facility.

.2 Contractors and construction employees who are in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist, will be directed to leave the institution.

.3 Smoking is only permitted outside the perimeter of a correctional facility in an area to be designated by the Director.

1.16 CONTRABAND

.1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on institutional property.

.2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Director.

.3 Contractors should be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.

.4 Presence of arms and ammunition in vehicles of contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

1.17 SEARCHES

.1 All vehicles and persons entering institutional property may be subject to search.

.2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband or unauthorized items, he may order that person to be searched.

.3 All employees entering the Institution may be subject to screening of personal effects for traces of contraband drug residue.

1.18 ACCESS TO AND REMOVAL FROM INSTITUTIONAL PROPERTY

.1 Construction personnel and commercial vehicles will not be admitted to the institution after normal working hours, unless approved by the Director.

1.19 MOVEMENT OF VEHICLES

.1 Escorted commercial vehicles will be allowed to enter or leave the institution through the vehicle access gate during the following hours:

.1 08:00 to 11:15

.2 13:00 to 15:45

.2 Construction vehicles shall not leave the Institution until an inmate count is completed.

.3 The contractor shall advise the Director twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.

.4 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC staff or Commissionaires working under the authority of the Director.

.5 Commercial vehicles will only be allowed access to institutional property when their contents are certified by the Contractor or his representative as being strictly necessary to the execution of the construction project.

.6 Vehicles shall be refused access to institutional property if, in the opinion of the Director, they contain any article which may jeopardize the security of the institution.

.7 Private vehicles of construction employees will not be allowed within the security perimeter of medium or maximum security institutions without the authorization of the Director.

.8 With prior approval of the Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.

.9 With the approval of the Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another fixed object.

1.20 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY

.1 Subject to the requirements of good security, the Director will permit the Contractor and his employees as much freedom of action and movement as is possible.

.2 However, notwithstanding paragraph above, the Director may:

.1 Prohibit or restrict access to any part of the institution.

.2 Require that in certain areas of the institution, either during the entire construction project or at certain intervals, construction employees only be allowed access when escorted by a member of the CSC security staff or a commissionaire.

.3 During the lunch and coffee/health breaks, all construction employees will remain within the construction site. Construction employees are not permitted to eat in the officer's lounge or the dining room of the institution.

1.21 SURVEILLANCE AND INSPECTION

.1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.

.2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among construction employees and maintained throughout the construction project.

1.22 STOPPAGE OF WORK

.1 The director may order at any time that the contractor, his employees, sub-contractors and their employees to not enter or to leave the work site immediately due to a security situation occurring within the Institution. The contractor's site supervisor shall note the name of the CSC staff member giving this instruction, the time of the request and obey the order as quickly as possible.

.2 The contractor shall advise the Departmental Representative of this interruption of the work within 24 hours.

1.23 CONTACT WITH INMATES

.1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any construction employee doing any of the above will be removed from the site and his security clearance revoked.

.2 It is to be noted that cameras are not allowed on CSC property.

.3 Notwithstanding the above paragraph, if the director approves of the usage of cameras, it is strictly forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this contract.

1.24 COMPLETION OF CONSTRUCTION PROJECT

.1 Upon completion of the construction project or, when applicable, the takeover of a facility, the Contractor shall remove all remaining construction material, tools and equipment that are not specified to remain in the Institution as part of the construction contract.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not used

PART 3 EXECUTION

3.1 NOT USED

.1 Not used

END OF SECTION

PART 1 GENERAL

GENERAL NOTE: in this section the term "site" includes all the facilities located at the site where the work is taking place (construction site, buildings, access, infrastructure, parkings, bays, etc.).

1.1 RELATED REQUIREMENTS

.1 N/A

1.2 REFERENCES

.1 Province of Québec

.1 Loi sur la santé et la sécurité du travail L.R.Q., c. S-2.1 (Act respecting occupational health and safety).

.2 Code de sécurité pour les travaux de construction L.R.Q., c. S-2.1, r.4 (Safety code for the construction industry).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit to Departmental Representative the site-specific prevention program, as outlined in the article "GENERAL REQUIREMENTS", at least 10 days prior to the start of work.

.3 Departmental Representative will review Contractor's site-specific prevention program and provide comments to Contractor within 10 days after receipt of the document. Revise plan as appropriate and resubmit to Departmental Representative within 5 days after receipt of comments from Departmental Representative. Departmental Representative reserves the right not to authorize the start of work on the construction site as long as the content of the prevention program is not satisfactory. The Contactor shall then update his prevention program and resubmit it to the Departmental Representative if the scope of work changes or if the working methods of the Contractor differ from his initial plans or for any other applicable new condition.

.4 Departmental Representative's review of Contractor's site-specific prevention program should not be construed as approval of the program and does not reduce the Contractor's overall responsibility for construction Health and Safety during the work.

.5 Submit copies of Contractor's authorized representative's construction site health and safety inspection reports to Departmental Representative, once a week.

.6 Submit to Departmental Representative within 24 hours a copy of any inspection report, correction notice or recommendation issued by Federal, Provincial and Territorial health and safety inspectors.

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

The investigation report shall contain at least the following:

.1 date, time and place of accident;

.2 name of sub-contractor involved in the accident;

.3 number of persons involved and condition of wounded;

.4 witness identification;

.5 detailed description of tasks performed at the time of the accident;

.6 equipment being used to accomplish the tasks performed at the time of the accident;

.7 corrective measures taken immediately after the accident;

.8 causes of the accident;

.9 preventive measures that have been put in place to prevent a similar accident.

.8 Submit to Departmental Representative WHMIS MSDS – Material Safety Data Sheets in accordance with Section 01 33 00 – Submittals. Contractor must also keep one copy of these documents on the construction site.

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

.10 Submit to Departmental Representative an on-site Emergency Response Plan at the same time as the prevention program. The Emergency Response plan must contain the elements listed in the article "GENERAL REQUIREMENTS" of this section.

.11 Submit to Departmental Representative copies of all training certificates required for the application of the prevention program, in particular (if applicable) for the following:

.1 first aid in the workplace and cardiopulmonary resuscitation;

.2 work likely to release asbestos dust (mandatory for all work where asbestos is present);

.3 work in confined spaces (mandatory for all work in confined spaces);

.4 lockout-tagout procedures (mandatory for all work requiring lockout);

.5 safely operating forklift trucks (mandatory for all forklift usage);

.6 safely operating elevating work platforms (mandatory for the use of all elevating platforms);

.7 any other requirement of Regulations or the safety program.

In addition, the certifications of the Cours de santé et sécurité générale pour les chantiers de construction (General Health and Safety Training for Construction Sites) shall be available on demand on the construction site.

.12 Engineer's plans and certificates of compliance: Contractor must submit to the Departmental Representative and to the Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST) a copy signed and sealed by engineer of all plans and certificates of compliance required pursuant to the Code de sécurité pour les travaux de construction (S-2.1, r.4) (Safety code for the construction industry) or by any other legislation or regulation or by any other clause in the specifications or in the contract. The Contractor must also submit a certificate of conformity signed by an engineer once the facility for which these plans were prepared has been completed and before a person uses the facility. A copy of these documents must be available on site at all times.

1.4 FILING OF NOTICE OF CONSTRUCTION SITE OPENING

.1 Notice of construction site opening shall be submitted to the CNESST before work begins. A copy of such notice and acknowledgment of receipt from the CNESST shall be submitted to Departmental Representative.

.2 At the completion of all the work, a notice of construction site closing shall be submitted to the CNESST, with a copy to Departmental Representative.

.3 The Contractor shall assume the role of being the Principal Contractor in the limits of the construction site and elsewhere where he must execute work within the framework of this project. The Contractor shall recognize the responsibility of being the Principal Contractor of the project and identify himself as such in the notice of the construction site opening he provides to the CNESST.

.4 The Contractor shall accept to divide and identify the construction site adequately in order to define time and space at all times throughout the course of the project.

1.5 HAZARD ASSESSMENT

.1 The contractor must perform construction site specific safety hazard assessment related to project.

1.6 MEETINGS

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

.2 Contractor's representative with decision power must attend any meetings at which construction site safety and health issues are to be discussed.

.3 If it is anticipated that there will be 25 workers or more on the construction site at any given time, the Contractor shall set up a worksite committee and hold meetings as required by the *Code de sécurité pour les travaux de construction* (S-2.1, r. 4) (Safety code for the construction industry). A copy of the minutes of the meetings of the committee shall be provided to the Departmental Representative no later than 5 days after the committee meeting.

1.7 REGULATORY REQUIREMENTS

.1 Do the Work in accordance with Section 01 41 00 – Regulatory Requirements.

.2 Comply with all legislation, regulations and standards applicable to the construction site and its related activities.

.3 Comply with specified standards and regulations to ensure safe operations on a site containing hazardous or toxic materials.

.4 Always use the most recent version of the standards specified in the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry), notwithstanding the date indicated in that *Code*.

1.8 COMPLIANCE REQUIREMENTS

.1 Comply with the *Loi sur la santé et la sécurité du travail* (L.R.Q., c. S-2.1) (Act Respecting Occupational Health and Safety) and the *Code de sécurité pour les travaux de construction* (S-2.1, r. 4.) (Safety code for the construction industry) in addition to respecting all the requirements of this specification manual.

1.9 RESPONSIBILITIES

.1 The Contractor must acknowledge and assume all the tasks and obligations which customarily devolve upon a principal Contractor under the terms of the *Loi sur la santé et la sécurité du travail* (L.R.Q., ch. S-2.1) (Act Respecting Occupational Health and Safety) and the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry).

.2 The Contractor must be responsible for health and safety of persons on construction site, safety of property on construction site and for the protection of persons adjacent to construction site and the environment to the extent that they may be affected by conduct of the work.

.3 No matter the size or location of the construction site, the Contractor must clearly define the limits of the construction site by physical means and respect all specific regulation requirements applicable in this regard. The means chosen to define the limits of the construction site must be submitted to the Departmental Representative.

.4 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific prevention Plan.

1.10 WORK PERFORMED BY EXTERNAL CONTRACTORS

.1 The Contractor must take the necessary steps to protect the health and safety of external contractors that have no contractual link with the Contractor but have been mandated by the Departmental Representative to perform certain work. In return, these external contractors are obligated to submit to the authority of the Contractor (Principal Contractor). A subordination agreement must be signed by the Contractor and by each external contractor to this effect and submitted to the Departmental Representative prior to the start of the work of each contractor (see the wording in the article HEALTH AND SAFETY SUBORDINATION AGREEMENT)

1.11 GENERAL REQUIREMENTS

.1 Before undertaking the work, prepare a site-specific prevention program based on the hazards identified according to the article "HAZARD ASSESSMENT" and the article "RISKS INHERENT TO THE WORKSITE" in this section. Apply this program in its totality from the start of the project until demobilization of all personnel from the construction site. The prevention program shall take into consideration the specific characteristics of the project and cover all the work to be executed on the construction site.

The safety program must include at least the following:

.1 company safety and health policy;

.2 description of the stages of the work;

.3 total costs, schedule and projected workforce curves;

.4 flow chart of safety and health responsibilities;

.5 physical and material layout of the construction site;

.6 risk assessment for each stage of the work, including preventive measures and the procedures for applying them;

.7 identification of the preventive measures relative to the specific risks inherent to the worksite indicated in the article "RISKS INHERENT TO THE WORKSITE";

.8 identification of preventive measures for health and safety of employees and / or public works site as indicated in the article "SPECIFIC REQUIREMENTS FOR THE 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 safety program;

.12 construction site inspection cheklist based on the preventive measures;

.13 emergency response plan which shall contain at least the following:

.1 construction site evacuation procedures;

.2 identification of resources (police, firefighters, ambulance services, etc.);

.3 identification of persons in charge of the construction site;

.4 identification of the first-aid attendants;

.5 communication organizational chart (including the person responsible for the site and the Departmental Representative);

.6 training required for those responsible for applying the plan;

.7 any other information needed, in the light of the construction site's characteristics.

If available the Departmental Representative will provide the evacuation procedures to the Contractor who shall then coordinate the construction site procedure with that of the site and submit it to the Departmental Representative.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted in the prevention program and may request resubmission with correction of deficiencies or concerns.

.3 In addition to the prevention program, during the course of the work the Contractor shall elaborate and submit to the Departmental Representative specific written procedures for any work having a high risk factor of accident (for example: demolition procedures, specific installation procedures, hoisting plan, procedures for entering a confined space, procedures for interrupting electric power, etc.) or at the request of the Departmental Representative.

.4 The Contractor shall plan and organize work so as to eliminate the danger at source or ensure collective protection, thereby minimizing the use of personal protective equipment.

.5 Equipment, tools and protective gear which cannot be installed, fitted or used without compromising the health or safety of workers or the public shall be deemed inadequate for the work to be executed.

.6 All mechanical equipment (for example, but not limited to: hoisting devices for persons or materials, excavators, concrete pumps, concrete saws) shall be inspected before delivery to the construction site. Before using any mechanical equipment, the Contractor shall obtain a certificate of compliance signed by a qualified mechanic dated less than a week prior to the arrival of each piece of equipment on the construction site; the certificate shall remain on the construction site and transmitted to the Departmental Representative on demand.

.7 Ensure all inspections (daily, periodic, annual, etc.) for the hoisting devices for persons or materials required by the current standards are carried out and be able to provide a copy of the inspection certificates to the Departmental Representative on demand.

.8 The Contractor shall perform a visual inspection of its equipment and maintain an up-to-date record of such inspections. He must also write inspection reports to be provided to the Departmental Representative at his request. The Departmental Representative can at all times, if he suspects a malfunction or the risk of an accident, order the immediate stop of any piece of equipment and require an inspection by a specialist of his choice.

.9 The Departmental Representative must be consulted for the location of storing gas cylinders and tanks on the construction site.

1.12 RISKS INHERENT TO THE WORKSITE

.1 In addition to the risks related to the tasks to be carried out, personnel responsible for the execution of the work on the construction site will be exposed to the following risks, inherent to the area where the work will be executed. Without limiting his prevention program to these, the Contractor shall also include these elements in his program.

At the worksite there is the presence of the following:

- .1 materials containing asbestos;
- .2 materials containing lead;
- .3 moulds;
- .4 overhead power lines;
- .5 underground services (electric, gas, vapour, water system, etc.).

.2 The Contractor shall process to a risk assessment of the site to validate this information and see if other risks are present on the site. He must include in its prevention program all risks that have been identified.

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

.1 The worksite is occupied by employees and/or the public during the following times: [specify the times]. The Contractor shall consider the following specific requirements for the protection of employees and / or the public:

- .1 Risk related to Patrols entering construction site.
- .2 Risks related to crane and boom truck.
- .3 Risks related to fall safety
- .4 Risks related to forest fire
- .5 Risks related to dust creation during work

These requirements must be included in the Contractor's site-specific safety plan as well as any other measures provided by the Contractor to protect the health and safety of employees and / or the public on the site.

1.14 UNFORESEEN HAZARDS

.1 Whenever a source of danger not defined in the specifications or identified in the preliminary construction site inspection arises as a result of or in the course of the work, the Contractor must immediately suspend work, notify the person responsible for health and safety on the construction site, take appropriate temporary measures to protect the workers and the public and notify Departmental Representative, both verbally and in writing. Then the Contractor must do the necessary modifications to the prevention program or apply the security measures required in order to resume work.

1.15 PERSON IN CHARGE OF HEALTH AND SAFETY

.1 If the construction site meets the requirements of article 2.5.3 of the Code the sécurité pour les travaux de construction (S-2.1, r.4) (Safety code for the construction industry), the Contractor needs to hire a competent person authorized as a safety officer and appoint this person full time from the beginning of the work. The safety officer's certificate shall be submitted to the Departmental representative before the start of the work.

.2 When the hiring of a safety officer is not required or if this person is hired by the Departmental Representative, the Contractor shall designate a competent person to supervise and take responsibility for health and safety, no matter the size of the construction site or how many workers are present at the workplace. This person shall be on construction site at all times and be able to take all necessary measures to ensure the health and safety of persons and property at or in the immediate vicinity of the construction site and likely to be affected by any of the work. The Contractor shall submit the name of this person to the Departmental Representative before the start of work.

1.16 POSTING OF DOCUMENTS

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

.2 At a minimum, the following information and documents must be posted in a location readily accessible to all workers:

- .1 notice of construction site opening;
- .2 identification of principal Contractor;
- .3 company OSH policy;
- .4 site-specific prevention program;
- .5 emergency plan;
- .6 minutes of worksite committee meetings;
- .7 names of worksite committee representatives;
- .8 names of the first-aid attendants;
- .9 action reports and correction notices issued by the CNESST.

1.17 INSPECTION OF THE CONSTRUCTION SITE AND CORRECTION OF NON-COMPLIANCES

.1 Inspect the construction site and complete the construction site inspection checklist and submit it to the Departmental Representative in accordance with the article "ACTION AND INFORMATIONAL SUBMITTALS" in this section.

.2 Immediately take all necessary measures to correct any situations deemed non-compliant during the inspections mentioned in the previous paragraph or noticed by the authorities having jurisdiction or the Departmental Representative or his agent.

.3 Submit to Departmental Representative written confirmation of all measures taken to correct the situation in case of non-compliance in matters pertaining to health and safety.

.4 The Contractor shall give the safety officer or, where there is no safety officer, the person assigned to safety and health responsibilities, full authority to order cessation and resuming of work as and when deemed necessary or desirable in the interests of safety and health. This person should always act so that the safety and health of the public and construction site workers and environmental protection take precedence over cost and scheduling considerations.

.5 The Departmental Representative or his agent may order cessation of work if the Contractor does not make the corrections needed to conditions deemed non-compliant in matters pertaining to health and safety. Without limiting the scope of the preceding articles, the Departmental Representative may order cessation of work if, in his view, there is any hazard or threat to the safety or health of construction site personnel or the public or to the environment.

1.18 PREVENTION OF VIOLENCE

.1 Health and safety management of Public Works and Government Services Canada construction sites includes the implementation of measures designed to protect the psychological health of all persons who access the construction site where the work is taking place. Consequently, in addition to physical violence, verbal abuse, intimidation and harassment are not tolerated on the construction site. Any person who demonstrates such actions or behaviors will receive a warning and/or could be definitely expelled from the construction site by the Departmental Representative.

1.19 BLASTING

.1 Blasting or other use of explosives is not permitted.

1.20 POWDER ACTUATED DEVICE

.1 Use powder actuated devices is not permitted.

1.21 USE OF PUBLIC ROADS

.1 Where it is necessary to encroach on a public road for operational reasons or to ensure the security of the workers, the occupants or the public (for example: the use of scaffolding, cranes, excavation work, etc.), the Contractor shall obtain at his own expense any authorizations and permits required by the competent authority.

.2 The Contractor shall install at his own expense any signage, barricades or other devices needed to ensure the safety and security of the public and the Contractor's own facilities.

1.22 LOCKOUT-TAGOUT

.1 For all work on electrically or otherwise energized equipment, the Contractor shall draw up and implement a general lockout-tagout procedure and submit it to the Departmental Representative.

.2 Supervisors and all workers concerned by work requiring lockout-tagout must have received training on lockout-tagout procedures by a recognized organization; Contractor shall submit training certificates to the Departmental Representative.

.3 Before starting the lockout-tagout procedure of a piece of equipment on an occupied site, Contractor must coordinate his work with the representative of the site if the interruption of the power sources can have an impact on the operations of the site or on its occupants.

.4 Contractor must designate a qualified person as responsible for the lockout-tagout and must make sure that that person prepares a lockout-tagout data sheet for each piece of equipment involved. The lockout-tagout data sheet must be submitted to the Departmental Representative at least 48 hours before the beginning of the work. The Departmental Representative will review the data sheet with the representative of the site if the work takes place in an existing building. The data sheets for lockout-tagout must contain at least the following information:

- .1 description of work to carry out;
- .2 identification, description and location of the circuit and/or equipment to lockout-tagout;
- .3 identification of energy sources that feeds the equipment;
- .4 identification of each cutout point;
- .5 sequence of lockout-tagout and the release of residual energy as well as the sequence of unlocking;

.6 list of material needed for the lockout-tagout;

.7 method of verification of zero energy implementation;

.8 name and signature of the person who prepared the data sheet.

.5 When required by the Departmental Representative, Contractor must record all this information on the site's representative form.

.6 At the time of lockout-tagout, the person responsible must date the data sheet and ensure that each worker involved in the work on the circuit/equipment to lockout-tagout puts his name on the data sheet and signs it.

1.23 ELECTRICAL WORK

.1 Contractor shall ensure that all electrical work is executed by qualified employees in accordance with the provincial regulation respecting vocational training and qualification.

.2 Contractor shall respect all requirements of standard CSA Z462 *Workplace Electrical Safety Standard*.

.3 No repairs or alterations shall be carried out on any live equipment except where complete disconnection of the equipment is not feasible.

.4 Contractor shall respect all requirements prescribed in paragraph "LOCKOUT-TAGOUT" in this section.

.5 Contractor shall advise in writing the Departmental Representative of all the work that cannot be done with de-energized equipment and obtain his authorization. Contractor shall demonstrate to the Departmental Representative that it is impossible to do the work with de-energized equipment and provide all the information necessary to request and obtain an energized electrical work permit (indicate working procedures, arc flash hazard analysis, protective perimeter, protective equipment, etc.) before the beginning of the work, excluding for the exceptions indicated in standard CSA Z462 Workplace electrical safety.

.6 The energized electrical work permit on must contain at least the following elements:

.1 description of the circuit and equipment and its location;

.2 justification for having to do the work in an energized condition;

.3 description of safe work practices to apply;

.4 results of the shock hazard analysis;

.5 limit of the protective perimeter against electric shocks;

.6 results of the arc flash hazard analysis;

.7 description of the arc flash protection boundary;

.8 description of the personal protective equipment required;

.9 description of the means to limit access to unqualified persons;

.10 proof that an information session has been carried out;

.11 approval signature of the energized electrical work (by a person in authority or by the owner).

.7 If for the operational requirements of the occupants of the site the representative of the site requires that the Contractor performs work in an energized condition, the Contractor shall obtain all the information required to request and obtain obtain an energized electrical work permit (indicate working procedures, arc flash hazard analysis, protective perimeter, protective equipment, etc.) and have it signed by the representative of the site assigned by the Departmental Representative before the beginning of the work.

1.24 FUNGAL CONTAMINATION

.1 It is not anticipated that the work covered by the present specifications involves the manipulation of materials contaminated by mould; however, if the Contractor or the Departmental Representative or his agent discover materials which are susceptible of being contaminated by mould, the Contractor must immediately stop the work and advise the Departmental Representative. If more investigation demonstrates that the materials do contain mould, the Contractor shall comply with the following requirements.

.2 Prior to starting any work where workers are likely to be in contact with materials contaminated by mould, the Contractor must:

.1 Provide a written procedure for the work which respects all the requirements of the *Code the sécurité pour les travaux de construction* S-2.1, r- 4, (Safety code for the construction industry), as well as the requirements indicated in the document "*Mould Guidelines for the Canadian Construction Industry*" published by the Canadian Construction Association (http://www.cca-acc.com/documents/electronic/cca82/cca82.pdf).

.2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

1.25 LEAD BASE PAINT REMOVAL

.1 Prior to all work where workers are likely to handle materials containing lead-base paint or other substances containing lead, the Contractor must:

.1 Provide a written procedure for the work which respects all the requirements of the Code de sécurité pour les travaux de construction S-2.1, r4, (Safety code for the construction industry), as well as the requirements indicated in the document "Guideline for Lead on Construction Projects" published by the Ontario Ministry of Labour (http://www.labour.gov.on.ca/english/hs/pdf/gl_lead.pdf). If there is a discrepancy between the Québec regulation and the Ontario document, the most stringent requirement shall apply.

.2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

1.26 EXPOSURE TO ANIMAL'S FECAL DROPPINGS

.1 Prior to all work where workers are likely to come in contact with materials contaminated by animal's fecal droppings, the Contractor must:

.1 Provide a written procedure for the work which respects all the requirements of the Code the sécurité pour les travaux de construction S-2.1, r4, (Safety code for the construction industry), as well as the requirements indicated in the document "Des fientes de pigeons dans votre lieu de travail: méfiez-vous" (Pigeon droppings in your workplace: Beware" published by the CNESST (http://www.csst.qc.ca/publications/100/Documents/DC100_1331_1web2.pdf)

.2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

1.27 FALL PROTECTION

.1 Plan and organize work so as to eliminate the risk of fall at the source or ensure collective protection, thereby minimizing the use of personal protective equipment. When personal fall protection is required, workers must use a safety harness that complies with CSA standard CAN/CSA Z-259.10 M90. A safety belt must not be used as fall protection.

.2 Every person using an elevating platform (scissors, telescopic mast, articulated mast, rotative mast, etc.) must have a training regarding this equipment.

.3 The use of a safety harness is mandatory for all elevating platforms with telescopic, articulate or rotative mast.

.4 Define the limits of the danger zone around each elevating platform.

.5 All openings in a floor or roof must be surrounded by a guardrail or provided with a cover fixed to the floor able to withstand the loads to which it could be exposed, regardless of the size of the opening and the height of the fall it represents.

.6 Everyone who works within two metres from a fall hazard of three metres or more must use a safety harness in accordance with the requirements of the regulation, unless there is a guardrail or another device offering an equivalent safety.

.7 Despite the requirements of the regulation, the Departmental Representative may require the installation of a guardrail or the use of a safety harness for specific situations presenting a risk of fall less than three metres.

1.28 SCAFFOLDINGS

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

.1 Foundation

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

.2 Assembly, bracing and mooring

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

.3 Protection against falls during assembly

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

.4 Platforms

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

.5 Guardrails

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

.6 Access

1. The Contractor shall ensure that access to the scaffoldings does not compromise worker safety.
2. Where the platforms of the scaffoldings are comprised of planks, ladders shall be installed in such a way that planks extending beyond the platform do not block the way up or down.
3. Notwithstanding the provisions of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), stairs shall be installed on all scaffoldings that have six or more rows of uprights or is six sections (or nine metres) high or higher.

.7 Protection of the public and occupants

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

.8 Engineering plans

1. In addition to those required by the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), the Departmental

Representative reserves the right to require engineering plans for other types or configurations of scaffoldings.

2. A plan signed and sealed by an engineer is required for all scaffoldings that will be covered with a canvas, a tarpaulin or any other material that has wind resistance.
3. A certificate of conformity signed by an engineer is required in all cases where an engineering plan is required ~~for the installation~~ and this, before anybody uses the facility. A copy of these documents must be available on the construction site at all times.

1.29 CONFINED SPACES

.1 In addition to the requirements of the provincial regulation applicable to confined spaces, the Contractor must respect the requirements in the following paragraphs.

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

Information on confined spaces existing on the construction site

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

.1 Training building above ceiling space

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

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

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

Training

.1 All persons having access to a confined space, including the person in charge and the watcher of the confined space shall have completed training on entry in confined spaces.

.2 All persons who have to use supplied-air respirator to access the confined spaces shall have completed training on the use of these apparatus.

.3 All persons identified as rescuers for confined spaces shall have completed training on confined spaces rescue.

.4 Each training required in the preceding paragraphs must be provided by a firm specialized in health and safety or in confined spaces.

.5 The training certificates of the persons mentioned above must be submitted to the Departmental representative before the beginning of the work in confined spaces.

Risk assessment of confined spaces

.1 For each of the confined spaces listed at the beginning of this article, the Contractor must obtain the necessary information from the site representative and proceed to the assessment of the risk inherent to each confined space and relative to:

1. the prevailing internal atmosphere, namely the concentration of oxygen, inflammable gases and vapours, combustible or explosive dusts as well as the categories of contaminants likely to be present in this enclosed area or nearby;
2. the fact that the natural or mechanical ventilation is insufficient
3. The materials that are present there and that can cause the worker to sink, to be buried or to drown, such as sand, grain or a liquid;
4. the interior configuration;
5. pipes and conduits penetrating the confined space;
6. energies such as electricity, moving mechanical parts, heat stress, noise and hydraulic energy;
7. ignition sources such as open flames, lighting, welding and cutting, static electricity or sparks;
8. all other particular circumstances, such as the presence of vermin, rodents or insects.

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

1. location of the confined space;
2. description of the confined space;
3. dimensions of the confined space;
4. number, location and dimensions of the openings;
5. content of the confined space (material, substances, etc.)
6. date of the assessment;
7. name and signature of the person who conducted the assessment and the name of his employer.

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

Confined spaces entry permits

.1 At least 5 days before the scheduled date for the work in a confined space the Contractor must submit for analysis to the Departmental representative a copy of each entry permit specific to the confined spaces where he must access. The entry permits must be completed by the person in charge of the health and safety of the work in confined spaces, and must contain the following information as a minimum:

1. description of the work that will be carried out and the method of work, including the materials and tools needed to do this work;
2. description of the risks and corresponding preventive measures according to the risk assessment inherent to the confined space done previously and according to the work to be carried out;

3. safety equipment that will be used to control the risks of confined spaces (e.g.: fan, gas detectors, local exhaust ventilation, personal protective equipment, etc.);
4. rescue procedure covering at least the following:
    1. means of communication between the supervisor of the confined space and the workers in the confined space;
    2. lifesaving equipment specific to each confined space;
    3. confirmation that the municipal emergency response service has been advised that work in confined spaces would be going on at this specific construction site and that they may intervene do to a confined space rescue; otherwise, the Contractor must identify the workers on the construction site that will act as rescuers in a confined space in the case where such rescuers must enter the confined space (rescue training is mandatory);
    4. location of telephone and phone number of the municipal emergency response service (if applicable);
5. date of entry permit;
6. name of person who issued the permit and the name of his employer;
7. name of the confined space safety watcher and the name of his employer;
8. name of the workers who must enter the confined space and the name of each one's employer.

.2 If the Departmental representative requires an entry permit specific to his site, the contractor shall comply with this permit requirements.

Medical surveillance

.1 The Contractor must submit to the Departmental representative a medical certificate dated in the last two years for all persons who must use a supplied-air respirator. The certificate must confirm the ability of each person to use this type of apparel.

.2 It is recommended that the persons who have to work in sewer collection systems or other similar systems be vaccinated against diphtheria, tetanus and hepatitis "B".

Requirements while working in confined spaces

.1 Before each entry into a confined space, the person in charge of the health and safety for the work in confined spaces shall take readings of oxygen concentration, flammable gases and all toxic gases likely to be present and record these readings on the entry permit required earlier.

.2 No worker can access the confined space if the following requirements are not respected:

1. the concentration of oxygen shall be greater than or equal to 19.5 % and less than or equal to 23 %;
2. the concentration of inflammable gases or vapours shall be less than or equal to 10% of the lower explosion limit;
3. the concentration of other gases must not exceed the standards prescribed in annex I of the Règlement sur la santé et la sécurité du travail (S-2.1, r.13) (Occupational Health and Safety Regulation).

.3 If the oxygen and gas concentrations measured respect the regulatory values, the person in charge of the health and safety for the work in confined spaces must ensure that all preventive measures indicated on the permit are in place and then must complete the entry

permit (date, time, signatures, etc.) before issuing the permit and allow entry into the confined space.

.4 A permit is only valid for one work shift; the Contractor must submit a new permit for each extra shift.

.5 During the work inside the confined space, the gas concentration must be measured continuously and the gas detector must be installed at the level of the breathing area of the workers. If the conditions inside the confined space are such that the workers might not hear/see the detector's alarm, the Contractor must find a way for the confined space safety watcher to watch the concentration measures while maintaining the measurements at the level of the breathing zone of the workers.

.6 If the work is organized in a way that the workers are scattered far away from each other in a large confined space, the Contractor needs to provide additional gas detectors.

.7 The Contractor must provide the gas detectors and maintain them in good condition. He must be able to show that the gas detectors used have been calibrated and adjusted by the person in charge of the health and safety for the work in confined spaces or by a qualified person, in accordance with the manufacturer's recommendations. The Departmental representative can at all times have the accuracy of the measuring devices checked. In the event of the failure of a detection device, the work must be stopped immediately and all workers must leave the confined space.

.8 The manufacturer's manual of the gas detectors must be available on the construction site.

.9 The Contractor shall provide a ventilation system to keep concentrations of contaminants below the regulatory limits.

.10 If work generating contaminants are performed (welding, use of products, etc.), the Contractor must, if needed, install an aspiration system for the contaminants so that the regulatory values of air quality can be maintained at all times.

.11 If a detecting device alarm goes off, all workers shall leave the confined space. The measured levels of concentration must then be recorded on the entry permit. The Contractor shall then find the source of contamination, neutralize it, ventilate the confined space to eliminate contaminant residues and authorize access to the confined space only when concentrations of oxygen and gas have returned to normal.

.12 Compressed gas cylinders or welding equipment shall not be brought into confined spaces: this equipment shall remain outside and shall not block entrances or exits; all cylinders shall be properly secured.

.13 Tools and electrical devices used to work in the confined spaces shall be grounded and, when necessary, designed to be explosion-proof. All equipment must be connected to a ground fault interrupter outlet or to a step-down transformer. The Contractor shall, at his own cost, hire a qualified electrician to adjust power receptacles and/or circuit breakers that he intends to use which do not meet these criteria.

.14 The Contractor shall obtain a Hot Work Permit and respect the requirements to that effect when the work to be carried out includes hot work.

.15 The Contractor must assign a competent person to assume the duties of confined space safety watcher. The supervisor shall be exclusively dedicated to these duties and must constantly remain outside of the confined space as long as there is a worker in it. He must also:

1. ensure that the entry permit has been filled, signed and posted near the confined space;
2. be familiar with the work procedure specific to the confined space and ensure that it is respected;
3. ensure continuous communication with all the workers in the confined space and ensure that all the equipement required in case of emergency is present;
4. have a good knowledge of the backup ventilation systems and ensure their proper functioning for the duration of the work;
5. prevent access to unauthorized persons;
6. ensure that the conditions around the confined space zone is not a health or security risk for the workers inside the confined space;
7. initiate the emergency procedure if needed.

.16 The same person may act as a confined space safety watcher and as the person in charge of the health and safety of the work in confined spaces, provided all requirements of both functions are met.

1.30 EXCAVATION WORK

.1 In addition to the requirements of the *Code de sécurité pour les travaux de construction* (Safety code for the construction industry), the Contractor who performs the digging of trenches or excavations must respect the following requirements:

.1 Fill out the following form and submit it to the Departmental Representative before beginning to excavation work.

.2 Submit to the Departmental Representative, as appropriate, the following documents:

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

.2 engineer's advice specifying the wall angles of the trench or excavation.

CSST

Excavation guidelines

N° ____ of ____

This directive is provided as an example by the Commission de la santé et de la sécurité du travail (CSST). It contains the main instructions that the employer should give to the person responsible for the work on the site and to the operator of the earth-moving machine.

Company name	
Project name	Project no.
Address of the site	Construction start date

Field survey

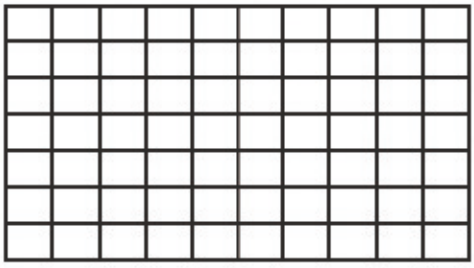
Chaining or axes : from _____ to _____ Attached plan ☐ Plan no. : _____

Working method to use

While making sure the excavation walls do not pose the risk of landslide

- ☐ dig and shore according to the plans and specifications of the engineer ;
- ☐ dig and shore using a trench box ;
- ☐ dig without shoring as long as one of the following conditions is respected
  - ☐ rock is sound;
  - ☐ no worker goes down in the trench or excavation;
  - ☐ the walls are dug according to the engineer's advice.

Dimensions of excavation (Dig according to the following profile.)



	Minimum	Maximum
H Depth		
Wb Width at bottom Width at top		

Safety measures

Deposit the materials at a distance of at least 1.2 metre (4 feet) from top of walls.
Do not allowed any vehicle to come closer than 3 metres (10 feet) from top of walls.

- ☐ Respect the engineer's plan concerning work in the proximity of an existing facility.
- ☐ Follow the location plan to locate the underground infrastructures.
- ☐ Install signaling devices prescribed in the traffic plan (barriers, visual references, etc.).
- ☐ Assign a flag person or more to control the flow of traffic.
- ☐ Respect the procedure prescribes for work near power lines.
- ☐ Provide protection devices for the workers, such as concrete crash barriers.

Name	Occupation	
Signature	Date	Telephone no.

Directive submitted
☐ to the responsible of the work on the site ☐ to the operator of the earth-moving machine

DC700-6042 (2001-03)

1.31 LIFTING LOADS WITH CRANE OR BOOM TRUCK

.1 Unless specified otherwise, the Contractor must prepare a hoisting plan and submit it to the Departmental Representative for all lifting operations done with a crane or a boom truck at least 5 days before these lifting operations begin. The hoisting plan must contain at a minimum the information listed at the end of this article.

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

- .1 lifting of concrete panels;
- .2 lifting mechanical/electrical equipment on a roof or on the floor of a building;
- .3 lifting of loads encroaching on the public road;
- .4 lifting large dimensions or very heavy loads;
- .5 all other lifting operation, in accordance with the requirements of the Departmental Representative.

.3 In addition to the above requirements, the Contractor must plan the hoisting operations in a way as to avoid that the loads pass over the occupied zones on the site. When there is no alternative, the hoisting plan must absolutely be signed and sealed by an engineer and must guarantee the security of the occupants in that zone; the plan must also be approved by the Departmental Representative. The Departmental Representative can, if he deems necessary, require that the work be done at night or on weekends.

.4 Upon the beginning of the work on the construction site, the Contractor must submit the list of the hoisting plans anticipated for the whole project to the Departmental Representative. That list shall be updated as needed if changes occur during the work.

.5 In addition to the mechanical service inspection certificate, the annual inspection certificate and the crane logbook must be aboard all cranes and boom truck cabs.

.6 The entire lifting area shall be marked off to prevent the entry of non-authorized persons.

.7 The Contractor shall carefully inspect all of the slings and lifting accessories and make sure that those in poor condition are destroyed and scrapped.

.8 Compressed-gas cylinders shall be lifted with a basket specially designed for this purpose.

1.32 MINIMUM CONTENT OF HOISTING PLAN

.1 Sketch indicating at a minimum, the location of the crane, the surrounding facilities, the zone covered by the hoisting operations, the pedestrian's pathways and vehicular routes, the security perimeter, etc.

.2 Weight of loads

.3 Dimensions of loads

.4 List of hoisting devices and weight of each

.5 Total weight lifted

.6 Maximum height of obstacles to clear

.7 Height of loads lifting relative to the surface of the roof (in the case of loads to be placed on roofs)

.8 Use of guide cables

.9 Type of crane used

.10 Crane capacity

.11 Boom length

.12 Boom angle

.13 Crane's radius of action

.14 Deployment of stabilizers

.15 Percentage usage of the crane's capacity

.16 Verification confirmation of hoisting equipment

.17 Identification of the crane operator and the person responsible for the hoisting operations with date and signatures

1.33 HOT WORK

.1 Hot work means any work where a flame is used or a source of ignition may be produced, i.e., riveting, welding, cutting, grinding, burning, heating, etc.

.2 Before the beginning of each shift of work and for each sector, the Contractor must obtain a "Hot Work Permit" emitted by the person responsible for the site.

.3 A working portable fire extinguisher suitable to the fire risk shall be available and easily accessible within a 5 m radius from any flame, spark source or intense heat.

.4 The Contractor must appoint an individual to do continuous monitoring of the fire risks for a period of one (1) hour after the end of the shift of hot work. This individual shall sign the section for this purpose on the permit and give it to the person in charge of the construction site after the one-hour period.

.5 When the hot work is done in areas where there is combustible materials or where the walls, ceilings or floors are made of or covered with combustible materials, a final inspection of the work area must be scheduled four (4) hours after the work has finished. Unless specified otherwise by the Departmental Representative, the Contractor must assign a person to carry out this monitoring.

Welding and cutting

.1 In addition to the requirements prescribed in the preceding paragraphs, the Contractor must respect the following requirements:

.1 Welding and cutting work must be carried out in accordance with the requirements of the *Code de Sécurité pour les travaux de construction, S-2.1, r.4* (Safety code for the construction industry) and CSA standard W117.2, Safety in Cutting, Welding and Allied Processes.

.2 Air extraction system with filters must be used for all welding and cutting work performed inside.

.3 Stop all activities producing flammable or combustible gas, vapours or dust in the vicinity of the welding or cutting work.

.4 Store all compressed gas cylinder on a fireproof fabric and make sure that the room is well ventilated.

.5 Store all oxygen cylinders more than 6 metres from a flammable gas cylinder (ex: acetylene) or a combustible such as oil or grease, unless the oxygen cylinder is separated from it by a wall made of non-combustible material as mentioned inthe article 3.13.4 of the *Code de sécurité pour les travaux de construction, S-2, r. 6* (Safety code for the construction industry)

.6 Store the cylinders far from all heat sources.

.7 Not to store the cylinders close to the staircases, exits, corridors and elevators.

.8 Do not put acetylene in contact with metals such as silver, mercury, copper and alloys of brass having more than 65% copper, to avoid the risk of an explosive reaction.

.9 Check that welding equipment with electric arc has the necessary tension and are grounded.

.10 Ensure that the conducting wires of the electric welding equipment are not damaged.

.11 Place the welding equipment on a flat ground away from the bad weather.

.12 Install fireproof canvas when the welding work is done in a superposition and where there is the risk of falling sparks.

.13 Move away or protect the combustible materials which are closer than 15 metres from the welding work.

.14 Prohibition to weld or cut any closed container.

.15 Do not perform any cutting, welding or work with a naked flame on a container, a tank, a pipe or other container containing a flammable or explosive substance unless:

1. they have been cleaned and air samples indicating that work can be done without danger has been taken; and
2. provisions to ensure the safety of the workers have been made.

1.34 ROOFING WORK

Protection against fall from heights

.1 Installation of guardrails is mandatory at all times; however, the installation of a warning line is allowed to define the limits of the work zones provided that all the requirements of the articles 2.9.4.0 and 2.9.4.1 of the *Code de sécurité pour les travaux de construction* (Safety code for the Construction Industry) are respected.

.2 The guardrails must remain in place until the end of the project. The Departmental Representative will authorize their dismantling when he can confirm that all the work, inspections and corrections have been made.

.3 Workers installing guardrails must wear safety harnesses.

.4 Workers installing and modifying guardrails or flashing shall wear safety harnesses in the event guardrails must be moved temporarily.

.5 Workers shall wear safety harnesses when receiving material and giving directions to the crane operator next to a drop.

.6 Safety harnesses shall be worn when carrying out work next to a drop where collective protection is not sufficiently safe.

.7 The Contractor shall provide a fastening method and safety cable system compliant with section 2.10.12 of the *Code de sécurité pour les travaux de construction (L.R.Q., S-2.1, r.4)* (Safety code for the Construction Industry) for each construction site or location.

Lifting of materials

.1 For all winch installations, the Contractor shall provide the Departmental Representative with the installation method recommended by the manufacturer. If unavailable, the Contractor shall then provide an installation procedure signed and sealed by an engineer. The installation procedure must take into account load-bearing capacity, the amount, weight and location of counterweight and any other detail that may affect the capacity and stability of the device.

.2 The Contractor shall carefully inspect all of the slings and lifting accessories and make sure that those in poor condition are destroyed or scrapped.

.3 Compressed-gas cylinders shall be lifted with a basket specially designed for this purpose.

.4 In all cases where a crane or boom truck is used, the Contractor must respect the requirements of the paragraph Lifting Loads With Crane or Boom Truck, in this section.

Protection against burns

.1 Individuals assigned to the boilers shall wear long sleeves, safety glasses and a face shield when filling the boilers.

.2 Individuals working with asphalt or other hot liquids shall wear gloves, long sleeves and safety glasses.

Protection against fire

.1 The storage and use of propane cylinders shall comply with the standard CAN/CSA-B149.2, *Propane Storage and Handling Code*. The cylinders shall be stored outdoors, in a safe place, away from any unauthorized handling, in a storage cabinet specially designed for this purpose. The cylinders shall be securely kept upright and locked at all times in a place where no vehicles are allowed unless the cylinders are protected by barriers or similar protection.

.2 The number of propane cylinders on the roof shall not exceed the number of cylinders necessary for a day's work, and cylinders shall at all times be secured upright or held in a cart designed for this purpose.

.3 All hot work (burning, heating, riveting, welding, cutting, grinding, etc.) must be done in accordance with paragraph "Hot Work" in this section.

Material and waste management

.1 On the roof, light material and sheet material shall be kept in containers or be securely fastened. In the event this requirement is disregarded in the slightest way, the Departmental Representative may disallow the storage of materials on the roof.

.2 Waste shall be discarded as produced using a waste chute or appropriate containers. The Contractor shall provide the means to prevent waste from being carried away by the wind.

.3 All waste must be removed from the roof at the end of shifts.

.4 Unless otherwise authorized by the Departmental Representative, all waste bins must be placed at least 3 m from any structure or building.

Protection of occupants and the public

.1 Contractor must install covered passageways, nets or other devices above the entrances and the exits of the building to protect the workers, the public and the occupants against falling object. The means of protection must be approved by the Departmental Representative.

.2 A safety perimeter on the ground must be placed under the work zone in order to protect the workers, the public and the occupants.

.3 The ground construction site, material handling area and boiler area shall be clearly sealed off to prevent occupants or the public from accessing the construction site and areas.

.4 Before installing any device that may emit gas or fumes, the Contractor shall receive authorization from the person in charge of the construction site, who shall make sure that there is no risk of gas or fumes infiltrating the building's ventilation system.

1.35 STEEL STRUCTURE ERECTION OR DISMANTLING WORK

.1 In addition to respecting section 3.24 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry), the Contractor must also respect the requirements described in the following paragraphs.

.2 Contractor must submit the following documents to the Departmental Representative before the beginning of steel structure erection work:

- .1 erecting procedures in accordance with article 3.24.10 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry);
- .2 rescue procedures for the release of a worker suspended in a safety harness within a maximum of 15 minutes; procedures must be adapted to the construction site and in accordance with article 3.24.4 of that same code; the procedure must be accompanied by a written confirmation that it has been tested;
- .3 statement from an engineer that the anchor rods have been installed in accordance with the anchoring plan as required by the article 3.24.12 of that same code;
- .4 hoisting procedures in cases where the lifting is done in one of the ways described in the article 3.24.15 of that same code;
- .5 name of the individual identified as rescuer and his rescue training certificate;
- .6 name of the individual identified as first-aid attendant and his first-aid training certificate.

.3 The Contractor must make sure that the following documents are available for consultation on construction site at all times:

- .1 Steel structure manufacturer's erection plan in accordance with the requirements of article 3.24.9 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry);
- .2 Column anchor rods's anchoring plan in accordance with the requirements of article 3.24.11 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry).

1.36 TEMPORARY HEATING

.1 In addition to respecting section 3.11 of the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry), the Contractor must also respect the requirements described in the following paragraphs.

.2 A portable fire extinguisher must be available at all times near the heating units, no matter what type of heating is used.

.3 The heating units must always be used in accordance with the manufacturer's specifications.

.4 If applicable, the canvas or tarpaulins used next to the heating units must be solidly fixed so as not to be projected on the heaters, on the pipes connected to the heaters or on any other heat source.

.5 The gas cylinders must be installed in a way that they are protected from vehicule and other equipment traffic.

.6 For the use of heating units other than electric, the Contractor must install a carbon monoxide detector in the work area, next to the heating units and/or the workers, throughout the course of the heating period. The

Contractor must immediately apply the corrective measures required to the heating units if the detector's alarm goes off.

.7 The Contractor must ensure a minimum surveillance of the heating units outside the hours of work (nights and weekends). He must submit a surveillance plan to the Departmental Representative before the use of the heating units.

PART 2 PRODUCTS

2.1 N/A

PART 3 EXECUTION

3.1 N/A

3.2 HEALTH AND SAFETY SUBORDINATION AGREEMENT

Project: _____ **Address:** _____

EXTERNAL CONTRACTOR

I hereby agree to submit to the authority of (name of the Principal Contractor's business) _____, which is the Principal Contractor for the project indicated above during the entire duration of our work on the construction site. Accordingly, I confirm that I have reviewed the Principal Contractor's prevention program, and I agree to:

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

Name of representative: _____

Name of business: _____

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

Approximate dates of work (start-end): _____

Signature: _____ Date: _____

PRINCIPAL CONTRACTOR

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

Name of representative: _____

Name of the Principal Contractor's business: _____

Signature: _____ Date: _____

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

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

DEFINITIONS

.1 Characterization: precise identification of distinctive elements of a substance, an environment or process.

.2 Waste: residuals, materials, substances or debris discarded after a production process, manufacture or use.

.3 Spill: Any accidental or voluntary short-term discharge to environment, likely to cause harm to the environment.

.4 Suspended Solids: materials that can by either deposited or retained by filtering.

.5 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.

.6 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

REFERENCE STANDARDS

.1 Construction activities will be conducted within Canada Border Services Agency. Work is subject to guidelines, laws and federal regulations. In some case, Provincial and Municipal approaches may be considered as guide values. The following sections present laws, standards and regulations applicable to environmental component and air emissions control.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.

.3 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

.4 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.5 Include in Environmental Protection Plan:

.1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.

.2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.

.3 Names and qualifications of persons responsible for training site personnel.

.4 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in

compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.

.5 Drawings indicating the site works limits, locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff, to contain materials on site and to protect the wet lands and the forest.

.6 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance, the contacts and the emergency equipments.

1.3 FIRES

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

1.4 DRAINAGE

.1 Develop and submit a plan for erosion and sediment transport measures, indicating the means to be implemented, including monitoring of work and reporting, to verify that these measures are in line with national laws and regulations. Federal, provincial and municipal regulations.

.2 Provide temporary drainage and pumping required to keep excavations and site free from water.

.3 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

.4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.5 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties as indicated.

.2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.

.1 Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas indicated.

.6 Deforestation should not occur during the nesting season of migratory birds between April 1 and August 31. If this condition cannot be met, a biologist must go to the site to confirm that there are no nests. If a nest is present, work must be stopped until 31 August.

.7 When cutting, avoid trees that must be left in place at adjacent locations. Cut crown if necessary.

1.6 WORK ADJACENT TO WATERWAYS

.1 Waterways to be kept free of excavated fill, waste material and debris.

1.7 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.

.4 Keep, at any time, absorbent materials to rapidly respond to hazardous material spills at construction site.

.5 Place cuttings, scrap materials and other debris in spaces provided in Construction Specifications.

.6 Do not store petroleum products or other hazardous material within 30 meters of aquatic environment.

.7 Maintain wheeled vehicles and refueling at a minimum distance of 30 meters from shore.

.8 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.8 CLEANING

.1 Leave work site clean at the end of each working day.

.2 Ensure that the aquatic environment remains free of waste and volatile material removed.

.3 Final Cleaning: remove from site extra materials, rubbish, tools and equipment in accordance with applicable law.

.4 Upon completion of construction, clean site and surrounding area of any equipment that may have dropped during truck passage.

1.9 NOTIFICATION

.1 Consultant will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.1 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Consultant.

.2 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

.1 Consultant will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

3.1 ENVIRONMENTAL COMPONENTS

.1 Air quality

.1 Contractor must ensure that the machinery used is in good working condition (regular maintenance) to reduce greenhouse gas emissions and dust

.2 Contractor must avoid leaving engines running unnecessarily on machinery that is not being used.

.3 Contractor must water dry materials and cover waste to prevent wind raising dust or blowing around debris.

3.2 ACCIDENTAL PETROLIUM PRODUCT SPILL

.1 The Contractor shall immediately notify the site supervisor, the Departmental Representative and the Facilities Chief Manager.

3.3 EMERGENCY KITS FOR RECOVERY OF PETROLEUM PRODUCTS

.1 Contractor shall have permanently on the site one or more oil recovery emergency kits for each of the work sites. Kits should include enough absorbent rolls, absorbent bedding and containers to intervene on the width of the river or allow to confine oil products within the perimeter of the machinery in question, by including a floating boom floating.

.2 Kits should be available near the rivers and machinery and must be easily accessible at all times for rapid response. Any spills on the site must be declared. Contaminated soil must be quantified and recovered. Proof of transport of any petroleum product to an authorized site must be submitted to the Departmental Representative.

.3 All tanks containing gasoline or oil and any stationary machine (pump, generator, etc.) running on gasoline or diesel should be installed in a drip tray for leaks with a capacity equivalent to 110% of the tank volume.

3.4 PETROLEUM TANK

.4 If a temporary tank is inevitable on the construction site, it shall be designed to minimize spills: The tank must be made following one of these design:

.1 Double-walled under vaccum.

.2 Included in a watertight holding tank that can collect 110% of the total tank volume.

.5 Install all tanks in a level, non-porous area away from rain and sanitation sewer.

.6 Putting a spill kit near any tank.

.7 Avoid spillage.

.8 Immediately notify Site Supervisor, Departmental Representative and Facilities Manager of any spills.

3.5 MACHINERY MAINTENANCE AND CIRCULATION

MACHINERY MAINTENANCE

.1 The Contractor shall ensure that the machinery, tools and equipment to be used in carrying out the work, are safe, clean and in good working order to prevent hydrocarbon or other lubricant leaks. Any machinery used must be visually inspected daily. Any defective equipment or apparatus must be evacuated from the site as soon as possible for repair and maintenance. The Departmental Representative reserves the right to refuse admission or expel the construction machinery, tools and equipment that do not meet these requirements. Equipment obviously poorly maintained and presenting evidence of leaks or potential leaks will be removed from the site at the expense of the Contractor or owner of the equipment, at no cost to the Owner.

.2 **EMachinery maintenance must be done out of site. Cleaning of machinery and its fueling and lubricating must be performed at a distance of at least thirty (30) meters from any water environment.**

.3 For purposes of interpretation of the requirements of this document, water environments (wetlands) are also considered as waterways.

MACHINERY STORAGE ON THE SITE

.4 Machinery stored overnight or for short periods of time should be placed on non-porous surfaces where spill can be recovered.

.5 Evacuated any machinery that is no longer required.

TRAFFIC ON-SITE

.1 The Contractor must avoid using heavy machinery in areas susceptible to surface erosion and landslide. To this end, he must pay particular attention to the banks of rivers, lakes and water environments. It is prohibited to operate heavy machinery on the shores of waterways, lakes and wetlands.

.2 Evenings and weekends, store heavy machinery at over thirty (30) meters from any waterway.

TRAFFIC BEYOND RIGHT-OF-WAY

.1 For any traffic beyond the right-of-way (temporary access road, waste area, temporary handling area), the Contractor shall notify and obtain approval from the Departmental Representative before using a site. The approval of the Departmental Representative will not relieve the Contractor of its legal responsibilities.

3.6 PLANNING OF DRAINAGE AND EROSION CONTROL DURING WORKS

.1 Wherever work is undertaken which could result in destabilizing the ground, it is the responsibility of the Contractor to plan the drainage system of these disturbed areas and provide temporary stabilization measures and sediment collection devices before sediments flow into rivers, lakes and wetlands.

.2 The devices must be installed at the exit of reprofiled ditches, culverts and where water flows on the site temporarily or continuously. These devices are the sediment barriers, sedimentation basins or other effective technique.

.3 The Contractor must presents a drainage plan and erosion control to Departmental Representative ten (10) days before the start of work which could lead to the flowing of sediment into rivers, lakes and wetlands.

.4 The Contractor shall ensure that the wetland at the northern boundary of the site is not dried.

SEDIMENTATION BASIN, NATURAL FILTER AND ALTERNATIVE METHODS

.1 Sedimentation Basin

.1 Contractor shall install settling ponds during the pumping work of cofferdams, to prevent sediment flowing into streams, wetlands or lakes. The minimum capacity of a basin is calibrated according to the flow of water pumped. It is prohibited to install these devices on the shore of a river, lake or wetland.

.2 When a sedimentation basin is 50% full, it must be cleaned. In addition, a final cleaning must be carried out at the temporary closure of a site and the permanent closure. Preventive cleaning should also be done at a weather alert announcing a heavy rain.

.2 Natural Filter

.1 In addition, water from the dewatering of excavations and cofferdams have to be evacuated in an area of vegetation (forest bed) at more than twenty (20) meters from any watercourse.

.3 Alternative Methods

.1 There are various products on the market that can monitor and retain sediment on a construction site (eg settling sediment pocket and portable settling tank, etc.). If the Contractor plans to use this kind of product, he must have the permission of the Departmental Representative before starting work.

3.7 MANAGEMENT OF EXCAVATION AND EMBANKMENT

.1 As far as possible, the Contractor shall reuse the soil from the Work Site as part of the Project. For surplus soils, they must be sent to the area provided for this purpose (see civil drawing). In the event that materials are to be disposed outside of the site, they should be sent to a site recognized and authorized by provincial regulations.

.2 If soils are to be temporarily stored on site, cover them to prevent wind dust.

.3 If contaminated soils are to be temporarily stored on site, place them on a waterproof membrane and cover them to prevent rain leaching. Do not store contaminated materials anywhere else than in designated areas.

3.8 MANAGEMENT OF DANGEROUS MATERIALS

.1 If required on site, handle and store hazardous materials with care:

.1 Watertight containers, properly sealed and identifying materials

.2 Containers in stable locations protected from vehicle collision and at least 30 meters from water courses.

.2 Petroleum products must be stored in accordance with regulations pertaining to the "Installation of petroleum equipment" sections of the Building Code and the safety code of the Régie du bâtiment.

.3 In the case of gas tanks, follow recommendations for use.

.4 Handle hazardous materials on flat, non-porous surfaces where spills may be recovered.

.5 No releases of hazardous materials are tolerated in soils, ditches and streams.

.6 Spill emergency plan to be established.

.7 Provide on-site intervention equipment to deal with accidental spillages (absorbents, leakproof containers, etc.)

.8 Recover any spilled quantity, even minimal.

.9 In the event of an accidental spill, apply emergency measures to control the spill and remedy the situation resulting (breakage, false maneuver, etc.). Contain contaminated area, clean and remove contaminated equipment and route to an authorized site.

.10 In the event of an environmental incident, the Contractor must immediately inform the Site Supervisor, the Departmental Representative and the Facilities Manager.

.11 Ensure workers are aware of precautions and emergency plan in case of spill.

.12 Ensure that all hazardous materials to be for disposed are handled by qualified contractors and licensed by the regulations.

.13 Hazardous materials must be present only for the duration of the work.

.14 Upon completion of work, clean site and evacuate hazardous materials and empty containers.

.15 Provide hazardous materials to licensed and authorized carriers.

3.9 MANAGEMENT OF DEBRIS AND RECYCLING MATERIALS

.1 Manage residual materials in compliance with 4R (Reduction at source, reuse, recycling, recovery). Only materials that cannot borrow one of these pathways are directed to disposal.

.2 Ensure that waste is deposited in designated containers and transported to authorized sites.

.3 Regular waste disposal is prioritized. Pay attention to waste that can be blown away by wind (paper, plastic bag, etc.). Do not leave empty containers that were filled with hazardous materials on site.

.4 Burying of waste on site is prohibited.

.5 If debris and / or contaminated material is to be temporarily stored, provide safe storage conditions:

.1 Minimize diffuse dust emissions by covering materials with a high proportion of fine particles.

.2 Place hazardous waste in sealed containers.

.3 Take measures to prevent cross-contamination of hazardous waste between themselves and non-hazardous waste.

.6 Ensure that waste sites or companies that received waste have the necessary permits and approvals for processing.

.7 It is the responsibility of the Contractor to dispose of waste in compliance with current regulations. The Contractor shall obtain a written authorizations required from owners and agencies involved in the regulation (eg Municipalities, MDDELCC, etc.).

.8 The Contractor shall provide a copy of the permits required within five (5) business days prior to the disposal of waste.

END OF SECTION

PART 1 GENERAL

1.1 PURPOSE

.1 This Section of Construction Specifications provides information about quality assurance program to be implemented by Contractor and its subcontractors and suppliers during Work. This program is not intended to replace contractually required quality assurance program. It sets out minimum quality activities to be performed by Contractor and its subcontractors and suppliers at their facilities or on Work site.

1.2 RESPONSIBILITIES

.1 Contractor is responsible for implementing all provisions of quality assurance program.

.2 Contractor is responsible for ensuring all its subcontractors and suppliers perform quality activities described in this Section.

.3 Contractor and its subcontractors and suppliers must demonstrate their quality assurance program is implemented and their Work complies with drawings and technical specifications during fabrication and construction.

.4 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.

.5 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.

.6 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.

.7 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents.

1.3 INDEPENDENT INSPECTION/TESTING 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 Employment of inspection/testing agencies does not relax responsibility of Contractor and its subcontractors and suppliers to perform Work in accordance with Contract Documents.

.3 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Contractor and its subcontractors and suppliers will have to correct defect and irregularities as advised by Departmental Representative at no cost and pay costs for retesting and reinspection.

1.4 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work and off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.5 PROCEDURE

.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.

1.6 QUALITY PROGRAMMING

.1 Contractor must provide details of quality programming it intends to implement for Project.

.2 Key personnel will not be replaced without prior notice from Departmental Representative.

.3 Contractor must present organizational diagram of its subcontractors and suppliers assigned to Project.

.4 All organizational diagrams must be included in Contractor's Quality Plan (see Section 1.9).

1.7 MANUFACTURING

RECEIPT OF MATERIALS

.1 Materials provided by Departmental Representative

.1 If Departmental Representative provides Contractor with materials or equipment to execute any Work, Contractor must verify their condition prior to taking possession.

.2 Receipt of materials purchased by Contractor

.1 Contractor must be able to demonstrate at any time compliance of all materials and equipment it has purchased or manufactured. These quality files must be complete and available at facilities of Contractor or its subcontractors or suppliers.

.2 Contractor must complete an acceptance inspection for each material received on site.

.3 Quality files of Contractor or its subcontractors or suppliers must provide proof of completion of acceptance inspections and review by Contractor of compliance documents, i.e., material analysis certificates and inspection reports.

.4 All materials provided by Contractor must be new. Origin and source of materials must be identified. Refurbished materials are not acceptable.

.3 Non-compliant materials

.1 Non-compliant materials must be correctly identified (labelled "hold" or "ne pas utiliser") and/or be set aside in a holding area.

DOCUMENT CONTROL

.1 Contractor must implement and maintain a document control system that makes it possible to control following activities:

.1 Ensure only latest revision of specifications, plans and procedures are accessible at facilities of Contractor and its subcontractors and suppliers.

.2 Ensure that if copies of past revisions are kept, they are labelled "Outdated."

.3 Provide functional system to distribute documents, drawings, procedures, reports, etc.

.4 Ensure all quality files are catalogued and stored in a controlled environment.

IDENTIFICATION AND TRACEABILITY

.1 Identification

.1 Contractor is responsible for ensuring all materials and equipment used in Work are identified and traceable, and remain so until end of Work.

.2 Traceability

.1 It must be possible at any time to associate materials and equipment with documentation establishing their compliance and inspection status.

CALIBRATION OF MEASURING EQUIPMENT

.1 Contractor and its subcontractors and suppliers must continue to maintain a control and recall system for calibrated measuring and testing equipment.

.2 Contractor and its subcontractors and suppliers must keep their equipment calibration certificates at their facilities.

.3 Contractor and its subcontractors and suppliers must store their measuring and testing equipment in a secure and controlled environment.

INSPECTIONS COMPLETED

.1 Contractor must be able to demonstrate at any time during Work which inspections have been completed.

.2 Completed inspections must also be verifiable in Contractor's quality files. Depending on discipline, Contractor must monitor inspection levels using annotated drawings or computerized lists or databases.

.3 It must be possible at any time to verify progress of inspection and testing activities, with references to reports produced.

.4 Regardless of type of monitoring system chosen by Contractor and its subcontractors and suppliers, it must be possible to demonstrate that 100% of Work, inspections, tests and reports has been completed.

FINAL INSPECTION

.1 At end of different manufacturing and construction phases, Contractor must declare said phases complete and compliant, submit its quality files and ask Departmental Representative to complete final inspection.

.2 Departmental Representative must receive advance notice requesting performance of final inspection as defined in Contract.

.3 Upon receipt of request for final inspection, Departmental Representative must complete final inspection of materials and equipment prior to issuing an inspection certificate.

PART 2 PRODUCT

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

PART 1 GENERAL

1.1 PRECEDENCE

.1 For Federal Government Projects, Division 01 Sections take precedence over technical specifications in other Divisions of this Project Manual.

1.2 REFERENCES

.1 Use the most recent versions available of the standards listed in this section.

.2 American National Standard Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE 52.2-[12], Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particulate Size (ANSI approved).

.3 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).

.2 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

.3 LEED Canada 2009 for Design and Construction-[2010], LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide.

.4 LEED Canada for Existing Buildings, Operations and Maintenance-[2009], LEED Canada 2009 Leadership In Energy and Environmental Design Green Building Rating System Reference Guide.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-92.1-[1989], Sound Absorptive Prefabricated Acoustical Units.

.5 Carpet and Rug Institute (CRI)

.1 Green Label Program.

.2 Green Label Plus Program.

.6 CSA Group

.1 AAMA/WDMA/CSA 101/I.S.2/A440-[11], NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights.

.2 CAN/CSA-B45.0 Series-[02(R2008)], Plumbing Fixtures.

.3 CAN/CSA-Z809-[08], Sustainable Forest Management.

.7 Environmental Choice Program

.1 CCD-016-[97(R2005)], Thermal Insulation Materials.

.2 CCD-020-[95(R2007)], Gypsum Wallboard.

.3 CCD-029-[96], Water Conserving Products.

.4 CCD-045-[95], Sealant and Caulking Compounds.

.5 CCD-046-[95], Adhesives.

.6 CCD-047-[98(R2005)], Architectural Surface Coatings.

.7 CCD-048-[95(R2006)], Surface Coatings - Recycled Water-Borne.

.8 CCD-127-[95], Recycled Plastic Products.

.9 CCD-144-[2003], Naturally-Derived Phenol Substitutes.

.10 CCD-150-[2004], Steel for Use in Construction Products.

.11 CCD-152-[2001(R2005)], Flooring Products.

.12 CCD-167-[2007], Mosaic Tiles.

.8 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-[2004], FSC Principle and Criteria for Forest Stewardship.

.9 Green Seal Environmental Standards (GS)

.1 GS-03-[97], Environmental Criteria for Anti-Corrosive Paints.

.2 GS-11-[11], Standard for Paints and Coatings.

.10 National Air Duct Cleaners Association (NADCA)

.1 NADCA ACR-[2006], Assessment Cleaning and Restoration.

.2 NADCA Standard 05-[1997], Requirements for the Installation of Service Openings in HVAC Systems.

.11 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-[A2011], Architectural Coatings.

.2 SCAQMD Rule 1168-[A2005], Adhesives and Sealants Applications.

.12 Scientific Certification Systems (SCS)

.1 FloorScore Program [2012].

.13 Sheet Metal and Air Conditioning National Contractors Association (SMACNA)

.1 IAQ Guideline for Occupied Buildings Under Construction, 2007.

.14 Sustainable Forestry Initiative (SFI)

.1 SFI-[2010-2014] Standard.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section [01 33 00 - Submittal Procedures].

.2 Submittals required:

.1 Compliance Report indicating requirement to purchase energy efficient and environmentally benign products.

.2 Use Report indicating understanding of requirement to use materials and methods of construction, which improve energy and water efficiency, reduce hazardous by-products, and use recycled materials, or materials, which can be reused.

.3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures. Indicate VOC emissions, prior to installation or use:

.1 Adhesives.

.2 Caulking compounds.

.3 Sealants.

.4 Insulating materials.

.5 Fireproofing or fire stopping materials.

.6 Paints.

.7 Carpets.

.8 Floor and wall patching or levelling materials.

.9 Lubricants.

.10 Clear finishes for wood surfaces.

.4 Construction Schedule:

.1 Submit schedule of construction prior to start of work, in co-ordination with scheduling requirements, including:

1. Sequence of finish applications and allowances for curing times.
2. Identification of finish types. See Table A
3. Schedule and duration of proposed temporary ventilation.
4. Delivery schedules of manufactured materials which are anticipated to off-gas in timely manner, which will allow for airing of those materials prior to their scheduled installation.
5. Indicate and schedule commissioning procedures and temporary usages of building mechanical systems, identifying types of filtration and schedule for filter replacement.

.5 IAQ Management Plan:

.1 Submit Indoor Air Quality (IAQ) Management Plan for construction and preoccupancy

1.4 EROSION AND SEDIMENTATION CONTROL

.1 Follow methods and procedures specified in Section [31 23 33.01 - Excavating, Trenching and Backfilling].

.2 Establish long-term soil stabilization program as indicated.

.3 Develop an Erosion and Sedimentation Control Plan to control stormwater runoff and other erosion measures.

.4 Protect stockpiled topsoil.

1.5 GENERAL CONSTRUCTION MATERIALS/PRACTICES

.1 Materials and Resources

.1 Use uncontaminated demolition materials for fill and hardcore and/or granular base.

.2 Incorporate reused building materials as indicated.

.3 Use products and services that meet criteria of EcoLogo guidelines.

.4 Provide list of non-endorsed products and services, provided the green labelled product or services are capable of meeting specified performance requirements.

.2 Construction Waste Management

.1 Follow recommendations and requirements of this projects construction, renovation and demolition (CRD) waste management plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Resource Reuse.

.3 Recycled Content

1. Use materials with post-consumer and post-industrial recycled content.

.4 Local/Regional Materials

1. Use systems and materials having 10% by cost, of total products or materials manufactured within 800 kilometers if transported by truck or 2400 kilometers if transported by rail or water of project site.

.5 Rapidly Renewable Materials

1. Use systems and materials that originate from renewable sources.

.6 Wood

1. Use lumber sourced from independently certified well-managed forests in accordance with CAN/CSA-Z809 or FSC or SFI
2. Materials made from composite wood materials or agricultural products: must not contain urea-formaldehyde resins.

.7 Insulation

1. Utilize insulation materials meeting following requirements:
   1. Board-type thermal insulation materials must contain, when calculated on 12-month rolling basis:
      .1 Over 35% recycled material by weight of finished product if made from glass fibre.
      .2 Over 45% recycled material by weight of finished product if made from mineral composition.
   2. Loose-fill and spray-on thermal insulation materials must contain, when calculated on 12-month rolling basis:
      .1 Over 75% recycled material by weight of finished product, if made from cellulose fibre.
      .2 Over 35% recycled material by weight of finished product if made from glass fibre.
      .3 Over 50% recycled material by weight of finished product, if made from mineral wool.
   3. Use insulation materials manufactured or installed that do not include CFC's.

1.6 EXTERIOR SITE

.1 Take measures to prevent soil erosion before, during, and after construction by controlling storm-water runoff and wind erosion

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 LIMITATION OF RESPONSIBILITY

.1 For construction facilities, limitations of responsibility between Contractor and Departmental Representative are as follows:

.1 Contractor will be responsible for:

.1 Field offices;
.2 Equipment storage facilities;
.3 Outdoor storages for material and equipment;
.4 Washrooms at Work site;
.5 Transportation of personnel;
.6 Safety of own personnel and equipment;
.7 Waste disposal;

1.2 OFFICES

.1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table. Office must also be air conditioned to 22 degrees C. Provide marked and fully stocked first-aid case in a readily available location.

.1 Maintain in clean condition.

1.3 STORAGE AREA

.1 Contractor provides adequate and covered spaces, if needed, for storage of materials.

.2 Departmental Representative is not responsible for theft of tools, equipment or materials. Contractor is responsible for keeping own tools, equipment and materials safe.

1.4 CONSTRUCTION SIGNAGE

.1 Contractor must install and maintain adequate and safe signage to indicate Work-related detours, bypasses and hazards.

.2 This signage must be placed and maintained throughout duration of Work in compliance with applicable safety codes and to satisfaction of Departmental Representative. If, for some reason, signage is insufficient or poorly maintained in CBSA's opinion, fees incurred to re-establish signage will be directly deducted from amounts payable to Contractor.

1.5 CLEAN-UP

.1 Remove construction debris, waste materials and 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.

1.6 AVAILBLE SERVICES

.1 The Contractor must consider that the electricity, potable water, sanitary sewer and communication must be available on site.

PART 2 PRODUCT

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.

.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.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 Canadian Standards Association (CSA International)

.1 CSA-O121-M1978(C2003), Douglas Fir Plywood.

.3 Public Works and Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R2002D, Title: General Conditions 'C', in effect as of May 14, 2004.

1.3 ACCESS TO SITE

.1 Provide and maintain access lanes, sidewalk crossings and ramps as may be required for access to the work site.

.2 Provide and maintain access lanes and roads necessary to ensure access to third parties (access to existing border station and new border station according to the advancement of the works).

1.4 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform work and protect public.

1.5 EMERGENCY ROUTES

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

1.6 PROTECTION FOR NEIGHBOURING PRIVATE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of work.

.2 Be responsible for any damage incurred.

1.7 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.

PART 2 PRODUCTS

2.1 CONSTRUCTION FENCE

.1 Erect temporary site enclosure using new, Omega type, 1.8 m high construction fencing wired to rolled steel T-bar fence posts spaced at 2.4 m on centre. Provide at least one lockable access barrier for trucks. Excavations must be protected at the end of each day with temporary barriers. Maintain fence in good repair.

PART 3 EXECUTION

3.1 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

END OF SECTION

PART 1 GENERAL

1.1 QUALITY

.1 Products, materials, equipment and articles incorporated in Work must 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.

1.2 AVAILABILITY OF PRODUCTS

.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 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, Engineer reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.3 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 lumber and sheet materials 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 satisfaction of Departmental Representative. Use touch-up materials to match original. Do not paint over name plates.

1.4 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

.2 Unload, handle and store such products.

1.5 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.

1.6 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 the right to require dismissal from site of 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.

1.7 COORDINATION

.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.

1.8 CONCEALMENT

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

1.9 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 remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.10 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

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 Prevent overloading of parts of building.

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 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 PRODUCT

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 35 43 – Environmental Procedures

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

1.2 REFERENCES

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

.2 Regulation Respecting the Landfilling and Incineration of Residual Materials (Q-2, r 19)

1.3 PROJECT CLEANLINESS

.1 Maintain work in tidy condition, free from accumulation of waste products and debris, including that caused by the Departmental Representative or other Contractors.

.2 Remove debris and waste products from worksite regularly to keep it free from garbage, hazardous waste (HW), waste products, material, substances or equipment not needed for carrying out work and dispose of them in compliance with the regulations in effect. Proof of disposal in a place authorized by the Department of Sustainable Development, the Environment and the Fight Against Climate Change (MDDELCC) shall be provided to the Departmental Representative.

.3 Do not burn waste materials on site.

.4 Keep public roads around the worksite free from material, waste, HW, debris, residue, or scrap from the worksite, and clean the public roads immediately should any such material be found thereon.

.5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.6 Provide on-site containers for collection of waste materials and debris.

.7 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.8 Dispose of waste materials and debris off site.

.9 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.10 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.11 Provide adequate ventilation during use of volatile or noxious substances.

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

.13 Water Used for Washing Concrete Mixers

.1 Excess concrete and cement from concrete mixers shall be poured into molds or some other type of leak-proof container. Concrete residue shall be managed with construction waste.

.2 Water used for washing concrete mixers shall be collected in a leak-proof pond so as to prevent any run-off into the environment. The cleaning area shall be located over 30 m from the Saint-Lawrence River.

.3 Water used for washing shall not be released directly into a watercourse or body of water or on the ground. Water used for washing may be collected by the concrete supplier and returned to the concrete plant for disposal. Otherwise, this water shall be confined, sampled and treated (if necessary) in order to meet MDDELCC's surface water quality criteria (protection of aquatic life – acute effects) for suspended material, pH and C_{10}-C_{50}, before release into the environment.

1.4 FINAL CLEANING

.1 When work is substantially performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining work.

.2 Remove waste products and debris other than that caused by others, and leave work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products from the site and dispose of them in compliance with the regulations in effect. Do not burn waste materials on site. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Proof of disposal in a place authorized by MDDELCC shall be provided to the Departmental Representative.

.5 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.

.7 Clean lighting reflectors, lenses, and other lighting surfaces.

.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.

.12 Clean roofs, downspouts, and drainage systems.

.13 Remove snow and ice from access to building.

.14 Contractor shall recover all hazardous waste (HW) produced during the work. All HW shall be sorted and managed in compliance with the regulations in effect, more particularly the Regulation Respecting Hazardous Materials (Q-2, r. 32).

.15 Contractor shall dispose of the HW in a site duly authorized by the MDDELCC. Proof of disposal shall be provided to the Departmental Representative.

.16 Contractor shall recover all residual material produced during the work (waste, recyclables, construction debris, etc.). All residual material shall be sorted and managed in compliance with the regulations in effect.

.17 Contractor shall dispose of the residual material in a site duly authorized by MDDELCC. Proof of disposal shall be provided to the Departmental Representative.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management.

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 WASTE MANAGEMENT GOALS

.1 Exercise maximum control over solid construction waste.

.2 Protect environment and prevent pollution and environmental impacts.

.3 Minimize the amount of non-hazardous solid waste generated by the work; Maximize reduction at source, reuse and recycling of solid waste generated by construction activities.

1.2 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil and paint thinner into waterways or into storm or sanitary sewers.

PART 2 PRODUCTS

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 CLEANING

.1 Upon completion of Work, remove tools and waste. Leave Work area clean and in order.

.2 Clean Work area as Work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

PART 1 GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.2 Departmental Representative's Inspection:

.1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates in French that tasks have been performed as follows:

.1 Work: completed and inspected for compliance with Contract Documents.

.2 Defects: corrected and deficiencies completed.

.3 Equipment and systems: tested, and fully operational.

.4 Operation of systems: demonstrated to Owner's personnel.

.5 Commissioning of mechanical systems: completed in accordance with 01 91 13 – General Commissioning (Cx) Requirements and copies of final Commissioning Report submitted to Consultant.

.6 Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.

.2 When Work incomplete according to Owner and Departmental Representative, complete outstanding items and request re-inspection.

1.2 FINAL CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENT

.1 Section 01 33 00 – Submittal Procedures.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume:

.1 provide title of project;

.2 Date of submission; names.

.3 Names, addresses and telephone numbers of the Departmental Representative and Contractor with names of responsible parties.

.4 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 data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data.

1.4 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of opaque drawings and in copy of specifications.

.2 Use felt tip marking pens.

.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 grade.

.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 Provide digital photos, if requested, for site records.

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 REQUIREMENTS

.1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel one week prior to date of final inspection.

.2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.

.2 Preparation

.1 Verify conditions for demonstration and instructions comply with requirements.

.2 Verify designated personnel are present.

.3 Ensure equipment has been inspected and put into operation in accordance with Section 01 91 13 – General Commissioning (Cx) Requirements.

.4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 – General Commissioning (Cx) Requirements and equipment and systems are fully operational.

.2 Demonstration and Training

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

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

.5 Time Allocated for Training: ensure amount of time required for instruction of each item of equipment or system.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two (2) weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

.5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

.1 When specified in individual sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:

.1 Instruct Owner's personnel.

.2 Provide written report that demonstration and instructions have been completed.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

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 provided.

.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 Departmental Representative requirements or determined by designer. To meet Project functional and operational requirements.

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 include transfer of critical knowledge to facility operational personnel.

.4 Departmental Representative will issue Interim Acceptance Certificate when:

.1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.

.2 Equipment, components and systems have been commissioned.

.3 O M training has been completed.

.4 Performance testing has been completed and is compliant, and report has been submitted.

.5 Operating and manufacturer's manuals have been submitted.

.6 As-built plans have been submitted.

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 Representative, to ensure effective performance.

.2 Costs for corrective work, additional tests and 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 and confirm by writing to Departmental Representative:

.1 Adequacy of provisions for Cx.

.2 Aspects of design and installation pertinent to success of Cx.

.2 During Construction:

.1 Co-ordinate provision, location and installation of provisions for Cx.

.3 Before start of Cx:

.1 Have completed Cx Plan up-to-date.

.2 Ensure installation of related components, equipment, sub-systems and systems is complete.

.3 Fully understand Cx requirements and procedures.

.4 Have Cx documentation shelf-ready.

.5 Understand completely design criteria and intent and special features.

.6 Submit complete start-up documentation to Departmental Representative.

.7 Have Cx schedules up-to-date.

.8 Ensure systems have been cleaned thoroughly.

.9 Complete TAB procedures on systems and submit TAB reports to Departmental Representative for review and approval.

.10 Ensure as-built system schematics are available.

.4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.5 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

.1 Submit no later than 4 weeks before Cx:

.1 Name of Contractor's Cx agent.

.2 Draft Cx documentation.

.3 Preliminary Cx schedule.

1.7 COMMISSIONING DOCUMENTATION

.1 Departmental Representative to review and approve Cx documentation.

1.8 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.07 – 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 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.

1.10 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days notice prior to commencement.

.2 Departmental Representative to witness start-up and testing.

.3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.11 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 Obtain written approval of test results and documentation from Departmental Representative.

.2 Obtain manufacturer's 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 Verify with manufacturer that testing as specified will not void warranties.

.3 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.

1.12 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 required tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:

.1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.

.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.

.3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.

.1 Rejected equipment to be removed from site and replaced with new.

.2 Subject new equipment/systems to specified start-up procedures.

1.13 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.

1.14 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel. Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start-up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.2 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.3 Post instructions where directed.

.4 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.5 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.15 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.

1.16 START OF COMMISSIONING

.1 Notify Departmental Representative at least 21 days prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.17 INSTRUMENTS/EQUIPMENT REQUIRED FOR START-UP

.1 Submit to Departmental Representative for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide following equipment as required:

.1 2-way radios.

.2 Ladders.

.3 Equipment as required to complete work.

1.18 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

.1 Under actual (or accepted simulated per Departmental Representative's instructions) operating conditions, over entire operating range, in all modes.

.2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

1.19 WITNESSING COMMISSIONING

.1 Departmental Representative to witness activities.

1.20 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.

1.21 RESULTS EXTRAPOLATION

.1 When commissioning of equipment and systems susceptible to occupation, weather conditions or seasonal changes cannot be executed under conditions inferior to nominal conditions or calculation, one can extrapolate the results for partial loads, subject to the approval of the Departmental Representative. The extrapolation should be performed according to the manufacturer of equipment and systems, from the manufacturer's data and with his help, using an approved formula. This clause is not valid for loading arms and flexible hoses.

1.22 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.

1.23 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx, leave systems in normal operating mode.

.2 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.

1.24 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.

1.25 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

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

1.26 MEASUREMENT TOLERANCES DURING VERIFICATION

.1 Unless otherwise specified, actual values to be within ± 2 % of recorded values.

1.27 CLEANING

.1 Clean and touch up surfaces with shop coat that were scratched or damaged during delivery and installation (according to Paint section requirements). Use type and colour of original paint.

.2 Clean hooks, supports, fasteners and other visible ungalvanized fasteners, and apply primer to prevent rust.

.3 Right before final acceptance of facility, clean and restore all devices to new condition and leave in perfect working order.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 TANKS LEAK TESTING

.1 Impoundment

.1 The Contractor shall provide the impoundment and test the sealing of tanks. The filling must be done before spring thaw. The Contractor shall fill the tanks slowly. After the completed filling, tests are performed by the Contractor to the satisfaction of project supervisor to ensure that the exfiltration is below the required value.

The tank impoundment must be done by the inlet and not by the outlet pipes, and must be done at a rate that will prevent any damage to the structure.

.2 Performance tests

.1 The Contractor must demonstrate, at the end of works, that built or installed tanks respond well to water retention characteristics (relative sealing) specified in this article. For the purpose of this article, the term "completion" means that all works are completed in the tank, and that all the equipment was installed in the tanks. This performance test is the responsibility of the Contractor and shall be done under the supervision of the representative of the Supervisor.

.2 The steps for performance testing are:

- Ensure that the entire interior of the tank was cleared of all residues, construction debris or other, and that all elements of the ventilation system are firmly in place.
- Perform the filling of tanks using clear or clean water, pumped from the nearest river or delivered on site using a tanker truck.
- All sections of all tanks must be filled to normal operating level with clean water. If it proves impossible to fill all tanks with clean water, the supervisor may authorize another filling method.
- When all sections have reached their normal level of operation, interrupt the filling. Also stop the aeration if it has been used during filling.
- Close the isolation valves at the inlet and outlet of the tanks.
- The performance test consists of measuring the lowering of the water level in the basin each day over a period of three (3) days.
- If the Contractor precedes the actual test by a wetting period of one or several days, it should reduce the level of water in the tank to its normal operating level before the start of the performance tests.
- Water maximum permissible losses are 1.0 mm / day. These values are not corrected for precipitation and evaporation effects.

.3 If the lowering of the water level exceeds the values prescribed above, corrected for precipitation and evaporation, the Contractor shall make the necessary corrections. These corrections must be followed by a second complete test performance, and so on if necessary. The correction works must be performed in a manner and with materials approved by the project manager, at the Contractor's expense.

.4 The Contractor shall verify the performance of the aeration system immediately before or after the performance test (sealing) described in this section. Adjustments to the ventilation system must be performed, if necessary, together with the corrections to the civil Department Representative works.

.5 The Contractor may not request the provisional acceptance of works before any defect is corrected and the performance tests described in this article was made and successful to the satisfaction of the supervisor.

3.2 FUNCTIONAL TESTS OF MECHANICAL EQUIPMENTS

.1 General

.1 The Contractor shall, in collaboration with suppliers, perform the start-up of each piece of equipment. He must also take the usual precautions such as oiling, greasing, checking the direction of rotation, verifying there is no obstruction, etc.

.2 The Contractor must ensure that the manufacturers' instructions are followed and respected. He must provide a written confirmation that all devices have been put into operation, that all checks have been done and that all facilities provided are free from defects.

.3 Functional tests must be performed in the presence of a Department Representative.

.4 He shall notify the Department Representative at least one (1) week before proceeding with finalizing. The tests in the presence of the Department Representative are only performed when the Contractor has already made his own trial and all necessary correctives.

.5 The Contractor shall modify or replace the equipment, materials or machinery that do not meet the usual conditions and specific operations to this project.

.6 During the commissioning, the Contractor provides all the equipment necessary for the good progress of the tests.

.7 At the final acceptance, the Contractor shall resume the same tests if requested by the Department Representative.

.8 The Contractor must carry out dry-run testing, or load as appropriate, all equipment and machinery as requested and directed by the Department Representative, in order to verify that the specific conditions of use and operation are met.

.2 Dry-RUN testing

.1 Dry-run testing include, without limitation, the usual verifications before switching on equipment such as:

- Free rotation of moving parts;
- Rotation direction;
- Bolts tightening;
- Alignment and balancing;
- Check if equipments are ready to use;
- Valves and check valves operation;
- Open/Closed identification;
- Electrical connection between the equipment and the starter;
- Operation of instrumentation loops;
- Perform a complete inspection of various control panels and electrical systems;
- Continuity of the grounding;
- Protections of overload and low voltage;
- Connection of all electrical services, control, etc.;
- Lighting equipments and receptacles;
- Phases load balancing;
- Alarms;
- Oil equipment ;
- Protection systems of various mechanical equipment;
- Amperage of motorized elements;
- Magnetic and manual starters;
- Operation of all alarm conditions and possible faults;

- Operation of timers (with chronometer for correctness);
- Operation in general: pressure gauges, check valves, valves, etc.

.3 Equipment engines must be verified by the Contractor at the factory and the report should include, but not be limited to, the following tests:

- Motor no-load current measurement ;
- Locked rotor current measurement;
- Full load current measurement without power factor correction.

.3 Starting tests

.1 After completion of the installation of equipment and dry-tests, the Contractor performs the startup of all equipment. This startup can be achieved only after an approval of the proceeding is given by the owner.

.2 The Contractor shall notify the owner at least forty-eight (48) hours in advance of any startup to come. The Contractor shall also coordinate with other contractors involved. During the startup period, the Contractor shall provide skilled labor for the operation of the equipment and any element required to properly operate, all without additional cost to the Owner. It must subsequently, eliminate any water and chemicals used.

.3 The Contractor is fully responsible for the equipment and its operation during the start-up period. If there is damaged equipment during water commissioning tests, the Contractor should repair or replace this equipment to the owner's satisfaction and without extra charge.

.4 During the startup period, the Contractor shall make all the equipments changes and adjustments and it must show that the equipment is capable of operating properly and is ready for the continuous test period.

.5 The Contractor shall perform all the tests specified below and must provide the Owner all test reports. The tests generally include the following checks:

- Sealing of structures and equipments;
- Doing pressure tests;
- Performing various tests on air devices based on energy consumption;
- Protection systems of various mechanical equipments;
- Amperage of motorized elements;
- Magnetic and manual starters;
- Operation of all alarm conditions and possible faults;
- Operation of timers (with chronometer for correctness);
- Operation in general: pressure gauges, check valves, valves, etc.;
- Operation of each valve.

.4 Performance tests

.1 The Contractor shall conduct performance tests to verify that the required performance criteria are met. These tests are performed when the previous operating tests and patches if any, are made. In some cases, the operation and performance tests can be conducted simultaneously. The complete tests with the report shall be borne by the Contractor. The test protocols must be submitted to the Department Representative for approval.

.2 For each performance test, a complete report must be submitted containing the results. The report in three (3) copies summarizes:

- Test protocol;

- Conditions during tests;
- Instrumentation diagrams;
- Interpretation and discussion of results;
- Conclusions and recommendations.

3.3 PRE-INSPECTION VISITS

.1 At the pre-inspection visit by the Owner, attended by all stakeholders, the Contractor must review the verification and testing program.

.2 The Contractor must establish with the Owner the schedule to complete the work and correct deficiencies.

.3 The visit also serves to plan, with all stakeholders, the continuous testing and the probable date of provisional acceptance.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 03 20 00 – Concrete Reinforcement

.3 Section 03 30 00 – Cast-In-Place Concrete

.4 Section 01 47 15 – Sustainable Requirements - Construction

.5 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

1.2 REFERENCES

.1 Canadian Standards Association (CSA)/CSA International

.1 CAN/CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CAN/CSA-O86-09, Engineering Design in Wood.

.3 CSA O121-08, Douglas Fir Plywood.

.4 CSA O151-09, Canadian Softwood Plywood

.5 CSA O153-FM1980(C2003), Poplar Plywood.

.6 CAN/CSA-O325-07, Construction Sheathing.

.7 CSA O437 Série-F93(C2006), Standards for OSB and Waferboard.

.8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.

.9 CAN/CSA-S269.3-FM92(C2003), concrete Formwork, National Standard of Canada

1.3 DOCUMENTS AND SAMPLES TO SUBMIT

.1 Submit shop drawings for the formwork and temporary shoring works in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop drawings must indicate, show or include the method and schedule of construction, procedures for shoring stripping and replacing props, materials, unique design features of finished exposed surfaces, arrangement of joints, tie and interior finishes, and the location of temporary embedded parts. Comply with CSA S269.1 for temporary shoring works drawings. Comply with CAN/CSA-S269.3 for to formwork drawings,

.3 Shop drawings must indicate, show or include formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms

.4 Indicate sequence of erection and removal of formwork/shoring as directed by DCC representative.

.5 Each submittal of shop drawings must be stamped and signed by professional engineer registered or licensed in Québec, Canada.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with section 01 47 15 – Sustainable Requirements - Construction.

.2 Waste Management and Disposal

.1 Separate waste materials for reuse and recycling according to 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 containers are sealed and stored correctly, out of reach of children, while in storage for disposal.

.4 Use sealers, formwork removal agents and form stripping agent which are non-toxic, biodegradable with no or low levels of volatile organic compounds (VOCs)

PART 2 PRODUCTS

2.1 MATERIALS

.1 Materials and resources: in accordance with section 01 47 15 – Sustainable Requirements – Construction.

.2 Formwork Materials

.1 For concrete without special architectural features, use wood and wood product formwork materials in compliance with standards CSA O121, CAN/CSA-O86, CSA O437 Series CSA O153."Duraform" type panels are authorised for buried works.

.2 For concrete with special architectural features, use formwork materials in compliance with CSA-A23.1/A23.2 "Duraform" type panels are not authorised for above ground works.

.3 Form Ties

.1 For concrete not designated 'Architectural', 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 Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.4 Form release agent: non-toxic, biodegradable, low VOC.

.5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal at 40 degrees C, flashpoint minimum 150 degrees C, open cup

.6 Temporary shoring materials: in accordance with standard CSA-S269.1.

PART 3 EXÉCUTION

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and axis centre before proceeding with formwork/shoring and ensure dimensions agree with drawings.

.2 Obtain representative ministerial approval before casting concrete directly in the ground or reserving in earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect temporary shoring works in accordance with standard CSA S269.1 and by the COFI, Exterior Plywood for Concrete Formwork guide

.5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.6 Do not place shores and mud sills on frozen ground.

.7 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3, to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.

.9 Align form joints and make watertight. Keep form joints to a minimum.

.10 Unless otherwise specified, use 25 mm chamfer strips on external corners and/or 25 mm fillets for the inside corners of formwork joints.

.11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.12 Construct forms for architectural concrete, and place ties as indicated and as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.13 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.14 Before placing concrete, clean formwork in accordance with CSA-A23.1/A23.2.

.15 Construction joints in footings and walls shall be located so as to reduce stresses in the structural elements and the engineer's approval. Refer to drawings.

.16 Anchor bolts and embedded plates are installed by the formwork contractor, but supplied by the steel manufacturer. For location, consult structural drawings and coordinate with the steel frame manufacturer. Anchor bolts must be vertical, be placed with templates and the location tolerance is 1,5mm. The embedded plates must be fixed firmly to the formwork with a tolerance of 10mm.

3.2 REMOVAL AND RESHORING

.1 After placing concrete, leave formwork in place for the following minimum periods of time:

- .1 Three (3) days for walls and sides of beams.
- .2 Thirty (30) days for columns.
- .3 Twenty one (21) days for beam soffits, slabs, decks and other structural members, or seven (7) days when replaced immediately with adequate shoring to standard specified for shoring works
- .4 Three (3) days for footings and abutments.

.2 Remove formwork when concrete has reached 75 % of its design strength or minimum hardening period previously noted, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.4 Space reshoring in each principal direction, at not more than 3000 mm.

.5 Re-use formwork and shoring work subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 03 30 00 – Cast-In-Place Concrete

1.2 REFERENCES

.1 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual 2004.

.2 ACI 315-99, Details and Detailing of Concrete Reinforcement.

.3 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A143/A143M-03, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.2 ASTM A185/A185M-05a, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.3 ASTM A497/A497M-05a, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

.4 ASTM A775/A775M-04a, Standard Specification for Epoxy Coated Reinforcing Steel Bars.

.3 Canadian Standards Association (CSA)/CSA International

.1 CSA-A23.1-F04/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-A23.3-F04, Design of Concrete Structures.

.3 CAN/CSA-G30.18-FM92(C2002), Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.

.4 CSA-G40.20/G40.21-F04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CAN/CSA-G164-FM92(C2003), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada..

.6 CSA W186-FM1990(C2002), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 DOCUMENTS AND SAMPLES TO SUBMIT

.1 Submit required shop drawings showing location of reinforcements in accordance with Section 01 33 00 – Submittal Procedures

.2 Indicate on shop drawings the list of reinforcing bars required, the number of elements and reinforcing bars necessary and their bar bending details, Sizes, spacing, locations of reinforcement and mechanical splices if approved by the DCC representative. Reinforcement bars shown must be marked with identifying code marks to permit correct placement without reference to structural drawings. Drawings must also specify sizes, spacing and locations of chairs, spacers and bar supports. Reinforcement drawings must be

prepared according to RSIC Manual of Standard Practice and ACI 315 and the ACI 315R Manual of Engineering and Placing Drawings for Reinforced Concrete Structures, published by ACI.

.3 Detail lap lengths and bar development lengths must be in compliance to CSA-A23.3. Unless otherwise indicated, provide type B tension lap splices where indicated.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 47 15 – Sustainable Requirements: Construction.

.2 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.

.2 Place materials defined as hazardous or toxic in designated containers.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Departmental representative.

.2 Reinforcing steel: high adherence, billet steel, grade 400, deformed bars in accordance to CAN/CSA-G30.18, unless indicated otherwise.

.3 Reinforcing steel: high adherence weldable low alloy steel deformed bars in accordance to CAN/CSA-G30.18.

.4 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.

.5 High adherence deformed steel wire for concrete reinforcement: to ASTM A497/A497M.

.6 Welded steel wire fabric: to ASTM A185/A185M.

.1 The wire fabric must be provided in flat sheets only.

.7 Welded high adherence steel wire fabric: to ASTM A497/A497M.

.1 The wire fabric must be provided in flat sheets only.

.8 Epoxy Coating of non-prestressed reinforcement: to ASTM A 775/A 775M.

.9 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.

.10 Mechanical splices: subject to approval of Departmental representative.

.11 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

.1 Unless otherwise indicated, fabricate reinforcing steel in accordance with /CSA-A23.1/A23.2 and ANSI/ACI 315, Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, as well as ACI315R named *Manual of Engineering and Placing Drawings for Reinforced Concrete Structures*, published by ACI.

.2 Obtain Departmental representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Departmental representative, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists of required bars.

.5 Unless otherwise indicated, use standard bends.

2.3 SOURCE QUALITY CONTROL

.1 At least four (4) weeks prior to beginning reinforcing work, provide Departmental representative, if requested, a certified copy of mill test report of reinforcing steel, showing physical and chemical steel reinforcing analysis.

.2 If requested, inform the Departmental representative of proposed source of material to be supplied.

PART 3 EXECUTION AND PREPARATION

3.1 FIELD CONSTRUCTION BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain Departmental representative's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

.5 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

.6 The reinforcements must be securely attached to ensure that they remain in place during concrete placement.

.7 Use black standard wire for black reinforced structures and galvanized wire for galvanized reinforcements.

3.3 FIELD TOUCH-UP

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

3.4 SLAB-ON-GRADE REINFORCEMENT

.1 Do not place directly on the ground wire fabric or reinforcement of slabs in preparation for subsequent lifting.

.2 Place concrete blocks with a 1.2 m x 1.2 m pattern beforehand.

END OF SECTION

PART1 GENERAL

1.1 RELATED SECTIONS

.1 Section 03 10 00 – Concrete Formwork, Temporary Shoring and Accessories

.2 Section 03 20 00 – Concrete Reinforcing

.3 Section 05 12 23 – Structural Steel for Buildings

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C260-01, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C309-03, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C330-04, Standard Specification for Lightweight Aggregates for Structural Concrete.

.4 ASTM C494/C494M-05, Standard Specification for Chemical Admixtures for Concrete.

.5 ASTM C1017/C1017M-03, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.6 ASTM D412-98a (2002)e1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

.7 ASTM D624-00e1, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.8 ASTM D1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.9 ASTM D1752-04a, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.

.2 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3 Canadian Standards Association (CSA)/CSA International

.1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.

.3 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ACRONYMS AND TYPES

.1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).

.1 Type GU or GUb : General use cement.

.2 Type MS or MSb : Moderate sulphate-resistant cement.

.3 Type MH or MHb : - Moderate heat of hydration cement.

.4 Type HE or HEb : - High early-strength cement.

.5 Type LH or LHb : Low heat of hydration cement.

.6 Type HS or HSb : High sulphate-resistant cement.

.2 Fly ash:

.1 Type F: with CaO content less than 8%.

.2 Type CI: with CaO content ranging from 8 to 20%.

.3 Type CH: with CaO greater than 20%

.3 Type S: Ground, granulated blast-furnace slag.

1.4 DESIGN REQUIREMENTS

.1 Alternative 1 - Performance: in accordance with CSA-A23.1/A23.2 and as described in MIXES of PART 2 – PRODUCTS.

1.5 DOCUMENTS AND SAMPLES TO SUBMIT

.1 Submit required samples in accordance with Section 01 33 00 – Documents and Samples to Submit

.2 At least 4 weeks prior to beginning Work, notify the Departmental representative of the source proposed for aggregate supply and allow him to have access for sampling

1.6 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 – Quality Control.

.2 Submit to Departmental representative, minimum 4 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete.

.1 When plant does not hold valid certification, provide test data and certification by qualified independent inspection and testing laboratory that materials used in concrete mixture will meet specified requirements.

.3 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures for review by Departmental representative, for his inspection, the proposed method for the quality control of the following items:

.1 Erection of temporary shoring

.2 Hot weather concrete

.3 Cold weather concrete

.4 Curing

.5 Finishes

.6 Formwork removal

.7 Joints

.4 Quality Control Plan: submit a written report to Departmental representative, as described in PART 3 – VERIFICATION, verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 – PRODUCTS.

.5 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

.1 Modifications to maximum time limit must be agreed to Departmental representative and concrete producer as described in A23.1/A23.2.

.2 Deviations to be submitted for review by Departmental representative for inspection.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.3 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.

.2 Divert unused concrete materials to local quarry or recycling facility authorised by the Departmental representative.

.3 Provide an appropriate area on the job site where concrete trucks can be safely washed.

.4 Divert unused admixtures and additive materials (pigments, fibres) to official hazardous material collections site as approved by the Departmental representative.

.5 Unused admixtures and additive materials must not be disposed of 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 SUSTAINABLE REQUIREMENTS

.1 Materials and resources in accordance with Section 01 47 15 – Sustainable Requirements: Construction.

2.2 MATERIALS

.1 Cement: for general use, compliant to CAN/CSA-A3001, de type GU.

.2 Hydraulic cement: based compound silica fume type GUb-SF compliant to standard CAN/CSA-A3001.

.3 Water: compliant to standard CSA-A23.1.

.4 Aggregates: compliant to CAN/CSA-A23.1/A23.2 and a nominal size not exceeding:

- 14 mm for concrete slabs on metal decking;
- 20 mm for all other cases.

Fine aggregates must be composed of only natural sand.

The physical properties of aggregates have met the requirements set out in Table 12 CAN/CSA-A23.1. The coarse aggregate shall meet the requirements of concrete subjected to freeze-thaw cycle.

.5 Admixtures

.1 Air entraining admixture: compliant to ASTM C260.

.2 Admixture: compliant to ASTM C494 ASTM C1017. The Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.6 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents, compliant to CSA-A23.1/A23.2

.1 Compressive strength: 30 MPa at 28 days.

.2 Net Shrinkage: maximum 2 % at 28 days.

.7 Non-premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and able of developing compressive strength of 50 MPa at 28 days.

.8 Curing compound: compliant to CSA-A23.1/A23.2 white, and ASTM C309, Type1-D with fugitive dye

.9 Ribbed waterstops: extruded PVC of sizes indicated with corner and intersecting pieces with legs of at least 500 mm long, shop welded:

.1 Tensile strength: compliant to ASTM D412, Die C, minimum 11.4 MPa.

.2 Elongation: compliant to ASTM D412, Die C, minimum 275 %.

.3 Tear resistance: compliant to ASTM D624, method A, Die B, minimum 48 kN/m.

.10 Pre-moulded joint fillers:

.1 Bituminous impregnated fiber-board: compliant to ASTM D1751.

.2 Sponge rubber: compliant to ASTM D1752, type I, flexible grade.

.3 Self-expanding cork: compliant to ASTM D1752, type II.

.11 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.

.12 Bonding Adhesive -:

.1 Compliant to ASTM D696 et D790.

.2 Resistant to temperatures ranging between – 60 °C and 145°C.

.3 With an adhesion strength ranging from 6.9 MPa, compliant to ASTMD1002.

.13 Silane Sealer

.1 A penetrating monomeric silane solution that is capable of forming a water-repelling (hydrophobic) layer on and in the surface of concrete.

.2 Properties at 23 °C and 50 % H.R.

.1 Active ingredients: 100 %

.2 Specific gravity: 0.88 kg/L

.3 Viscosity: 5-10 cps

.4 Colour and finished: colourless, invisible.

.14 Sealer, densifier agent :

.1 A one-component liquid sodium silicate surface hardener.

.2 Properties at (23 °C and 50 % R.H.)

.1 pH : 11.7

.2 Density : 1.2 kg/L.

.3 Water Vapour Transmission ASTM E 96 : Not a vapour barrier.

.4 Abrasion (Taber Abrader, Wheel H22/1000 g/500 cycles) : 35 % increase in abrasion resistance.

.15 Elastomeric Joint Sealant :

.1 Fill construction joints and / or separation joints and the saws cut with an elastomeric sealing with two components, polyurethane-based.

.2 Properties at (23 °C and 50 % R.H.)

.1 Tear Strength ASTM D 624 : 17.5 N/mm

.2 Shore A Hardness ASTM D 2240 : 40 ± 5

.3 Tensile strength at break : 1.2 MPa

.4 Tensile elongation : 650 %

.5 100 % Modulus: 0.69 MPa

2.3 MIXES

.1 Alternative 1 – Performance method for specifying concrete: compliant to Departmental representative performance criteria in accordance with CAN/CSA A23.1/A23.2.

.1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 – VERIFICATION.

.2 Provide concrete mix to meet following plastic state requirements:

.1 Uniformity

.2 Placeability

.3 Workability: free of surface blemishes, loss of mortar, colour variations and segregation

.4 Finishability: 2 % maximum bleeding and should be absorbed within 24 hours.

.5 Set time: normal.

.6 Slump: at least 60 mm but not more than 100 mm at the time of discharge from the mixer truck. In all cases where the addition of a superplasticizer is accepted, the minimum and maximum slump will be checked before the superplasticizer is incorporated into the concrete. After the addition of the superplasticizer, slump must be maximum 150 mm.

.3 Produce and supply normal density concrete according to the following requirements:

	Exposition Type	Compressive Strength at 28 days (MPa)	Ciment	Maximum ratio W/CM	Slump	Aggregate	Air content
			Type				
Blinding concrete, concrete filler under seats or footing and canalization.	F-2	20	GU	----	Less than 80 mm	20	5 % to 8 %
Interior concrete and buried : Footings, seats, interior walls, slabs on grade and pilasters.	N	25	GU	----	Less than 80 mm	20	----
Exposed walls foundation.	F-2	35	GU	0,45	60 mm to 100 mm	20	5 % to 8 %
Exterior concrete : bases, slabs on grade and ramps.	C-1	35	GU	0,45	60 mm to 100 mm	20	5 % to 8 %
Curbs, sidewalks	C-2	35	GU	0,45	60 mm to 100 mm	20	5 % to 8 %

.4 Provide quality management plan to ensure verification of concrete quality to specified performance.

.5 Concrete supplier's certification.

.6 The use of calcium chloride is prohibited.

.7 The Contractor shall submit the mix formula to the Departmental Representative for approval. No concrete can be placed without the mix formula being approved.

PART 3 EXECUTION

3.1 PREPARATION

.1 Obtain Departmental representative's approval before placing concrete.

.1 Provide 48 hours notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 – Concrete Reinforcing.

.3 During concreting operations.

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete obtain Departmental representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Protect previous Work from staining.

.8 Clean and remove stains prior to application for concrete finishes.

.9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.10 Do not place load upon new concrete until authorized by Departmental representative.

3.2 CONSTRUCTION

.1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2.

.2 Sleeves and inserts

.1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental representative.

.2 Where approved by Departmental representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental representative.

.4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental representative before placing of concrete.

.5 Check locations and sizes of sleeves and openings shown on drawings.

.6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor Bolts

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.2 With approval of Departmental representative, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be minimum 25 mm larger in diameter than bolts used to manufacturers' recommendations.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Set bolts and fill holes with shrinkage compensating grout.

.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.4 Drainage holes and weep holes

.1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories If wood forms are used, remove them after concrete has set.

.2 Install weep hole tubes and drains as indicated.

.3 anchor slots at 800 mm on centre where concrete walls are masonry faced.

.5 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

.6 Finishing and curing

.1 Curing must be realized in accordance with CSA-A23.1/A23.2.:

.1 Retaining formwork as described to section 03 10 00 – Concrete Forming and Accessories.

.2 Retaining wet surface 7 days consecutively.

.2 Finish concrete in accordance with CSA-A23.1/A23.2.

.1 Table 22

.2 The exterior slabs, sidewalks and curbs are monolithic finish with wood trowel and broom finish to make the non-skid surface. Apply a layer of sealing based silane at a rate of 4.8 m²/L depending on the porosity of the concrete. See location plan.

.3 Where indicated on plans, apply a sealer-densifier agent on slab on grade.

.3 Use procedures as reviewed by Departmental representative, or those noted CSA-A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.

.4 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible

.5 Provide swirl-trowelled finish where floor tile is to be applied.

.6 Provide swirl-trowelled finish unless otherwise indicated.

.7 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

.7 Waterstops

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in a way that could hamper performance.

.3 Do not displace reinforcement when installing waterstops.

.4 Use equipment to manufacturer's requirements to field splice waterstops.

.5 Tie waterstops rigidly in place.

.6 Use heat sealed butt joints in field only on straight lengths

.7 Use factory welded corners and intersections unless otherwise approved by Departmental representative.

.8 Joint fillers

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental representative.

.2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Locate and form isolation, construction and expansion joints as indicated.

.4 Install joint filler.

.5 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface, unless indicated otherwise.

.9 Damp proof membrane

.1 Install damp proof membrane under concrete slabs-on-grade inside building.

.2 Lap damp proof membrane minimum 150 mm at joints and seal.

.3 Seal punctures in damp proof membrane before placing concrete.

.4 Use patching material at least 150 mm larger than puncture and seal.

3.3 SURFACE TOLERANCE

.1 Concrete tolerance in accordance with CSA-A23.1/A23.2.

3.4 FIELD QUALITY CONTROL

.1 Site tests: conduct following test [in accordance with Section 01 45 00 – Quality Control and submit report as described in PART 1 – DOCUMENTS AND SAMPLES TO SUBMIT.

.1 Concrete pours.

.2 Slump tests.

.2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental representative, for review in accordance with CSA-A23.1/A23.2.

.1 Ensure testing laboratory is certified in accordance with CSA A283.

.3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental representative.

.4 The Departmental representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

3.5 VERIFICATION

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

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 04 05 12 - Mortar and Masonry Grout.

.2 Section 04 05 23 - Masonry Accessories.

.3 Section 04 22 00 - Concrete Unit Masonry.

.4 Section 05 50 00 - Metal Fabrications.

.5 Section 07 92 10 - Joint Sealants.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA A179-94(R1999), Mortar and Grout for Unit Masonry.

.2 CSA-A371-94 (R1999), Masonry Construction for Buildings.

1.3 SCOPE OF WORK

.1 The following non-exhaustive list describes in general the masonry work to be carried out as part of the current project, without being limited by this list, and excepting masonry work described in the sections on demolition:

.1 Supply and installation of new face brick for the building addition.

.2 Supply and construction of new interior block walls in the building addition and in existing building.

.3 Dismantling and reconstruction of sections of brick and block walls to allow integration of new steel structure in existing building.

.4 Dismantling and reconstruction of sections of brick wall to allow waterproofing of joint between new and existing roofs and walls.

.5 Repair of brick facing damaged by removal of conduits or equipment.

.6 Any other work described in the documents and required in order to achieve complete and finished Work.

1.4 SAMPLES

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

.2 Submit samples as follows:

.1 Two of each type of masonry unit specified.

.2 One of each type of masonry accessory specified.

.3 Minimum required for testing purposes.

1.5 TEST REPORTS

.1 Submit laboratory test reports in accordance Section 01 33 00 – Submittal Procedures.

.2 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.

.3 For clay elements, respect CSA and ASTM requirements mentioned above. Specify initial absorption rate of proposed elements.

1.6 MOCK-UPS

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

.2 Construct mock-up panel of exterior masonry wall construction 1200 x 1800 mm showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, mortar and workmanship.

.3 Construct mock-up where directed.

.4 Allow 24 hours for inspection of mock-up by Ministerial representative before proceeding with work.

.5 When accepted by Ministerial representative, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to job site in dry condition.

.3 Keep materials dry until use except where wetting of bricks is specified.

.4 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.8 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal paper, plastic and corrugated cardboard packaging material in accordance with Waste Management Plan.

1.9 SITE CONDITIONS

.1 Cold weather installation to be in accordance with following instructions, applicable standards, and requirements of masonry veneer product manufacturers in regards to temperature, heating, and protection.

.2 The use of antifreeze or salt to lower freezing point of mortar is not permitted. The use of calcium chloride or other accelerating agents is also not permitted.

.3 Ensure that during cold weather masonry installation, substrate insulation is in place in order to create a weather barrier that will help maintain prescribed temperature within temporary work shelter. If for a reason out of Contractor's control the insulation is not installed in time, masonry sub-contractor must take necessary precautions to maintain prescribed temperature for the time required for mortar to cure.

.4 Cold weather installation:

.1 Below 4.4 degrees C: Mortar temperature to be between 21 degrees C and 48.9 degrees C; water and sand temperature to be between 21 degrees C and 71 degrees C.

.2 Below 0 degrees C, location to be enclosed and heated. Water and sand to be heated to between 21 degrees C and 71 degrees C.

.3 Below 7.8 degrees C, masonry elements to be heated to at least 4.4. degrees C.

.4 No masonry installation to be performed when temperature is below negative 17.8 degrees C if requirements for heating, shelter, and other recommendations of this section are not met.

.5 Heating and shelter requirements:

.1 When temperature is between 0 degrees C and 4.4 degrees C: normal conditions (use minimal required protection).

.2 When temperature is between negative 3.9 degrees C and 0 degrees C: heat with salamanders and provide windbreak type shelter.

.3 When temperature is between 7.7 degrees C and negative 3.9 degrees C: heat with salamanders am<nd provide plastic or canvas shelter.

.4 Add following specifications to requirements of paragraph 5.15.2 of CSA-A371.

.6 Hot weather installation:

.1 Cover fresh masonry work with non-staining weatherproof tarp in order to keep mortar from drying out.

.2 As long as masonry work is not finished or protected by flashings or other permannet construction, it must be kept dry with non-staining weatherproof tarps extended over walls for a distance sufficient to protect from wind-driven rain.

.3 Protect masonry work and adjacent work from dirt and damage. Protect finished work from mortar spatter with non-staining tarps.

1.10 PROTECTION OF WORK

.1 Protect masonry work and adjacent work from dirt and damage.

.2 Protect finished work from mortar spatter with non-staining tarps.

.3 Protect exterior walls at grade level from soil spatter before sodding or other landscaping work.

.4 Provide temporary shoring of masonry work until permanent lateral support is in place.

PART 2 Products

2.1 MATERIALS

.1 Masonry materials are specified in Related Sections.

PART 3 Execution

3.1 INSTALLATION

.1 Do masonry work in accordance with CSA-A371 except where specified otherwise.

.2 Build masonry plumb, level, and true to line, with vertical joints in alignment.

.3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.2 CONSTRUCTION

.1 Jointing.

.1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.

.2 Cutting.

.1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.

.2 Make cuts straight, clean, and free from uneven edges.

.3 Building-In.

.1 Build in items required to be built into masonry.

.2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.

.3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.

.4 Joints: When work is interrupted in mid-course or at building corners:

.1 Step-back blocks starting from most recent full course.

.2 At no time shall a section of wall under construction be more than 1220 mm higher than an adjacent section of wall.

.5 Support of loads.

.1 Use grout to CSA A179 where grout is used in lieu of solid units.

.2 Install building paper below voids to be filled with concrete; keep paper 25 mm back from faces of units.

.6 Provision for movement.

.1 Leave 3 mm space below shelf angles.

.2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.

.3 Built masonry to tie in with stabilizers, with provision for vertical movement.

.7 Steel windows.

.1 Install the steel window frames that will serve as lintels. Centre over opening width.

.8 Lateral support angles:

.1 Install steel angles along tops of block walls as indicated.

.9 Control joints.

.1 Construct continuous control joints as indicated.

.10 Expansion joints.

.1 Build-in continuous expansion joints as indicated.

3.3 SITE TOLERANCES

.1 Tolerances in notes to Clause 5.3 of CSA-A371 apply.

.2 The following tolerances are permitted for visible masonry work:

.1 From fixed reference point: 3 mm for length of 2.5 meters.

.2 At openings: additional 6 mm.

.3 Assume full responsibility for precision of dimensions, plumbing and leveling of Work, and continuous verification with graduated rod.

.4 Masonry courses shall be of equal height, horizontal and vertical joints shall be of constant width, and both coursing and jointing shall match existing pattern.

.5 Place first masonry course without mortar for Ministerial representative's approval of joint locations.

3.4 COOPERATION WITH OTHER TRADES

.1 Make openings in masonry where necessary or where indicated.

.2 Carefully execute, at indicated locations and dimensions, housings and openings for conduits.

.3 Where masonry encloses conduits or plumbing, ensure flush setting as required. Do not close openings or housings for plumbing or conduits until receiving confirmation that inspections and tests have taken place.

.4 In cooperation with all other trades, verify if all elements to be integrated into masonry wals are in place, or if they are to be installed prior to or at the time of wall construction. To this end, check all mechanical, electrical, and structural documents, as well as documents of any other consultant.

3.5 CLEANING

.1 When masonry work is finished, remove all stains, spatters, or surplus mortar with wooden paddle.

.2 As needed. Patch or replace defective mortar with fresh mortar to match existing mortar, according to requirements of these specifications.

.3 Rub surfaces with non-darkening alkaline cleaning solution in accordance with manufacturer's recommendations.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 All sections of division 04.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA A179-94(R1999), Mortar and Grout for Unit Masonry.

1.3 PRODUCT DATA

.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide instructions for:

.1 Reference standards for product in question.

.2 "Factory-prepared mix standards" table indicating mortar characteristics (compression strength, water retention, air contents).

.3 Test certificates for mortar mix batches delivered to site for use in work.

1.4 SAMPLES

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

.2 Submit two size samples of each coloured mortar

.1 Samples to be submitted in clear plastic channels, 12 x 12 x 100 mm long.

.2 Identify each type of mortar and each pigment colour.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate for disposal paper, and corrugated cardboard packaging material in accordance with Waste Management Plan.

PART 2 Products

2.1 MATERIALS

.1 Use same brands of materials and source of aggregate for entire project.

.2 Mortar and grout: CSA A179.

.3 Type 10 Portland cement, to CAN/CSA-A5.

.4 Type "S" hydrated lime, to ASTM C270-91 (1997).

.5 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.

.6 Colour: ground coloured natural aggregates or metallic oxide pigments.

.7 Use of admixtures in not permitted.

2.2 MORTAR TYPES

.1 Factory-mixed mortar with compression strength similar to adjacent masonry elements. Mortar may be delivered with sand mixed into matrix: add water according to instructions.

.2 Mortar for exterior masonry above grade:

.1 Loadbearing: type S based on Property specifications.

.3 Mortar for interior masonry.

.1 Non-Loadbearing: type M based on Property specifications.

.4 Grout: to CSA A179, Table 3.

2.3 CONCRETE

.1 Concrete for filling concrete block lintels and reinforced concrete block cavities, to CSA A179 (most recent revision):

.1 1 part Portland cement.

.2 2 parts sand.

.3 2 parts gravel, 9.5 mm to 4.75 mm minimum, to ASTM 92.

2.4 COLOUR

.1 Concrete block masonry: colourless mortar.

PART 3 Execution

3.1 CONSTRUCTION

.1 Do masonry mortar and grout work in accordance with CSA A179 except where specified otherwise.

3.2 MIXING

.1 Mixing to be done with mechanical mixer; clean and free of dried mortar, rust, or other contaminant; do not defrost equipment with salt or antifreeze.

.2 Use 1 cubic foot containers for precision measurement of required quantity of sand according to grout type. Measuring sand with shovel is not permitted.

.3 Prepare mortars according to supplier's instructions in regards to proportion of water to cementitious materials, as well as steps to follow in mixing. Perfectly respect water quantities required per sack of mortar as prescribed by manufacturer.

.4 Total mixing time to be no less than 8 minutes and no more than 10 minutes. Let rest 2 minutes and remix 2 minutes. For mortar coloured on-site, mixing to be between 8 and 12 minutes to ensure complete and uniform dispersion of pigments.

3.3 INSTALLATION TIMEFRAME FOR MORTAR AND GROUT

.1 Mortar to be used and applied within 2.5 hours following mixing; when air temperature is equal or higher than 25°C, timeframe is reduced to 1.5 hours. Past these limits, mortar must be rejected.

3.4 REMIXING

.1 Remixing of mortar stiffened due to evaporation is not permitted; such mortar must be rejected.

3.5 COLOUR UNIFORMITY

.1 In order to ensure uniformity of mortar colour, Contractor should:

- .1 Use clean water from a single source.
- .2 Avoid adding water after initial mixing in order to make mortar more workable.
- .3 Always smooth joints within the same time after initial application of mortar.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal procedures

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

.3 Section 03 30 00 – Cast-in-Place Concrete

.4 Section 04 05 10 – Common Work For Masonry

.5 Section 04 05 12 – Masonry Motar and Grout

1.2 REFERENCES

.1 CSA Group

.1 CAN/CSA A23.1/A23.2-F14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CAN/CSA-A370-F14, Connectors for Masonry.

.3 CAN/CSA-A371-F14, Masonry Construction for Buildings.

.4 CAN/CSA G30.18-F09 (C2014), Carbon Steel Bars for Concrete Reinforcement.

.5 CSA S304-F14, Design of Masonry Structures.

.6 CAN / CSA S304-F14, Calculation of Masonry Structures

.7 CAN/CSA W186-FM1990 (C2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.8 CAN/CSA-A179-F14 Mortar and grout for the masonry of elements

.9 CSA G164-FM92 (C2003), Hot dip galvanizing irregularly shaped objects.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for and include product characteristics, performance criteria, physical size, finish and limitations in accordance with 01 33 00 – Submittal Procedures.

.2 Submit relevant WHMIS (Workplace Hazardous Materials Information System) data sheets in accordance with Section 01 33 00 – Submittal Procedures. The data sheets must specify the VOC emission rate of epoxy resin coatings, galvanizing coatings and coatings used for retouching.

.2 Shop Drawings:

.1 Submit required drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Workshop drawings shall include the list of rebar required, as well as the folding details and drawings for placing these bars.

.3 Positioning drawings indicate sizes, spacing, location and quantities of reinforcement and connectors.

.4 Manufacturers' Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports [including sand gradation tests in accordance with CAN/CSA-A179] showing compliance with specified performance characteristics and physical properties.

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

.3 Mock-ups:

.1 Construct mock-ups in accordance with Section 01 45 00 – Quality Control and requirements of Section 04 05 00 – Common Work Results for Masonry.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Masonry Construction for Buildings: to CAN/CSA-A371-F04

.2 Mortar and Grout for Unit Masonry : to CAN/CSA-A179-F14.

.3 Bar reinforcement: to CAN/CSA-A371-F04 and CAN/CSA G30.18, Grade 400W.

.4 Ladder wire reinforcement: to CAN/CSA-A370 et CAN/CSA G30.14.

.5 Connectors and anchors: CAN/CSA-A370 and CAN/CSA S304.1.

.6 Corrosion protection: to CAN/CSA S304.1 and CAN/CSA-A370.

.7 Steel angles for free lintel as indicated on the drawings and for lateral restraint at the top of walls as indicated in drawings and in the technical manual. Complies with CAN/CSA G30.21 standard grade 300 W.

.8 Fasteners: installed post-construction in block masonry shall comply with CAN/CSA-A370 as specified on drawings and specifications:

.9 Adhesive Anchors: proprietary systems, self-contained system contain epoxy. The installation is carried out in accordance with manufacturers' written instructions.

2.2 FABRICATION

.1 Fabricate reinforcing in accordance with CSA A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Québec.

.2 Anchorage and connectors shall be shape in accordance with CAN/CSA-A370.

.3 Obtain Ministerial Representative approval for locations of reinforcement splices other than shown on placing drawings.

.4 Upon approval of Ministerial Representative, weld reinforcement in accordance with CSA W186.

.5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Ministerial Representative with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.

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

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written requirements, recommendations and specifications, including technical bulletins and installation instructions specified in product catalogs and packing , as well as specifications in the data sheets.

3.2 GENERAL

.1 Unless otherwise indicated, provide and install reinforcements, anchorages in accordance with CAN/CSA-A370, CSA-A371, CSA-A23.1, CSA-S304.1 and in accordance with drawings and specifications.

.2 Obtain approval of Ministerial Representative regarding location of frames and anchors prior to placement of mortar.

.3 Provide and install additional reinforcement in masonry as shown on plans and to meet seismic standards.

3.3 BONDING AND TYING

.1 Bond walls of two or more wythes using connectors in accordance with CSA S304, CAN/CSA-A371 and as indicated.

.2 Tie masonry veneer to backing in accordance with NBC, CSA S304.1, CAN/CSA-A371 and as indicated.

3.4 REINFORCED LINTELS AND BOND BEAMS

.1 Reinforce masonry beams, masonry lintels and bond beams as indicated.

.2 Place and grout reinforcement in accordance with CSA S304.1, CAN/CSA-A371, and CAN/CSA-A179.

3.5 GROUTING

.1 Grout masonry in accordance with CSA S304.1, CAN/CSA-A371 and CAN/CSA-A179 and as indicated.

3.6 ANCHORS

.1 Supply and install metal anchors as indicated.

3.7 LATERAL SUPPORT AND ANCHORAGE

.1 Supply and install lateral support and anchorage in accordance with CSA S304.1 and as indicated.

3.8 MOVEMENT JOINTS

.1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.9 FREE LINTELS

.1 Install free lintels as indicated in documents.

3.10 FIELD BENDING

.1 Rebar anchorages shall not be bent or bent on site.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars and connectors which develop cracks or splits.

3.11 FIELD TOUCH-UP

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

3.12 CLEANING

.1 Final cleaning: upon completion remove surplus materials, rubbish, tools and safety gates from site.

PART 1 General

1.1 RELATED SECTIONS

.1 Sections of this Division.

.2 Section 05 50 00 – Metal Fabrications (steel door frames).

PART 2 Products

2.1 MATERIALS

.1 Stainless steel fasteners, hex head, size and length appropriate for application.

.2 Control joint filler: open cell polyethylene foam, 20 Shore A durometer hardness, diameter 30 to 50% wider than joint.

.3 Asphalt board: 13 mm thick x width required for joint.

.4 Waterproofing mastic: single component urethane-based sealant, to CAN/CGSB-19.13, type 2, grey.

.5 Weep hole vents: raked-out joints.

.6 Steel window frames: supplied by section 05 50 00 – Metal Fabrications.

.7 Masonry flashing: self-adhesive membrane composed of SBS rubberized bitumen laminated to cross-laminated polyethylene film designed specifically for thru-wall flashing.

- .1 Thickness: 1 mm.
- .2 Puncture resistance: 180 N (40 lb/f)
- .3 Accepted materials: self-adhesive thru-wall flashing membrane Blueskin TWF by BAKOR or approved equivalent.
- .4 Adhesive for joints: as recommended by masonry flashing manufacturer.

PART 3 Execution

3.1 INSTALLATION OF ACCESSORIES

.1 Coordinate trades so that installation of adjustable masonry ties is finished before installation of insulation and application of air-barrier products around and over anchor plates and fasteners where they penetrate the vapour barrier.

.2 Build in flashings in masonry in accordance with CSA-A371 as well as following instructions:

.1 Install flashings under exterior masonry bearing on foundation walls, shelf angles, and steel angles over openings, for a height of at least 150 mm or as indicated.

.2 Lap joints 150 mm.

.3 Steel window frames:

.1 Install steel window frames to support masonry cladding over smaller openings that do not have structural lintels.

.4 Weep hole vents:

.1 Provide weep holes free of mortar in vertical joints immediately over flashings, in exterior wythes of masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre,

.2 Take precautions necessary to prevent weep holes from being obstructed by mortar.

.5 Other accessories:

.1 The installation of other accessories indicated in the drawings or described in this section will be in accordance with manufacturer's written instructions.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 All sections of Division 04.

.2 See structure for reinforcing and block wall anchors.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN3 A165 SERIES-94(R2000), CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene or corrugated cardboard packaging material in appropriate on-site containers for recycling in accordance with Waste Management Plan.

.4 Divert damaged or unused concrete materials from landfill to local recycling facility approved by Ministerial representative.

Part 2 Products

2.1 MATERIALS

.1 Concrete block units cured in high-pressure autoclave at 1050 @ 1100kPa, temperature of 175 @ 185 degrees centigrade, 100% humidity for 5 hours; to CSA A165.1-94.

.1 Grade H15CM, 190 x 190 x 390.

.1 Special shape blocks: use corner blocks for visible corners, and special shape blocks for lintels and beams; provide other special shape blocks as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Bond: Running, coursing height respected throughout.

.1 Coursing height: 200 mm for one block and one joint.

.2 Jointing: concave.

.2 Concrete block lintels.

.1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.

.2 End bearing: not less than 150 mm.

3.2 CLEANING

.1 Standard block: Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block and finally by brushing.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Documents and Samples to Submit.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 05 31 00 – Steel Decking.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM A36/A36M-01, Specification for Structural Steel.

.2 ASTM A193/A193M-01b, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

.3 ASTM A307-04, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.4 ASTM A325-06, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

.5 ASTM A325M-00, Specification for High-Strength Bolts for Structural Steel Joints Metric.

.6 ASTM A490M-00, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-85.10-99, Protective Coatings for Metals.

.3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).

.1 ICCA/AFPC 1-73b, Quick-Drying, One-Coat Paint for Use on Structural Steel.

.2 ICCA/AFPC 2-75, Quick-Drying, Primer for use on Structural Steel.

.4 Canadian Standards Association (CSA International)

.1 CAN/CSA-G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA-G164-FM92(C2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA-S16-09,], Limit States Design of Steel Structures.

.4 CAN/CSA-S136-07, Cold Formed Steel Structural Members..

.5 CSA-S136S-10, Commentary on CSA Standard S136..

.6 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.

.7 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.

.8 CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.9 CSA W59-03(C2008), Welded Steel Construction (Metal Arc Welding)

.5 Master Painters Institute

.1 MPI-INT 5.1-98, Structural Steel and Metal Fabrications.

.2 MPI-EXT 5.1-98, Structural Steel and Metal Fabrications.

.6 The Society for Protective Coatings (SSPC)

.1 SSPC SP-6/NACE No. 3-00, Commercial Blast Cleaning.

1.3 DESIGN REQUIREMENTS

.1 Design details and connections in accordance with requirements of CAN/CSA-S16 et CAN/CSA-S136.1, to resist forces, critical combinations of moments, shears, bending, twisting and other effects caused by gravity and lateral loads, and allow for foreseen thermal movement.

.2 Shear connections

.1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required

.2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.

.3 Design frames, joints and combinations of efforts based on data available from structural drawing to safely transfer the vertical and horizontal loads to the foundation seamless.

.4 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in Province of Quebec, Canada for non-standard connections.

.5 Assemblies of trusses supports and other elements are the responsibility of the contractor. The minimum design loads to be used are shown in drawings.

1.4 SHOP DRAWINGS

.1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 – Documents and Samples to submit.

.2 Erection drawings: indicate details and information necessary for assembly and erection purposes including:

.1 Description of working methods;

.2 Sequence of erection;

.3 Type of material used in erection;

.4 Temporary bracings.

.3 Ensure Fabricator drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the province of Quebec, Canada.

1.5 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 – Documents and samples to submit.

.2 Upon demand prepare sample of typical exposed structural connections in accordance with AISC Specifications of Architecturally exposed structural steel for approval of Departmental representative. Samples to be judged upon alignment of surfaces, uniform contact between surfaces, smoothness and uniformity of finished welds. When approved, sample units will serve as a standard for workmanship, appearance and material acceptable for entire project.

1.6 QUALITY ASSURANCE

.1 Submit four (4) copies of mill test reports four (4) weeks prior to fabrication of structural steel.

.1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project

.2 Provide mill test reports certified by metallurgists qualified to practice in province of Quebec, Canada.

.2 Provide structural steel Fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site containers for recycling in accordance with Waste Management Plan

.4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental representative.

.5 Divert unused paint material from landfill to official hazardous material collections site approved by Departmental representative.

.6 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

1.8 CERTIFICATS OF COMPLIANCE

.1 The Contractor shall provide the Commission des Normes, de l'Équité de la Santé et Sécurité du Travail du Québec (C.N.E.S.S.T.) all certificates requested by the CNESST under the Safety Code of construction or the Act respecting occupational health and safety certificates of work, including those to be signed by an engineer member of the l'Ordre des ingénieurs du Québec, notably that concerning the compliance of the installation of the anchor columns on the assembly plan and the one concerning compliance to the assembly procedures when the columns are anchored with less than four (4) anchors (ref. sections 3.24.10 and 3.24.11 of "Regulatory Safety Code for the Construction and Health and Safety Regulations ").

.2 The Contractor shall therefore design the assembly and verify the installation of anchor rods, so as to be able to provide these certificates.

.3 The Contractor must show and submit competency cards of personnel who will carry out welding on site.

1.9 ACCEPTABLE MATERIALS OR PRODUCT

.1 Where materials or products are prescribed by trade-mark, refer to the "Instructions to bidders" for instructions on approving materials or substitute products.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Structural steel: compliant to CAN/CSA-G40.20/G40.21.

- .1 W, WT, S and I section: ASTM A992 grade 50.
- .2 Plates and other shapes: 300 W grade
- .3 Round or square hollow structural section: ASTM A500
- .4 All products: Atmospheric corrosion resistant welded steel. (Intemperic steel), grade 350A.

.2 Anchor bolts:

- .1 Round rod: conform to /G40.21, grade 300 W
- .2 Ribbed bars (rebar): conform to CAN/CSA-G30.18, grade 400 W.

.3 Bolts, nuts and washers: compliant to ASTM A325M and A490M.

.4 Stud: ASTM A-108, grade 60 (fy=413mpa et fu=450mpa) Carbon Steel, Cold-Finished

.5 Welding material: Compliant to CSA W48 and CSA W59 and certified by Canadian Welding Bureau.

.6 Shop paint primer: compliant to ICCA/AFPC 1.

.7 Hot-dipped galvanising: The thickness of the zinc layer must conform to ASTM A123.

2.2 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.

.2 Install shear studs in accordance with CSA W59.

.3 Continuously seal members by continuous welds where indicated. Grind smooth the welds.

.4 Shop connections must be welded and field connections must be bolted unless noted otherwise on drawings. Use high strenght steel bolts M20 or M24 diameter in accordance with ASTM A325 AND A490 standard. All bolted connections shall be tightened by the turn-of-nut method or equivalent for approved.

.5 Steel trusses shall be manufactured with a camber as shown in the drawings.

.6 All welding must be according to the requirements of CSA W59 shall be performed by a manufacturer accredited recognized by the Canadian Welding Association according to the specifications of the CSA W47.1 division 2.

.7 The size of the angle weld not to exceed the thickness of the thinner metal to attach.

.8 Design and provide stiffeners to beams bearing on columns, to beams bearing on beams, and to suspended beams. Provide stiffeners each time that is required.

.9 Design rigid connections to develop the element capacity unless otherwise stated on drawings.

.10 Coordinate position and loads of structural members with other disciplines or other trades.

.11 Before concrete formwork, provide the anchor jigs and concrete embedded plates. The embedded pieces location must be coordinate with the others contractors

2.3 SHOP PAINTING

.1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16 except where members are to be encased in concrete.

.2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface according to SSPC SP1 concerning scouring by brushing.

.3 Apply one coat of primer in shop to steel surfaces to achieve minimum dry film thickness of 1.5 to 2.0 mil, on all surfaces except:

.1 Surfaces to be encased in concrete;

.2 Surfaces to receive field installed stud shear connections;

.3 Surfaces and edges to be field welded;

.4 Faying surfaces of friction-type connections;

.5 Below grade surfaces in contact with soil.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 °C.

.5 Maintain dry condition and 5 °C minimum temperature until paint is thoroughly dry.

.6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

2.4 GALVANISATION

.1 All components exposed to the weather must be hot-dipped galvanised.

.2 Where indicated on the drawings, steel and fabricated metal elements must be hot-dipped galvanized. The thickness of the zinc layer must conform to ASTM A123 Perform cleaning SSPC SP-6 before galvanizing. Touch-up with a zinc-rich paint in accordance with ASTM-A780 and ONGC CAN/CGSB-1.181.

2.5 TOUCH-UPS

.1 Touch-ups with a zinc-rich paint will be performed on galvanized surfaces that have been damaged during the assembly.

.2 Products accepted for zinc touch-ups when the elements are made of galvanized steel:

.1 METAFLUX distributed by BPB Chemicals BVBA with 98.5% - 99% pure zinc (recommended).

.2 Zinga distributed by GALVANISATION ZINGA with 96% ± 1% of zinc content.

.3 Rust-Anode Primer distributed by Galvatech 2000 with more than 90% zinc.

.4 "Galvicon" type product is not accepted.

.5 The manufacturer of the selected product must have at least 700 m² of verifiable expertise in Québec.

.6 Provide application protocol for approval and skilled labor.

PART 3 EXECUTION

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16.

.2 Welding: in accordance with CSA W59.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.2 MARKING

.1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection

.2 Match marking: shop mark bearing assemblies and splices for fit and match

3.3 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.

.2 Field cutting or modifying of structural members must have prior approval of the Departmental representative.

.3 If during assembly, adjustments were required to the structure, the manufacturer's assembly engineer must provide a signed repair sketch and submit it for approval. Any repairs carried out before approval is at the Contractor's risk.

.4 Do not enlarge the hole on site with a torch. Do not bend steel with drift pins. When a joint requires an adjustment in the alignment of bolt holes, the erector must ream the diameter greater than all the holes of the same assembly. Replace the assembly bolts with larger diameter bolts. A repair sketch signed by the manufacturer's engineer must be submitted for approval

.5 Provide sufficient assembly bracing cables. These cables may be removed after the final tightening of a sector, concrete casting or after the fastening of the metal bridging.

.6 The editor shall provide, upon request, access for the inspectors and the Departmental Representative to workplaces and equipment, especially for areas difficult to access.

.7 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection

.8 Continuously seal members by continuous welds where indicated. Grind smooth.

.9 All field bolted joints shall receive a controlled bolt tightening by the turn of nut method or equivalent method for approval.

.10 All sliding bolted connections with slotted holes must be tightened by hand with double nuts.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of [materials and workmanship] will be carried out by testing laboratory designated by Departmental representative.

.2 Work found to be incomplete or incorrect by the Departmental Representative shall be at the expense of the Metal Structural Contractor.

.3 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental representative.

.4 Submit test reports to Departmental representative within two (2) weeks of completion of inspection.

3.5 FIELD PAINTING

.1 Touch up damaged surfaces and surfaces without shop coat with primer to SSPC-SP-6 except as specified otherwise. Apply in accordance with CAN/CGSB 85.10.

.2 Touch-ups to the galvanisation on site must be made with a zinc-rich approved product. See section 2.5.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Documents and Samples to Submit.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

.3 Section 05 12 23 – Structural Steel for Buildings

.4 Section 05 31 00 – Steel Decking

.5 Refer also to all related sections of other concerned disciplines.

.6 The specialised contractor must obtain a copy of all documents related to his specialty, even if it seems irrelevant to him, otherwise it will be recognized that he accepts the terms and requirements of all sections of the specifications and other contractual documents.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM A36/A36M-05, Specification for Structural Steel.

.2 ASTM A193/A193M-07, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

.3 ASTM A307-07a, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.4 ASTM A325-07, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

.5 ASTM A325M-05, Specification for High-Strength Bolts for Structural Steel Joints Metric.

.6 ASTM A490M-04, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.

.2 CAN/CGSB-1.105-M91, Quick Drying Primer.

.3 CAN/CGSB-85.10-99, Protective Coatings for Metals.

.4 CAN/CGSB-85.100-93, Painting.

.3 Canadian Institute of Steel Construction (CISC)/Canadian Paint and Coatings Association (CPCA) (previously known as Canadian Paint Manufacturer's Association (CPMA)

.1 CISC/AFPC 2-75, Quick-Drying, Primer for Use on Structural Steel.

.2 CISC/AFPC 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.

.4 Canadian Standards Association (CSA International)

.1 CAN/CSA-G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA-S16-09, Limit States Design of Steel Structures.

.3 CAN/CSA-S136-07, North American Specification for the Design of Cold-Formed Steel Structural Members

.4 CSA-S136S-10, Supplement no 1 to the North American Specification for the Design of Cold-Formed Steel Structural Members.

.5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.

.7 CSA W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum.

.8 CSA W59-03(C2008), Welded Steel Construction (Metal Arc Welding).

.5 Master Painters Institute

.1 MPI-INT 5.1-98, Structural Steel and Metal Fabrications.

.2 MPI-EXT 5.1-98, Structural Steel and Metal Fabrications

.6 The Society for Protective Coatings (SSPC)

.1 SSPC SP-6/NACE No. 3-00, Commercial Blast Cleaning

.7 National Research Council Canada

.1 National Building Code of Canada 2015 - CCBFC

1.3 QUALITY ASSURANCE

.1 Submit 4 copies of mill test reports at least four (4) weeks prior to fabrication of steel joists and accessories. Reports to show:

.1 Chemical and physical properties;

.2 Other details of steel to be incorporated into work;

.3 Certification by qualified metallurgists confirming that tests conform to requirements of CSA G40.20/G40.21.

.2 Supply affidavit prepared by fabricator of structural steel joists stating that materials and products used in fabrication conform to this specification.

1.4 DESIGN OF STEEL JOISTS AND BRIDGING

.1 Design steel joists and bridging to carry loads indicated in joist schedule shown on drawings in accordance with CAN/CSA-S16 and CSA-S136.

.2 Design joists and anchorages for uplift forces as indicated.

.3 Ensure joists are manufactured to consider load effects due to fabrication, erection and handling.

.4 Design joists to safely transfer the horizontal shear of diaphragms to the foundation without discontinuity.

.5 Limit roof joist deflection due to specified live load to 1/360 of span

.6 Submit 1 copie of calculations and joist design drawings for typical joists for DCC representative's review at least four (4) weeks prior to fabrication and/or delivery.

.7 Unless otherwise specified on drawings, camber must be equal to the dead load deflection.

.8 Except where indicated on the drawings, it is never allowed to pierce joist top and bottom cord.

.9 Any connection to a joist must be made to a panel point.

.10 Before designing joists, the open-web steel joist contractor must be sure that there will be no interference between the joist and bridging structural members and the elements of other disciplines. This coordination

must be done from the beginning of construction mandate to not produce delays or additional fees. The costs of this coordination must be totally assumed by the General contractor and/or his sub-contractors.

1.5 SHOP DRAWINGS

.1 Submit shop details and erection drawings in accordance with Section 01 33 00 – Documents and Samples to Submit.

.2 Submit drawings stamped and signed by qualified professional engineer(s) registered in the province of Quebec, Canada.

.3 Indicate on erection drawings, relevant details such as joist marks, depth, spacing, bridging lines, bearing, anchorage and details.

.4 Provide particulars, on shop drawings, relative to joist geometry, framed openings, splicing details, bearing and anchorage. Include member size, properties, specified and factored member loads, and stresses under various loadings, deflection and camber.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site containers for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by DCC representative.

.5 Dispose of unused paint material at official hazardous material collections site approved by DCC representative.

.6 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

1.7 MINISTERIAL REPRESENTATIVE AUTHORIZATION OR APPROVAL

.1 When required in accordance with the requirements of this specification section, the Ministerial representative authorization or approval will be considered to have been obtained only if it has been indicated in writing or recorded in the minutes of a site meeting at which Ministerial representative attended and ratified by all people present.

1.8 COMPLETE WORKS

.1 Drawings and specifications of structural, mechanical, electrical, civil engineering and architecture must be considered as a whole in order to complete the construction entirely. They must be read together and integrally with each other to take into account all the implications, impacts and consequences that other specialties could have on the steel joist framing and bridging structure system and vice versa.

.2 These implications, impacts and consequences must be taken into consideration by the general contractor and the sub contactors in the cost evaluation of the design, fabrication and erection of the steel joist framing and bridging structure system. In addition to the requirements specified in the contract documents, these implications, impacts and consequences include all the elements which are not specifically identified in the drawings and specifications, such as localised demolition works, piercing works, connecting works, finishing works, etc, but are professionally expected as required in order to execute an obtain complete work,

.3 If elements related to a discipline are included in another discipline, but not indicated in the discipline concerned, the general contractor must evaluate and include these elements cost in his bid.

1.9 ACCEPTABLE MATERIALS OR PRODUCT

.1 Where materials or products are prescribed by trade-mark, refer to the "Instructions to bidders" for instructions on approving materials or substitute products.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Open web steel joists.

.2 Structural steel: compliant to CSA-G40.20/G40.21 and CSA-S136.

.3 Welding materials: compliant to CSA-W59.

.4 Hot-dipped galvanising: conform to ASTM A123

.5 Studs: According to CSA W59 Ann. H and to CSA W59S1.

2.2 FABRICATION

.1 Fabricate steel joists and accessories as indicated in accordance with CAN/CSA-S16 and CSA-S136 and in accordance with reviewed shop drawings.

.2 Weld in accordance with CSA-W59 and supplement CSA-W59S1.

.3 Provide top and bottom chord extensions where indicated.

.4 Provide diagonal and horizontal bridging and anchorages as indicated.

.5 Install shear studs in accordance with CSA-W59 and supplement CSA-W59S1.

.6 Provide and install all rows of bridging required for all open web steel joist type indicated on drawings and all the connectors required for all open web steel joists

.7 The depth of the seats of the open web steel joist according to the indication given on drawings.

.8 Top chords must be at least 6,4mm thick when the deck is fixed with nails.

2.3 GALVANISATION

.1 All joists, bridging and connections must be hot-dipped galvanised.

.2 Steel and fabricated metal elements must be hot-dipped galvanized. The thickness of the zinc layer must conform to ASTM A123 Perform cleaning SSPC SP-6 before galvanizing. Touch-up with a zinc-rich paint in accordance with ASTM-A780 and ONGC CAN/CGSB-1.181.

2.4 TOUCH-UPS

.1 Touch-ups with a zinc-rich paint will be performed on galvanized surfaces that have been damaged during the assembly.

.2 Products accepted for zinc touch-ups when the elements are made of galvanized steel:

.1 METAFLUX distributed by BPB Chemicals BVBA with 98.5 % - 99 % pure zinc (recommended).

.2 Zinga distributed by GALVANISATION ZINGA with 96 % ± 1 % of zinc content.

.3 Rust-Anode distributed by Galvatech 2000 with more than 90 % zinc.

.4 "Galvicon" type product is not accepted.

PART 3 EXECUTION

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16 and CSA-S136.

.2 Welding: in accordance with CSA-W59 and supplement CSA-W59S1.

.3 Companies to be certified under Division 1 or 2.1 of CSA-W47.1 for fusion welding and/or CSA-W55.3 for resistance welding.

.4 Provide certification that welded joints are qualified by Canadian Welding Bureau.

3.2 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Ministerial representative.

.2 Testing laboratory will inspect representative joists for integrity, accuracy of fabrication and soundness of welds. Testing laboratory will also monitor test loading of joists used by manufacturer to verify design and check representative field connections. The Ministerial representative will determine extent of and identify all inspections.

.3 Submit test report to Ministerial representative, within 3 days after completion of inspection.

.4 Owner will pay costs of tests.

.5 Test shear studs in accordance with CSA-W59.

3.3 ERECTION

.1 Erect steel joists and bridging as indicated in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.

.2 Complete installation of all bridging and anchorages before placing construction loads on joists.

.3 Field cutting or altering joists or bridging that are not shown on shop drawings: to approval of Ministerial representative.

.4 Clean and touch up shop primer to bolts, welds, burned or scratched surfaces at completion of erection.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Documents and Samples to Submit.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal].

.3 Section 05 12 23 – Structural Steel for Buildings.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM A653/A653M-10, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM A792/A792M-10, Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.3 ASTM A924/A924M-10a, Standard specification for General Requirement for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA)/CSA International)

.1 CSA C22.2 No. 79-1978(R1999), Cellular Metal and Cellular Concrete Floor Raceways and Fittings.

.2 CAN/CSA-S16-09, Limit States Design of Steel Structures.

.3 CAN/CSA-S136-07, Cold Formed Steel Structural Members.

.4 CSA-S136S-10, Supplement No. 1 to Cold Formed Steel Structural Members.

.5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.7 CSA W59-03(C2008), Welded Steel Construction, (Metal Arc Welding).

.4 Canadian Sheet Steel Building Institute (CSSBI)

.1 ICTAB 10M-96, Standard for Steel Roof Deck.

.2 ICTAB 12M-96, Standard for Composite Steel Deck.

1.3 DESIGN REQUIREMENTS

.1 Design steel deck using limit states design in accordance with CSA S136, CSSBI 10M and CSSBI 12M.

.2 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, composite deck action, and uplift as indicated.

.3 Deflection under specified live load not to exceed 1/300 of span.

.4 Where vibration effects are to be controlled as indicated, dynamic characteristics of decking system to be designed to be in accordance with CAN/CSA-S16.1, Appendix 'G'.

.5 The depth and thickness of steel deck are specified on the drawings.

.6 Steel deck must continuous on at least three supports in continuity on each supports.

1.4 SHOP DRAWINGS

.1 Submit shop drawings erection and shoring drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of Quebec, Canada.

.3 Submit design calculations if requested by Departmental representative.

.4 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories

.5 Indicate details of temporary shoring of steel deck, such as location, time and duration of placement and removal of shoring for concrete fill decks.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Divert unused metal from landfill to metal recycling facility approved by Departmental representative.

.3 Dispose of unused paint material at official hazardous material collections site approved by Departmental representative.

.4 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.5 Dispose of unused caulking material at official hazardous material collections site approved by Departmental representative.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Zinc (Z) coated steel sheet: compliant to ASTM A653/A653M structural quality Grade 230, with ZF75, coating, regular spangle, extra smooth surface, chemically treated for unpainted finish, for exterior surfaces exposed to weather, 0,76 mm minimum base steel thickness

.2 Closures: in accordance with manufacturer's recommendations.

.3 Galvanize cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.76 mm. Metallic coating same as deck material.

.4 Touch-up: zinc rich, ready mix, compliant to CAN/CGSB-1.181.

.5 Shear studs: compliant to CSA W59.

2.2 TYPES OF DECKING

.1 Steel roof deck: 0.76 mm minimum base steel thickness, 38 mm maximum deep profile, non-cellular, interlocking side laps.

PART 3 EXECUTION

3.1 GENERAL

.1 Steel decking work: in accordance with CAN/CSA-S136, ICTAB 10M and ICTAB 12M.

.2 Welding: in accordance with CSA W59, except where specified otherwise.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding.

3.2 ERECTION

.1 Erect steel deck as indicated and in accordance with CSA S136, CSSBI 10M and CSSBI 12M and in accordance with reviewed erection drawings..

.2 Lap ends: to 50 mm minimum.

.3 Weld and test stud shear connectors through steel deck to steel joists/beams below in accordance with CSA W59.

.4 Immediately after deck is permanently secured in place, touch-up with a layer of zinc-rich coating, touch up metallic coated top surface with compatible primer where burned by welding.

.5 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mill scale and other foreign matter.

.6 Temporary shoring, if required, to be designed to support construction loads, wet concrete and other construction equipment. Do not remove temporary shoring until concrete attains 75% of its specified 28 day compression strength.

.7 Place and support reinforcing steel as indicated.

3.3 CLOSURES

.1 Install closures in accordance with approved details.

3.4 OPENINGS AND AREAS OF CONCENTRATED LOADS

.1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.

.2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer, except as otherwise indicated.

.3 For deck openings with any one dimension greater than [300] mm and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.

3.5 CONNECTIONS

.1 Install connectors as recommended by CSSBI as indicated.

.2 Erect steel deck so as to ensure continuity of at least 3 spans.

.3 The fasteners are power-driven fasteners manufactured from hardened carbon steel with an electroplated zinc coating complying with ASTM B 633- 07, SC 1, Type III. The fasteners are 0.937 inch (23.8 mm) long with a 0.177-inch-diameter (4.5 mm) fully knurled tip and tapered shank fitted with two 0.590-inch-diameter (15 mm) steel cupped washers. The fasteners have a flattened head design to accept a stainless steel sealing cap. Fix steel deck on all supports including the beams, the joists, opening reinforcing supports and shear plots.

.4 The sidelap connectors shall be No. 12, single thread, self-drilling, threaded fasteners with 14 threads per inch. The sidelap connectors shall be manufactured from ASTM A510 Grade 1022 carbon steel with an electroplated zinc coating complying with ASTM F 1941 type III finish (5-7 microns thickness). The sidelap connectors shall have a minimum major thread diameter to drill point diameter ratio of 1.5:1.

.5 The installers need to have a certification from the connector's fabricant.

.6 Connections penetration in compliance with the fabricant specifications.

.7 Steel deck fixing patterns, screws and nails, are given on drawings.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 06 40 00 – Architectural Woodwork (for provision of Gun Slit frames).

.2 Sections of Division 04 for elements to be integrated into masonry Work.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in compliance with requirements of Section 01 33 00 – Submittal Procedures.

.2 The shop drawings must indicate or show materials, web thickness, finishes, connections, joints, type of anchoring and number of anchoring devices, bearings, reinforcement elements, details and accessories.

PART 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Steel: 300W, in accordance with CAN/CSA-G40.20/G40.21 standard.

.2 Welding materials: compliant with CSA W59 standard.

.3 Welding electrodes: compliant with standards from the CSA W48 series.

.4 Bolts, nuts, lag screws, threadbars and washers: compliant with ASTM A307 standard. All fasteners used outdoors must be grade 304 stainless steel.

2.2 FINISHING

.1 Galvanization: hot-dipped, 600 g/m² zinc content, to CAN/CSA-G164..

2.3 FORMING

.1 Unless otherwise indicated in the drawings, connections must as much as possible be shop welded.

.2 Work must be shop assembled, in elements that are as long and complete as possible and ready to be put together on-site.

.3 No welding will be done on-site. Cut and pre-bore in the shop all work that must be assembled on-site.

.4 Connections must be adjusted with precision; exposed parts must be flush; joints and miters must be tight.

.5 Welds and visible extremities of profiles must be carefully grinded or filed.

.6 Visible seals must be performed continuously along the length of the joint, filed or grinded to obtain a smooth and even surface. Seal the outdoor metal fabrications with steel to protect from corrosion in compliance with CAN3-S16.1 standard.

2.4 GALVANIZATION

.1 Proceed with galvanization once elements are produced (forming, cutting, boring, welding, etc.).

2.5 LIST OF WORKS

.1 Cell Window fabricated with steel angles and bars as shown in drawings.

- .1 Components:
  - .1 Exterior steel angle frame, welded, predrilled, galvanized.
  - .2 Interior steel channel frame with tubular bars, welded, galvanized.
- .2 Quantity and location: one (1) set per cell.
- .3 Note: the interior frame will also act as a lintel for the concrete blocks above the opening. Delivery shall be coordinated with masonry work. The exterior frame must be slightly smaller than the window opening in order to allow easy installation.

.2 Vertical steel angles for "Cell" building corridor: steel angles as shown in drawings, galvanized.

- .1 Predrilling:
  - .1 Holes for block anchors: drill holes before galvanizing
  - .2 Holes for attaching plywood: drill holes after galvanizing. Thread holes. Hole dimensions and thread type according to bolts proposed for installation of plywood. Apply a coat of cold galvanizing coating to holes after threading.
- .2 Quantity and location: one (1) set of 2 angles at each end of the "Cell" building corridor.

.3 Gun Slit frames: steel angles, dimensions as indicated, galvanized.

- .1 Predrilling: drill holes before galvanizing.
- .2 Components :
  - .1 Exterior steel angle frame, welded, predrilled, galvanized.
  - .2 Exterior steel angle frame, welded, predrilled, galvanized.
- .3 Quantity and location: two per shooting gallery separator.
- .4 Provide frames to subcontractor responsible for section 06 40 00

PART 3 Execution

3.1 EXECUTION

.1 Install metal fabrications in the areas indicated on the drawings.

.2 Assemble metal fabrications so they are square, plumb, aligned and adjusted with precision, and so joints and connections are tight.

.3 Supply and install threadbars as well as adhesive capsules to anchor metal fabrications to concrete or masonry units. Foresee the boring of holes if necessary.

.4 Give the appropriate building trades the jigs and parts to encase/embed in concrete.

.5 The assembly of metal fabrications on-site must be done with bolts only. No cutting, welding or grinding must be done on the work site.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 07 61 00 – Sheet Metal Roofing.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA B111-1974(R1998), Wire Nails, Spikes and Staples.
.2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CSA O121-M1978(R1998), Douglas Fir Plywood.
.4 CAN/CSA-O141-91(R1999), Softwood Lumber.
.5 CSA O151-M1978(R1998), Canadian Softwood Plywood.
.6 CAN/CSA-O325.0-92(R1998), Construction Sheathing.
.7 CAN/CSA O86.1-09 Engineering Design in Wood.

.2 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2000.

1.3 QUALITY ASSURANCE

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

.3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene or corrugated cardboard packaging material [in appropriate on-site bins] for recycling in accordance with Waste Management Plan.

.4 Divert unused wood materials from landfill to recycling reuse or composting facility approved by Ministerial representative.

.5 Do not dispose of preservative treated wood through incineration.

.6 Do not dispose of preservative treated wood with materials destined for recycling or reuse.

.7 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Ministerial representative.

.8 Dispose of unused wood preservative material at official hazardous material collections site approved by Ministerial representative.

.9 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other locations where they will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 LUMBER MATERIAL

.1 Lumber: unless specified otherwise, softwood of class S-P-F no1/no2, S4S. All parts must be stamped S-Dry (oven dried), moisture content 19 % or less in accordance with following standards:

.1 CAN/CSA-O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.2 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:

.1 S2S is acceptable.

.2 Board sizes: "Standard".

.3 Dimension sizes: "Standard" light framing.

.4 Post and timber sizes: "Standard".

.3 All parts located outside or in contact with concrete must be of pressure treated wood and not incised in accordance with Quebec standard. All cut sections must be covered with treatment product.

.4 Angles, channels and plate , CAN/CSA-G40.20/G40.21, grade 300W

.5 Bolt connections: ASTM A-307.

.6 Concrete anchor bar: Rebar in accordance to CAN/CSA-G30.18, grade 400W (fy=400 MPa)

2.2 PANEL MATERIALS

.1 Douglas fir plywood (DFP): to CSA O121, standard construction.

.2 Canadian softwood plywood (CSP): to CSA O151, standard construction.

2.3 ACCESSORIES

.1 Nails, spikes and staples: to CSA B111.

.2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

.4 Manufactured fasteners shall be made of galvanized steel.

2.4 FINISHES

.1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work interior highly humid areas and pressure- preservative treated lumber.

2.5 WOOD PRESERVATIVE

.1 Surface-applied wood preservative: copper napthenate water repellent preservative.

PART 3 EXECUTION

3.1 PREPARATION

.1 Contractor shall provide all wood, metal parts required for its assembly, anchors into concrete and accessories needed for good execution of work.

.2 Treat surfaces of material with wood preservative, before installation.

.3 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.

.4 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.5 Treat following material :

.1 Wood cants, fascia backing, curbs, nailers, sleepers on roof deck not in direct contact with dampproof membranes or bituminous vapour barriers.

.2 Wood sleepers supporting wood subflooring over concrete slabs in contact with ground or fill.

3.2 INSTALLATION

.1 Comply with requirements of NBC, supplemented by the following paragraphs.

.2 Install the wood elements wood according to lines, levels and elevations indicated and space evenly. Make continuous items from the longest parts.

.3 Nailing of sills must conform to the national building code of Canada 2010 (part 4).

.4 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.

.5 Align and plumb faces of furring and blocking to tolerance of 1:600.

.6 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.7 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.

.8 Provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19 mm thick plywood on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate

.9 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.

.10 Install sleepers as indicated.

.11 Use caution when working with particle board. Use dust collectors and high quality respirator masks.

3.3 ERECTION

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

3.4 CONNECTIONS

.1 Brackets and other connections must be calculated by the contractor's engineer specialized in wood framework. Assemblies will hold loads indicated on the drawings under the combination of CNB 2010. Submit for approval the connection plans. The shop drawings of connections must be signed and sealed by an oiq member engineer.

.2 The details of the wood connections are shown on the drawings. They are typical arrangements. The manufacturer's engineer must adapt to the various configurations met taking into account size, loads, angles, directions, and inclination of parts to assemble.

.3 Assemblies must be composed of minimum 6.4 mm plates.

.4 All metal parts required for assembly of wood (plates, bolts, washers, brackets, etc.) Are to be galvanized.

.5 Lag-screws: pre-drill holes which consist of a pilot hole for the threaded part and a counter sink for the smooth part of the lag screw in accordance with standard CSA-O86.09.

3.5 STUD WORK :

.1 Studs must be in spruce, stud class except where otherwise indicated on the drawings. If other wood qualities are used, contractor must get a written approval from the engineering manager and change in spacing and dimensions.

.2 Maintain one or more continuous chords to each stud where covering of bearing walls is not nailed over the full height on each stud. Girt spacing must not exceed 1200 mm.

.3 Studs must be doubled on each side of openings and under lintels unless otherwise indicated on plans.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 04 05 10 – Common Work Results for Masonry

.3 Division 6 – Wood Plastics and Composites

.4 Division 8 – Openings

1.2 SCOPE OF WORK

.1 The work includes the provision of expertise, materials, labour, equipment and everything that is required for the manufacture and installation of prefabricated trusses wood such requested in the drawings and/or necessary for the full and satisfactory completion of all these works.

.2 Also refer to the related sections and other disciplines for the exact scope of the work.

1.3 REFERENCES

.1 CSA International

.1 Series CSA O80-F97 (C2002 Wood Preservation.

.2 CAN/CSA-O86.1-09, Engineering Design in Wood.

.3 CAN/CSA-O141-05, Softwood Lumber.

.4 CSA S307-FM1980 (C2001 Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.

.5 CSA S347-99 (R2004), Method of Test for Evaluation of Truss Plates Used in Lumber Joints.

.6 CSA W47.1-F03, Certification of Companies for Fusion Welding of Steel.

.2 Health Canada – Information system on Hazardous Materials (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber [2010].

.4 National Research Council (NRC)/Institute for Research in Construction (IRC) – Canadian Construction Materials Centre (CCMC)

.1 CCMC, Registry of Product Evaluations.

.5 Truss Plate Institute of Canada (TPIC)

.1 TPIC – 1996 (R2001), Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (Limit States Design).

1.4 CALCULATION CRITERIA AND DESIGN REQUIREMENTS

.1 Light wood trusses with metal connectors must be designed in accordance with the methods TPIC regarding chords, and conform to the calculation requirements CAN/CSA O86 for the webs.

.2 Light trusses with metal connectors must be designed according to methods of the TPIC in terms of joints; they must meet the test requirements of CSA S347 standard and be included in the CCMC registry of product evaluations.

.3 Calculate trusses, bridging, and bracing according to CAN/CSA O86.1 according to the loads indicated to drawings and point loads and uniform minimums stipulated in the comments of the National Building Code of Canada

.4 Deformation caused by overload must not exceed 1/360 of the span in the case of ceilings suspended directly from the trusses.

.5 Specify the camber of the trusses according to the indications.

.6 At supports the crushing stresses shall not exceed the limitations permitted in the CAN/CSA-086.09.

.7 Provide bracing lines according to the characteristics of the trusses and joists shown on the drawings and ties required for all the trusses. Install bracing so that the distance between a support and a brace or between two braces does not exceed 2.1 metres.

.8 If necessary, the bracing must consist of cross bracing of 38 mm x 38 mm sections minimum or full section.

.9 All parts cut or damaged by pipe passages must be doubled.

1.5 QUALITY ASSURANCE

.1 Qualifications

.1 Fabricator for trusses to show evidence of quality control program such as provided by regional wood truss associations, or equivalent.

.2 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.

.2 Health and Safety

.1 Respect health and safety during construction according to the following documents and organisations:

.1 Canadian Code of safety on construction sites.

.2 CSA S350-M1980

.3 Code de sécurité pour les travaux de construction S-2.1 r.6 (current edition) au Québec.

.4 Also comply with the National Building Code of Canada, Part 8 Safety Measures on Work sites.

.5 All other municipal and provincial regulations.

1.6 SHOP DRAWINGS, SAMPLES AND DATA SHEETS

.1 Submit the documents, data sheets, shop drawings and samples in accordance with Section 01 33 00 – Submittal Procedures

.2 Consult the table of shop drawings and data sheets in appendix 1 of the structural technical specifications.

.3 Each submittal of assembly shop drawings showing the assembly details must carry a seal and signature of by professional engineer registered or licensed in Quebec.

.4 Each drawing must indicate special structural application and specification as according to local authorities having jurisdiction

.5 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates

.6 Indicate species, sizes, and stress grades of lumber used as truss members. Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for members.

.7 Submit stress diagram or print-out of computer design indicating design load for truss members. Indicate allowable load and stress increase.

.8 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

.9 Show lifting points for handing and assembly.

.10 Show location of lateral bracing for compression members.

1.7 DELIVERY, STORAGE AND HANDLING

.1 The trusses must be stored on site in accordance with the manufacturer's instructions. Provide and install necessary supports and bracing to prevent, among other things, the weakening, warping and the tipping of the trusses.

1.8 AUTORISATION OR APPROVAL OF THE DEPARTMENTAL REPRESENTATIVE

.1 Where required in accordance with the requirements of this section of the specification, the authorization or approval of the Departmental Representative shall not be deemed to have been obtained until it has been notified in writing or recorded in the minutes of meeting, ratified by all present, a site meeting which he attended.

1.9 COMPLETED WORKS

.1 The structural, mechanical, electrical, civil and architectural drawings and specifications are part of a whole in order to achieve the construction in full. They must be read together and integrally with each other to take account of all the implications thereof.

.2 These implications include, in addition to the requirements in the contract documents, all demolition, piercing, connecting and finishing work that is not specifically identified, but which is required to execute complete works.

.3 In the event of items related to discipline are included in another discipline, but failed to appear in the discipline concerned, the general contractor must still plan and include these elements in his bid.

1.10 PAYMENT

.1 All works of this section are paid as an overall lump sum according to the item(s) of the planned schedule(s) for this purpose. The price includes materials, equipment, fixtures and fittings and the labour for the implementation, verifications and any incidental expenses. It must cover the losses and damages resulting from the nature of the work, the fluctuation of prices and wages, business risk, strikes, delays not attributable to the client, restrictions relative to transportation, accidents and the action of the elements of nature.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Lumber: Softwood category S-P-F no1/no2 or MSR classification, milled on 4 sides (S4S), and meet the following standards:

.1 CAN/CSA-O141-05, Softwood Lumber

.2 Standard Grading Rules for Canadian Lumber of the National Lumber Grades Authority (NLGA)

.2 All parts must be stamped S-dry (oven dried) ,with a moisture content not exceeding 19 % at the time of manufacture of the trusses

.3 Fastenings: to CAN/CSA O86.

.4 All parts located outside or in contact with concrete must be of pressure treated wood and not incised in accordance with Quebec standards. All cut sections must be covered with treatment product. Cell bulding: wood trusses must be in treated wood.

2.2 FABRICATION

.1 Fabricate wood trusses in accordance with reviewed and approved shop drawings.

.2 Cut elements of the trusses accurately to length, the angle and dimensions desired, to obtain tight joints during final assembly.

.3 Assemble the elements in accordance with the theoretical layout, using jigs or staples.

.4 Provide for design camber and roof slopes when positioning truss members.

.5 Connect members using metal connector plates or galvanized metal gussets.

2.3 SOURCE QUALITY CONTROL

.1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

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 ERECTION

.1 Erect wood trusses [as indicated] [in accordance with [reviewed] [approved] shop drawings].

.2 Handling, installation, erection, bracing and lifting in accordance with manufacturers instructions. Use the indicated lifting points to lift and position the trusses into their final position

.3 Make adequate provisions for handling and erection stresses.

.4 Exercise care to prevent out-of-plane bending of trusses.

.5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.

.6 Install the final bracing before submitting trusses to the loads, in accordance with verified and approved shop drawings.

.7 Do not cut or remove any truss material without approval of Departmental Representative.

.8 It is forbidden to make any on-site repairs to the truss elements.

.9 Remove chemical and other surface deposits on treated wood, in preparation for applied finishes.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its product(s), and submit written reports, in acceptable format, to verify compliance of work with Contract.

.2 Manufacturer's field services: 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 at stages listed:

.1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.

.2 Upon completion of work, after cleaning is carried out.

3.4 CLEANING

.1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 61 00 – Common Product Requirements.

.4 Section 01 74 21 – Construction/Demolition Waste Management.

.5 Section 05 50 00 – Metal Fabrications (for provision of Gun Slit frames).

.6 Section 07 92 10 – Joint Sealing.

.7 Section 09 91 13 – Painting – New Exterior Work.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

- .1 ANSI A208.1-99, Particleboard.
- .2 ANSI A208.2-94, Medium Density Fiberboard (MDF).

.2 American Society for Testing and Materials (ASTM)

- .1 ASTM E1333-96, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
- .2 ASTM D2832-92(R1999), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
- .3 ASTM D5116-97, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC)

- .1 AWMAC Quality Standards for Architectural Woodwork [, 1994].

.4 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.5 Canadian Standards Association (CSA)

- .1 CSA B111-74(R1998), Wire Nails, Spikes and Staples.
- .2 CSA O112.4-M1977(R1999), Standards for Wood Adhesives.
- .3 CSA O112.5-Series-M-1977(R1999), Urea Resin Adhesives for Wood (Room- and High-Temperature Curing).
- .4 CSA O112.7-Series M-1977(R1999), Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate-Temperature Curing).
- .5 CSA O115-M1982(R2001), Hardwood and Decorative Plywood.

.6 CSA O121-M89(R1998), Douglas Fir Plywood.

.7 CAN/CSA O141-91R1999, Softwood Lumber.

.8 CSA O151-M1978(R1998), Softwood Plywood.

.9 CSA O153-M1980(R1998), Poplar Plywood.

.6 Environmental Choice Program (EPC)

.1 ECP-44-92, Adhesives.

.2 ECP-45-92, Sealants and Caulking Compounds.

.3 ECP-76-98, Surface Coatings.

.7 National Hardwood Lumber Association (NHLA)

.1 Rules for the Measurement and Inspection of Hardwood and Cypress, January 1996.

.8 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber, 2000.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate details of construction, profiles, jointing, fastening and other related details.

.3 Indicate materials, thicknesses, finishes and hardware.

.4 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store and protect materials of this section in accordance with Section 01 61 00 - Common Product Requirements.

.2 Protect millwork against dampness and damage during and after delivery.

.3 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal and the Waste Reduction Workplan, to the maximum extent economically possible.

.2 Separate wood waste in accordance with the Waste Management Plan and place in designated areas in the following categories for recycling: Solid wood/softwood/hardwood, composite wood, treated, painted, or contaminated wood.

.3 Set aside damaged wood for acceptable alternative uses (e.g. bracing, blocking, cripples, bridging, finger-joining, or ties). Store this separated reusable wood waste convenient to cutting station and area of work.

.4 Separate corrugated cardboard in accordance with Waste Management Plan and place in designated areas for recycling.

.5 Do not burn scrap at the project site.

.6 Fold up metal banding, flatten, and place in designated area for recycling.

PART 2 Products

2.1 MATERIALS

.1 Softwood lumber: unless specified otherwise, S4S, moisture content 19 % or less in accordance with following standards:

- .1 CAN/CSA-O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber.
- .3 AWMAC premium grade, moisture content as specified.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 Hardwood lumber: moisture content 6 % or less in accordance with following standards:

- .1 National Hardwood Lumber Association (NHLA).
- .2 AWMAC premium grade, moisture content as specified.

.4 Poplar plywood (PP): to CSA O153, standard construction.

.5 Marine plywood: BC Fir plywood, good two sides, exterior grade, sanded, laminated with impermeable waterproof glue.

.6 Laminated plastic for flatwork: to NEMA LD3, Grade VGL for vertical surfaces, 1.6 mm thick; based on solid woodgrain colour range with gloss or matt finish.

.7 Laminated plastic backing sheet: Grade BK, not less than 1.65 mm thick or same thickness same colour as face laminate.

.8 Nails and staples: to CSA B111.

.9 Wood screws: copper, type and size to suit application.

.10 Sealant: refer to section 07 92 10.

.11 Laminated plastic adhesive: contact adhesive to CAN/CGSB-71.20 or resorcinol resin adhesive to CSA O112.7

- .1 Test for acceptable VOC emissions in accordance with ASTM D2369 and ASTM D2832.

2.2 MANUFACTURED UNITS

.1 Casework.

- .1 Fabricate caseworks to AWMAC premium quality grade. See drawings for materials.
- .2 Furring, blocking, nailing strips, grounds and rough bucks and sleepers.

.1 S2S is acceptable.

.2 Board sizes: "Standard".

.3 Dimension sizes: "Standard".

.2 Casework Doors

.1 Fabricate doors to AWMAC premium quality grade. See drawings for materials.

.3 Countertops

.1 Fabricate counters to AWMAC premium quality grade. See drawings for materials. Backsplash is separate piece. 3mm PVC nosing.

.4 Shelving: Fabricate to AWMAC premium quality grade. See drawings for materials.

.5 Janitor's shelves: 16mm plywood, 300mm deep x 1400mm long, white laminate finish both sides, white PVC edge band. Support rail spacing: 450mm o.c. max.

.6 Firearms inspection tables : treated wood as indicated in drawings, painted finish.

.7 Gun slits: marine plywood with welded steel frames, dimensions as indicated in drawings, painted finish.

.8 Shooting Gallery division walls: treated wood as indicated in drawings, painted finish.

2.3 HARDWARE

.1 Hinges: chromed pressed steel with spring closure, invisible and adjustable, with black finish cap, angle of opening 110 degrees for all doors, model "Clip."

.2 Cabinet handles: U-shaped tube of aluminum or stainless steel, 150mm wide.

.3 Door bumpers: transparent.

.4 Heavy-duty piano hinges for Gun Slits: galvanized steel, at least 14 gauge.

.5 Slide-bolt for Gun Slits: galvanized steel, bolt long enough to penetrate 100mm into slab when in extended position.

.6 Adjustable shelf supports: stainless steel with stainless steel receptacles.

.7 Rails and supports for wall-mounted shelving:

.1 Bracket support: double heavy-duty type.

.2 Rails: double rails for double bracket supports.

2.4 FABRICATION

.1 Set nails and countersink screws apply wood filler to indentations, sand smooth and leave ready to receive finish.

.2 Shop install cabinet hardware for doors and shelves. Recess shelf standards unless noted otherwise.

.3 Shelving to cabinetwork to be adjustable unless otherwise noted.

.4 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

.5 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

.6 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.

.7 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.8 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 3000 mm. Keep joints 600 mm from sink cutouts.

.9 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.

.10 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.

.11 Apply laminate backing sheet to reverse side of core of plastic laminate work.

.12 Apply laminated plastic liner sheet to interior of cabinetry.

2.5 FINISHING

.1 Laminate:

- .1 Countertops: one colour to be chosen from standard range of manufacturer.
- .2 Fronts and visible surfaces: one colour to be chosen from standard range of manufacturer.
- .3 Shelves and cabinet interiors: white.
- .4 Note: chosen colours may be from different manufacturers with no extra charge. Special finish ranges (such as real wood veneers, metal finishes, translucent materials, etc.) are excluded.

.2 Paint: by Section 09 91 13

PART 3 Execution

3.1 INSTALLATION

.1 Do architectural woodwork to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.

.2 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.

.3 Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.

.4 Use draw bolts in countertop joints.

.5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

.6 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant.

.7 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

.8 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

.9 Site apply laminated plastic to units as indicated. Adhere laminated plastic over entire surface. Make corners with hairline joints. Use full sized laminate sheets. Make joints only where approved. Slightly bevel arises.

.10 For site application, offset joints in plastic laminate facing from joints in core.

.11 Build up the Gun Slits in shop. On site, install Gun Slits on the Shooting Gallery division walls with heavy-duty galvanized steel piano hinges. Install a slide bolt on each metal frame and drill a hole in the slab to maintain the Gun Slit in position. At areas where the frame galvanisation is damaged during hardware installation, retouch with zinc-rich paint.

3.2 CLEANING

.1 Clean cabinet work inside cupboards and outside surfaces.

.2 Remove excess glue from surfaces.

3.3 PROTECTION

.1 Protect cabinet work from damage until.

3.4 QUANTITY AND LOCATION

.1 Vanities: 1 per restroom.

.2 Storage shelving: one shelf per storage closet.

.3 Janitor's shelving: Training Building janitor's closet, 5 shelves, 5 rails.

.4 Firearms inspection tables, division walls, and gun slits: as indicated in drawings for Shooting Gallery.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral-Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.

.2 CAN/CGSB 37.3-M89, Application of Emulsified Asphalts for Dampproofing or Waterproofing.

.3 CAN/CGSB 37.5-M89, Cutback Asphalt Plastic Cement.

1.2 PRODUCT DATA

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

1.3 DELIVERY, STORAGE AND HANDLING

.1 Provide and maintain dry, off-ground weatherproof storage.

.2 Remove only in quantities required for same day use.

.3 Store liquid coatings and primers at temperature above 5 degrees C in order to facilitate application. Keep any product containing solvents away from naked flame and sources of excessive heat.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Place toxic or hazardous waste in appropriate containers.

.3 Ensure that empty containers are sealed and stored correctly, out of reach of children, until final disposal.

.4 Collect and separate for disposal paper, plastic or corrugated cardboard packaging material in accordance with Waste Management Plan.

.5 Fold up metal banding, flatten and place in designated area for recycling.

.6 Use least toxic sealants and adhesives possible in order to respect requirements of this section.

.7 Close and seal partially used containers of adhesives or sealants and store at moderate temperature in well ventilated, fireproof location.

.8 Place used tubes and containers of sealant in location designated for hazardous materials.

.9 Divert unused bituminous dampproofing, sealing compounds and asphalt primer materials from landfill to recycling facility approved by Ministerial representative.

1.5 PROJECT/SITE ENVIRONMENTAL REQUIREMENTS

.1 Check to see if work already performed is ready for the work of this section. Notify Ministerial representative of any defect or anomaly. Do not perform work until defects have been corrected. Ensure that surfaces to be covered are smooth.

.2 Start of work or any part of work indicates acceptance of base work.

.3 Do not perform work in inclement weather, or on wet or frost-covered surfaces. Ensure that surfaces are clean and dry.

Part 2 Products

2.1 MATERIALS

.1 Asphalt: for application and curing at temperatures above 5 degrees C: to CAN/CGSB-37.2.

- .1 Colour: black.
- .2 Percent solids: ± 57%.
- .3 Minimal application temperature: +5 degrees C.
- .4 Water vapour permeability (ASTM E96) (3 mm film before drying): 8.0 ng/Pa.m*.sm (0.14 perm).

.2 Sealing compound: plastic cutback asphalt cement to CAN/CGSB-37.5.

- .1 Colour: black.
- .2 Percent solids: ± 70%.
- .3 Minimal application temperature: ambient.
- .4 Water vapour permeability (ASTM E96) (3 mm film before drying): 2.9 ng/Pa.m*.sm (0.05perm).

Part 3 Execution

3.1 PREPARATION

.1 Seal concrete surfaces and patch large gaps, flaking areas, and open mortar joints for smooth, uniform surface.

.2 Seal exterior joints between foundations walls and footings, around penetrations and holes left by removal of form ties.

3.2 APPLICATION

.1 Apply one coat of bituminous dampproofing at rate of 1.0 to 1.5 l/m².

3.3 PROTECTION

.1 Let dry completely before backfilling. Protect coating from damage when backfilling.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 See Structure.

.2 Section 07 27 00 – Air Barrier.

.3 Section 07 61 00 – Sheet Metal Roof Cladding.

1.2 REFERENCES

.1 Underwriters Laboratories of Canada (ULC)

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

PART 2 Products

2.1 INSULATION

.1 For walls and under slabs: Extruded polystyrene (XPS): to CAN/ULC-S701, Type: 4, Compressive strength: 30 lbs/in2, Thickness: as indicated, Size: 610 x 2440 mm, Edges: square, Rsi of 1.76/50mm.

.2 Under roofing of "Shooting Gallery": Polyisocyanurate panels laminated with high density wood fiber support panels, Rsi of 1.8/50mm.

2.2 ADHESIVE

.1 Adhesive (for polystyrene): to CGSB 71-GP-24, type 2.

2.3 ATTACHMENTS

.1 Stainless steel screws and discs.

PART 3 Execution

3.1 WORKMANSHIP

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.4 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.5 Do not enclose insulation until it has been inspected and approved by Ministerial representative.

3.2 EXAMINATION

.1 Examine substrates and immediately inform Ministerial representative in writing of defects.

.2 Prior to commencement of work ensure that substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.3 FOUNDATION AND SLAB INSULATION

.1 Training building:

1. Extend boards 1220mm vertically below bottom of grade level, installed on inside face of perimeter foundation walls.
2. Install boards horizontally over entire surface of grade to be covered by slab.

.2 Other buildings: see Sructure.

3.4 EXTERIOR WALL INSULATION

.1 Where required, install inulation over air barrier with attachments, 4 screws and discs per panel initially. The panels will be permanently installed once wall cladding furring is installed.

3.5 "SHOOTING GALLERY" ROOF INSULATION

.1 Install laminated polisocyanurate support panels over "Shooting Gallery" roof structure. Install in staggered rows parallel to lower roof edge. Install the panels with mechanical attachments.

END OF SECTION

PART 1 General

1.1 REFERENCES

.1 CAN/ULC-S702-97, Mineral Fibre Thermal Insulation for Buildings.

1.2 TECHNICAL DATA SHEETS

.1 Submit the technical data sheets in compliance with requirements of Section 01 33 00 – Submittal Procedures.

PART 2 Products

2.1 INSULATION MATERIALS

.1 Acoustic insulation: glass fiber blanket insulation, recycled content minimum 70%, non-combustible, type 1 (preformed insulation), dimensions according to stud spacing and wall thickness as indicated in plans.

.2 Thermal insulation: glass fiber blanket insulation, recycled content minimum 70%, non-combustible, type 1, with an RSi value of 0.66/25mm (R 3.75/in.).

.1 Blanket thickness: as indicated in plans for various locations.

.2 Blanket width: for roof spaces, according to joist spacing. For walls, according to stud spacing as indicated in plans.

PART 3 Execution

3.1 INSTALLATION OF INSULATION

.1 Install acoustic insulation in the cavities of interior acoustic walls.

.2 Install thermal insulation in the roof construction spaces between the wood truss joists as well as in the cavity of the training building's exterior wall.

.3 Install the insulation in such a way as to ensure continuous thermal protection for the components and empty construction spaces of the building.

.4 Carefully adjust the insulation on the elements to cover up as well as around service boxes, pipes, air ducts and frames that penetrate it.

.5 Do not compress the insulation to make it fit in the spaces to be insulated.

.6 Do not cover the insulation until the installation work has been inspected and approved by the ministerial representative.

END OF SECTION

PART 1 General

1.1 SCOPE OF WORK

.1 Provide all labour, materials and equipment required for installation of acrylic cladding on light concrete panels or on existing masonry.

1.2 PRODUCT DATA

.1 Submit product data sheets for system materials. Include product characteristics, performance criteria, limitations and colours.

1.3 SAMPLES

.1 Two samples of 250 mm x 250 mm, for each material and/or texture and/or colour to be provided as required by Architect; one sample to remain on-site.

1.4 QUALIFICATIONS

.1 Contractor to provide project-specific written certification from manufacturer of system certifying that Contractor is competent to install all system components, from substrate to finish.

.2 Contractor to provide qualified workforce required for completion of Work according to the needs of the project, industry standards, and the manufacturer's most recent norms, from substrate to finish.

1.5 DELIVERY, STORAGE AND HANDLING

.1 All materials to be delivered in original packaging with labels intact.

.2 Upon delivery, inspect materials for damage and inform manufacturer of any defect.

.3 Provide clean, dry, weatherproof storage.

.4 Protect packages from frost, direct sunlight, and other deleterious environmental conditions.

.5 Store liquid products at air and surface temperature between 8° C (45° F) and 40° C (105° F).

1.6 PROJECT/SITE ENVIRONMENTAL REQUIREMENTS

.1 Air and surface temperature of products to be between 5° C (41° F) and 40° C (105° F) for a period of twenty-four hours before, during, and after installation.

.2 Relative humidity to be lower than 60%.

.3 Protect Work from weather and any other condition which could deteriorate products that have already been installed.

.4 Joints, surfaces, and coatings to be protected during and after installation until completely cured and dry.

1.7 WARRANTY

.1 Contractor to provide signed, written warranty to Owner certifying that products are as specified and free of manufacturing defects, valid for a one year period beginning with substantial achievement of Work.

.2 Contractor hereby warrants that exterior finish system will not leak or delaminate for 5 years.

PART 2 Products

2.1 GENERAL

.1 All exterior finish system components must come from single authorized source.

2.2 MATÉRIAUX

.1 Acrylic base: acrylic based mortar composed of microfibres, silica, admixtures, compatible with alkaline concrete surfaces, to be mixed with type 10 Portland cement, as directed by manufacturer's written instructions.

.2 Reinforcing mesh:

- .1 Made of fibreglass with alkaline-resistant coating, to EIMA 105.01
- .2 Width: 75 mm for joint tape, 960 mm for field mesh.
- .3 Self adhesive in the case of joint tape.

.3 Primer for finish coat: coloured, acrylic based, as recommended by manufacturer.

.4 Finish coat: acrylic based, as recommended by manufacturer, colour to be chosen from compete range of manufacturer.

.5 Mouldings: PVC, as recommended by manufacturer.

.6 Backer rod: ethafoam rod, 150% wider than joint.

.7 Sealant: for sealing finish and other elements: single component polyurethane hybrid, colour chosen by Ministerial representative.

PART 3 Execution

3.1 EXAMINATION

.1 Inspect and verify condition of existing substrate surfaces for contamination, surface absorption, chalkiness, cracks, damage, deterioration, moisture content, moisture damage, and tolerances.

.2 Painted surfaces to be cleaned, rough surfaces to be smoothed out.

.3 All traces of efflorescence or oil must be cleaned with acid solution.

3.2 PREPARATION

.1 Protection

- .1 Protect adjacent surfaces from damage resulting from Work of this section.
- .2 Protect finished Work from water penetration at end of each day or on completion of each section of Work.
- .3 Protect installation from moisture for 48 hours minimum after completion of each portion of Work.

3.3 MIXING

.1 Follow manufacturer's instructions in regards to mix proportions and installation time limits.

.2 Additional products such as antifreeze or accelerant may not be added.

3.4 JOINTING AND BASE COAT

.1 Ensure that the surface to be finished is free of efflorescence or other foreign matter that might prevent joint compound from adhering. Ensure that screws are fully inserted in panels and mouldings are correctly installed.

.2 Install self-adhesive joint tape over joints.

.3 In clean container, gradually mix joint compound according to written instructions of manufacturer of system. Mix until smooth, granule-free consistency is obtained.

.4 Base coat on masonry:

.1 Apply initial base coat horizontally to completely fill joints.

.2 When first coat is dry (24 hrs.), apply second base coat over entire wall to obtain perfectly smooth surface.

.5 To prevent infiltration, seal joints as rapidly as possible before application of finish coat. Take special care at doors, windows, parapets, etc.

3.5 FINISH

.1 Ensure that the surface to be finished is free of efflorescence or other foreign matter that might prevent finish coat from adhering.

.2 Surfaces to be coated should first be primered with acrylic primer, colour identical to finish coat. Apply primer with paint roller by rolling in multiple directions. Apply second coat with light rolling in single direction, taking care to eliminate roll marks. Primer must be dry to the touch until application of finish coat.

.3 Prepare fish coating according to manufacturer's written instructions and check that coating and colour correspond to Ministerial representative's specifications.

.4 Apply coat of acrylic finish coating to surface, thickness determined by size of aggregate, applying sufficient pressure to ensure complete adherence. Let dry 5 to 15 minutes. Immediately afterwards, work surface with trowel to obtain specified texture. Surface to be uniform and free of holes, bumps, lines, marks, or other defects. Let dry twenty-four hours.

.5 Do not apply finish coat to horizontal surfaces, or to surfaces angled less than 30 degrees, to avoid water accumulation.

3.6 CLEANING

.1 Carefully clean site as work progresses, and at end of Work, remove from site all waste and extra materials relative to this section.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Concrete slab – see structure.

1.2 REFERENCES

.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.3 PRODUCT DATA

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

PART 2 Products

2.1 SHEET VAPOUR BARRIER

.1 Polyethylene film: to CAN/CGSB-51.34, 0.25 mm thick for under-slab applications.

2.2 ACCESSORIES

.1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide.

.2 Joint separator: if not specified in structure: asphalt-impregnated fibreboard, to ASTM D1751.

.3 Sealant: to Section 07 92 10 - Joint Sealing, unless otherwise specified in Structure.

.4 Staples: minimum 6 mm leg.

PART 3 Execution

3.1 INSTALLATION

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install vapour barrier under slab. Overlap joints by at least 250 mm and lift up at walls.

.3 Install 12 mm thick joint separator board at vertical surfaces, from bottom of slab to 12 mm below top of finished slab, seal.

.4 Use sheets of largest practical size to minimize joints.

.5 Inspect for continuity. Repair punctures and tears with additional vapour barrier, 150 mm wider than perforations. Seal.

END OF SECTION

PART 1 General

1.1 TECHNICAL DATA SHEETS

.1 Submit technical data sheets in compliance with requirements of Section 01 33 00 – Submittal Procedures.

.2 Submit all products and accessories used, indicating the physical properties of these elements.

1.2 QUALITY ASSURANCE

.1 Ensure the competence and specialization of the labour.

.2 Supply a document issued by the manufacturer attesting that it officially recognizes the company responsible for carrying out the work of this section as a qualified contractor.

.3 Keep a copy of the manufacturer's documentation on the work site at all times.

.4 At the commencement of work and during execution, allow access to the site and on roofs to representatives or other people designated by the manufacturer so they can supply the required technical assistance.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver and store all materials in their original packaging, bearing the name of the manufacturer, the grade or quality, the applicable standards and other relevant technical instruction or reference.

.2 Adequately protect the materials and keep them stored in a dry, ventilated and weatherproof area. Only remove from this shelter the materials to be used for the day.

.3 Store liquid coatings and primers at a temperature over +5° C to facilitate their application. Keep all products containing solvents away from open flames or excessive heat sources.

.4 Keep all products containing solvents away from open flames or excessive heat sources.

.5 Store materials delivered in rolls upright.

1.4 PREREQUISITES

.1 Check whether the work already performed is ready to receive the membrane. Notify the ministerial representative of any anomaly or mismatch. Only undertake work once corrective actions have been taken. Ensure that surfaces to be covered are clean, smooth and dry. Do not undertake work in bad weather, on wet surfaces or on surfaces covered in frost.

.2 The commencement of work will imply acceptance of the base work.

1.5 WORK SCHEDULING

.1 Only apply coatings once certain that they will be covered within a maximum of 7 days of exposure to open air.

PART 2 Products

2.1 MANUFACTURER

.1 Acceptable products: only use membranes, primers, adhesives, sealants and air barriers from the same manufacturer in carrying out the work outlined in this section.

2.2 MATERIALS

.1 Self-sticking membrane: vapour-permeable air barrier membrane, water resistant, self-sticking, with a coating of permeable adhesive and a removable plastic film.

.1 Water vapour transmission : 202 g/m²/24 hours

.2 Air permeability : to ASTM E 2178. Maximum 0,02 L/s.m² @ 75Pa

.3 Resistance to water penetration around nails : to AAMA 711-05 & ASTM D 1970.

.4 Fire resistance : to NFPA 285

.2 Sealant: Medium module polyether-based polymer sealant, to CAN/CGSB-37.5, from same manufacturer as the membrane and according to their recommendations.

.3 Primer and adhesive for self-sticking membrane : as recommended by membrane manufacturer.

PART 3 Execution

3.1 INSPECTION

.1 Before commencing the work, inspect the surfaces and notify the ministerial representative of any condition which could damage the installation of the air barrier or the surfaces to be covered with the self-adhering membrane.

.2 The commencement of work will imply acceptance of the state of the substrate.

2.3 INSTALLATION

.1 Apply the primer with a roller, brush or pulverizer at the rate recommended by the manufacturer; let dry completely before installing the membrane.

.2 Apply the membrane starting at the bottom and overlapping the bituminous dampproofing by 50mm. Install membrane on all wall surfaces up to the bottom of the plywood decking.

.1 Reinforce corners with strips of membrane; cut the membrane at penetrations and work it to ensure the watertightness of seals.

.2 Overlap lateral and end joints of the membrane over a minimum of 50mm. Align the membrane, remove the protective backing and press firmly in pace. Once the membrane is well adhered, roll the entire surface, including joints, with a plastic laminate roller.

.3 Seal with the sealing compound around penetrations and at joints with other building elements functioning as air barrier to ensure the continuity of the seal.

.4 Within seven days, cover finished zones with insulation. Before installing the insulation, advise the ministerial representative and wait for his acceptance of the work.

3.2 PROTECTION

.1 Protect the work at the end of the day, when it looks like it will rain or when installation work is not expected for over a day.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 07 27 00 – Air Barrier Membrane.

.2 Section 07 62 00 – Sheet Metal Flashing and Trim.

.3 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

.1 American National Standards Institute (ANSI).

.1 ANSI B18.6.4-99, Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws.

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM A-780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.2 ASTM D2369-03, Test Method for Volatile Content of Coatings.

.3 ASTM D2832-92(R1999), Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.

.3 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.181 (cancelled), Zinc Rich Coating, organic, prepared. Note: Although this standard has been cancelled, the product specified in Part 2 of this section shall still conform.

.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 CAN/CGSB-93.3-M91, Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet for Residential Use.

.4 Canadian Standards Association (CSA International).

.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

1.3 SUBMITTALS

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

.2 Product data: submit manufacturer's printed product literature, specifications and data sheets.

.3 Shop Drawings:

.1 Submit shop drawings.

.2 Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, metal furring, and related work.

.3 Contractor shall submit drawings and calculations showing determination of sizes required by the National Building Code and bearing the seal of an engineer recognized by the Order of Engineers of Quebec.

.4 Samples: Submit duplicate 300 x 300 mm samples of siding material, of colour and profile specified.

.5 Manufacturer's Instructions: Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements

1.5 CALCULATIONS

.1 Calculate wall cladding metal panels in accordance with the requirements of CAN / CSA-S136 and CSA-S136.1.

.2 Metal siding panels must be designed to allow for thermal movements of expansion and contraction of the component materials under a temperature differential of about 80°C without putting excessive strain on the fasteners, or cause buckling, sealant rupture, or other damage.

.3 Joints must be designed to absorb the movements of expansion and contraction between the panels and between the panels and building structure, movements caused by the structural movement, and, without sealant rupture, water infiltration, and permanent distortion or damage to filler materials and construction joints.

.4 Panels must be designed to take into account the tolerances specified for the mounting of the support structure.

.5 Tolerances for panel installation.

.1 The maximum deviation in the flatness of the elements is 6 mm / 10 m in length and 10 mm / 10 m and more in length.

.2 The maximum shift in the alignment of two adjacent elements in the same plane is 0.75 mm.

.3 The elements must withstand static load and wind loads in accordance with the NBC and relevant local regulations. Permissible maximum deflection is 1/180 of span.

.6 Panels must be designed to effectively discharge condensate and rainwater to the outside according to the rain screen principle.

1.6 WARRANTY

.1 Immediately after completion and before the release of contractual retentions, return to the ministerial representative the manufacturer's warranty for each product and a warranty against defects for a period of 5 years from the date of the signing of the final certificate of completion.

1.7 PROTECTION

.1 Protect prefinished materials during transport, storage on site and erection in accordance with CISSB (Bulletin # 9, the Canadian Institute of Steel Sheet for Building).

.2 When stored at the site, materials must be stacked on wooden blocks and inclined enough to ensure that water does not remain permanently on the material.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

.2 Divert reusable materials for reuse at nearest used building materials facility.

.3 Divert unused caulking, sealants, and adhesive materials from landfill through disposal at hazardous material depot.

PART 2 Products

2.1 STEEL CLADDING AND COMPONENTS

.1 Metal cladding panels, to ASTM A 653 / A653M, made of grade A steel, with a minimum yield strength of 230 MPa and admitting a maximum stress of 207 MPa for the factored loads, coated on both sides with a layer of hot-dipped Z275 aluminum zinc to ASTM A792, having the following characteristics:

- .1 Finish coating: painted on one side.
- .2 Colour: colour selected from manufacturer's entire range.
- .3 Thickness: 0.061 mm base metal thickness.
- .4 Dimensions: 878mm wide x 22mm corrugation.
- .5 Profile: corrugated, 7/8".

2.2 ACCESSORIES

.1 Exposed trim: inside corners, outside corners, cap strip, drip cap, undersill trim, starter strip and window/door trim of same materia and colour as cladding.

.2 Edge closures: monocellular soft PVC foam, same shape as the metal siding, type for arctic climate.

.3 Metal sealing element: same thickness and finish as the adjacent panels.

.4 Touch-up paint: as recommended by the manufacturer of the metal panels and used only with the permission of the ministry representative.

2.3 FASTENERS

.1 The screws to CSA B111 and ANSI B18.6.4.

.2 Exposed Screw: #14 Type AB cadmium-plated steel tapping screw, pre-painted hex head of same color, and neoprene support washer.

.3 Non-visible Screw: #14 cadmium-plated carbon steel tapping screw with hex head of suitable length for the application.

.4 Any other appropriate screws or fastening recommended by the manufacturer.

2.4 CAULKING

.1 Sealants: See 07 92 00.

2.5 TOUCH UP PAINT FOR SUPPORT STRUCTURES

.1 Zinc-rich paint for galvanization touch-up: to ASTM A-780 and CAN / CGSB-1.181; dry film to contain 95% metallic zinc.

2.6 FABRICATION

.1 Factory fabricate all items to size, profile, and gauge as shown in shop drawing details, including all sub-girts and finish flashings as required by CSSBI.

.2 All items must be ready for installation on site.

.3 Shape each piece to maximum length. Provide expansion joints. Shape flashings to industry standards.

.4 Shape elements square and level with precise dimensions, so they are free from distortion and other defects likely to affect their appearance or efficiency.

PART 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 PREPARATION

.1 Protect by means of an insulating coating any metal surfaces in contact with concrete, masonry mortar, gypsum, aluminum or any other hydraulic binder based product.

.2 Before starting the installation of the panels, examine the alignment of brackets and notify Ministry representative in writing if the materials do not meet the requirements of the panel installer.

.3 Starting the installation constitutes acceptance of materials by the contractor.

.4 Z bar installation must be coordinated with the installation of the air/vapor barrier and insulation.

3.3 INSTALLATION

.1 Install cladding in accordance with CGSB 93.5, manufacturer's written instructions, and approved shop drawings.

.2 Install cladding as prescribed by CSSBI and manufacturer's written instructions.

.3 Installation shall be by qualified, experienced personnel.

.4 Install Z bars as indicated to clearances required by drawings.

.5 Install continuous starter strips, inside and outside corners, edgings, soffit, drip, cap, sill and window/door opening flashings as indicated in shop drawings, ensuring all fasteners are non visible.

.6 Make openings and seals required for mechanical or electrical penetrations and for decorative elements through the siding. The seal around pipes and other accessories shall be watertight.

.7 Install outside corners, fillers and closure strips with carefully formed and profiled work.

.8 Install metal panels one seamless length, as indicated in the drawings.

.9 Install soffit and fascia cladding as indicated.

.10 Maintain joints in exterior cladding, true to line, tight fitting, hairline joints.

.11 Never leave exposed the sharp outer edges of the steel sheet. Fold them towards the inside over a width of at least 6 mm.

.12 Attach components in manner not restricting thermal movement.

.13 Caulk junctions with adjoining work with sealant. Do work in accordance with Section 07 92 00 - Joint Sealants.

3.4 CLEANING

.1 If the panels were soiled and / or stained, wash the exposed exterior surfaces with warm water and mild household detergent, using a clean, rough cloth.

.2 Remove excess sealant with recommended solvent; see sealant datasheets.

.3 Clean daily all filings panel cutting or drilling. Touch up scratches with the appropriate paint as required.

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

END OF SECTION

PART 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Aluminum board cladding.

.2 Aluminum board soffits.

.3 Aluminum board mouldings and accessories.

1.2 RELATED SECTIONS

.1 Section 07 21 13 – Board Insulation.

.2 Section 07 21 16 – Mattress Insulation.

.3 Section 07 92 10 – Joint Sealants.

.4 Section 08 50 00 – Windows.

1.3 REFERENCES

.1 ASTM :

.1 ASTM D 958 – Practice for Determining Temperatures of Standard ASTM Molds for Test Specimens of Plastics.

.2 ASTM E136 – Standard Test Method for Material Behavior in a Vertical Tube Furnace at 750°C.

.2 AAMA 2604 – Voluntary Specification, Performance requirements and Test Procedures for High Performing Organic Coatings on Aluminum Extrusions and Panels.

.3 CAN/ULC S114 – Standard Test Method for Determining Construction Material Comustibility.

1.4 PERFORMANCE REQUIREMENTS

.1 Design aluminum wall panel system to provide for expansion and contraction of components caused by an ambient temperature range of 100° C (between -40° C and +60° C) without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.

.2 Provide system to accommodate movement in wall system and between wall system and building structure, caused by structural movements without permanent distortion, damage to component, racking of seals, or water penetration.

.3 Provide positive drainage of condensation occurring within system and water entering at joints, to exterior face of wall in accordance with NRC Rain Screen principle.

1.5 SHOP DRAWINGS AND PRODUCT DATA

.1 Make submittals in accordance with requirements of Section 01 33 00 – Submittals Procedures.

.2 Shop Drawings: Indicate component dimensions, wall openings, materials and finishes, and details of lintels, jambs, sills and anchoring. Include compliance with performance requirements, related to applicable standards, and requirements of related work.

.3 Each drawing submitted should bear the stamp and signature of a professional structural ministerial representative licensed at the place where the Project is located.

.4 Product Data: Provide manufacturer's data indicating the principle components and methods of fabrication and installation of the system.

1.6 SAMPLES

.1 Submit samples in accordance with requirements of Section 01 33 00 – Submittal Procedures.

.2 Colour samples: for each specified product, submit two samples, minimum 2" by 3.5", showing true colour and finish of product.

.3 Manufacturer's Certificate: certify that products conform to specs or exceed them.

.4 Submit manufacturer's maintenance instructions, including recommendations or periodic cleaning and maintenance of components.

1.7 QUALITY INSURANCE

.1 Manufacturer Qualifications : A company with minimum 5 years experience producing aluminum finishes to AAMA 2604.

.2 Installer Qualifications : A company with minimum 5 years successful in-service performance in installation of work similar to that specified for this project. Ministerial representative reserves the right, at any time during the work, to visit the fabrication plant and the material suppliers' premises used for the project.

1.8 MOCK-UPS

.1 Provide a full size mock-up of wall system covering at least 900mm x 900mm.

.2 Provide mock-up showing the method of installation of the back wall, doors, windows and other related work. Assemble to illustrate component assembly including weep drainage and air equalization system, attachments, anchors, and perimeter sealant.

.3 Allow 48 hours for inspection mock-up by Ministerial representative before proceeding with work.

.4 When accepted, mock-up will demonstrate minimum standard for this work.

.5 Mock-up may remain as part of finished work.

1.9 PRE-INSTALLATION MEETING

.1 Convene one week before starting work of this section.

1.10 DELIVERY, STORAGE AND HANDLING

.1 Protect prefinished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.11 SEQUENCING

.1 Coordinate the work of this section with installation of thermal insulation windows and other materials and components.

1.12 WARRANTIES

.1 Provide a written document, signed and issued in the name of the Owner, warranting the wall panel system against any material, fabrication and installation defect for a period of five (5) years. Include the stipulation that the work shall remain structurally solid and free of distortions or deformations under normal loads; that the joint covers and sealants will no be damaged by sunrays, weather conditions or oxidation and will remain free or permanent deformation under normal loads.

.2 Provide manufacturer's guarantee of fifteen (15) years for paint finishes stipulating that the finish material will not be altered excessively, that colors will remain uniform and without cracking, peeling, delaminating, or otherwise deteriorate or corrode, as per AAMA 2604..

PART 2 Products

2.1 MATERIALS

.1 Extruded aluminum cladding and soffits: in extruded aluminum, faux wood finish, integrated ventilation system:

- .1 Dimensions:
  - .1 Width: 100mm with V joint.
  - .2 Length: 7.3m.

.2 Accesories:

- .1 Perforated ventilation strips.
- .2 V-joint 2.5" soffit boards (special order).
- .3 J moulding.
- .4 Extra wide starter strip.
- .5 Exterior corners.
- .6 Cover finish and base.
- .7 U moulding and base.
- .8 Flat moulding and base.

2.2 FINISHES

.1 Pretreatment: pretreatment system to AAMA 2604, without chromate, cyanide and other heavy metals. Waste treatment by pH neutralization.

.2 Super durable powder coatings: superior aluminate woodgrain finishes, composed of a polyurethane powder-coat layer of powder, pattern printed with ink-based woodgrain sublimated to base powder. The combination of polyurethane and ink recreates the appearance of wood.

.3 Colour and pattern : chosen from complete woodgrain range of manufacturer.

PART 3 Execution

3.1 PREPARATION

.1 Do not begin installation until colours are verified.

.2 Verify that substrate is ready to receive the panel system.

.3 If the preparation is carried out by another installer, advise ministry representative of any improper preparation prior to installation.

.4 Clean surfaces before installation.

.5 Prepare surfaces using the methods recommended by the manufacturer to obtain the best result depending on the material and project conditions.

3.2 INSTALLATION

.1 Install in accordance with manufacturer's installation instructions.

.2 Barrier Protection: Do not install over cementitious materials, dissimilar metals or pressure treated material without adequate barrier protection.

- .1 Install building paper horizontally on walls to receive metal siding.
- .2 Weather lap edges 6 inches (150 mm) and ends minimum 6 inches (150 mm).
- .3 Stagger vertical joints of each layer.
- .4 Securely staple, nail in place.

.3 Fasten siding to structural supports; aligned, level, and plumb.

.4 Locate joints over supports.

.5 Install expansion control joints where indicated.

.6 Use concealed fasteners unless otherwise approved by Ministerial representative.

.7 Install soffits, and accessories in accordance with best practice, with all joint members plumb and true.

3.3 FIELD QUALITY CONTROL

.1 After installation of soffits, check entire surface for obvious flaws or defects.

.2 Replace and repair any problem areas, paying close attention to the substrate for causes of the problem.

3.4 CLEANING

.1 After application of soffits, clean as necessary to remove all fingerprints and soiled areas.

.2 Upon completion of soffit application, clean entire area, removing all scrap, packaging, and unused materials related to this work.

3.5 PROTECTION

.1 Protect installed products until completion of project.

.2 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 11 – Rough and Finish Carpentry.

.2 Section 07 62 00 – Sheet Metal Flashing.

1.2 REFERENCES

.1 ASTM International Inc.

.1 ASTM D41-05, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

.2 ASTM D6164-05, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 37-GP-56M-80b(A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

.3 Association des maîtres-couvreurs du Québec (AMCQ)

.1 Specifications, Roofing, most recent edition.

.4 Canadian Standards Association (CSA International)

.1 CSA A123.21-10, Standard Test Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane-Roofing Systems

.2 CSA-A123.3-F05, Asphalt Saturated Organic Roofing Felt.

.3 CSA-A123.4-F04, Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.

.4 CSA B111-1974, Wire Nails, Spikes and Staples.

.5 CSA O121-F08, Douglas Fir Plywood.

.5 Factory Mutual (FM Global)

.1 FM Approvals – Roofing Products.

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

.1 Material Safety Data Sheets (MSDS).

.7 Underwriters Laboratories' of Canada (ULC)

.1 CAN/ULC-S102-M88.

.2 CAN/ULC-S107-03, Methods of Fire Tests of Roof Coverings.

.3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit a document issued by a certified testing laboratory demonstrating that the specified roofing system has been tested to CSA A123.21-10. Test results shall demonstrate that the roofing system is resistant to wind pressures of 0.8 kPa for the current surface area, 1.0 kPa at the perimeters and 2.0 kPa at the corners of the roof

.2 Submit a document issued by a body officially recognized by the Standards Council of Canada certifying that the proposed sealing system meets the requirements of CAN / ULC-S107-03.

.3 Provide copies of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Provide copies of WHMIS MSDS and indicate VOC content for:

- .1 Primers.
- .2 Asphalt.
- .3 Sealers.
- .4 Filter fabric.

.5 Provide shop drawings:

- .1 Indicate flashing, control joints, and tapered insulation details.
- .2 Provide layout for tapered insulation.

1.4 QUALITY ASSURANCE

.1 Roofing installer and sub-contractors, at moment of bid and during Work, must possess a license as a Roofing Comntractor. Roofing installer shall be a company specializing in application of modified bituminous roofing systems with 5 years experience, approved by manufacturer.

.2 The roofing installer and subcontractors shall be members of the manufacturer's Quality Assurance program and shall submit a written certificate issued by the manufacturer for this purpose prior to the commencement of the roofing work.

.3 The roofing installer and subcontractors shall be members of AMCQ.

.4 Roofing and sheet metal work shall be carried out in accordance with the written recommendations of the membrane manufacturer and to ULC Class A, Factory-Mutual (FM), Class I-60 and AMCQ requirements (most recent editions).

1.5 ACCEPTABLE PRODUCTS OR MATERIALS

.1 When materials or products are prescribed by their trademark, consult the Instructions to Bidders in order to know the procedure concerning the request for approval of materials or substitutes.

1.6 MANUFACTURER'S REPRESENTATIVE

.1 At beginning of roofing work, a representative of the manufacturer may be given access to the job site.

1.7 FIRE PROTECTION

.1 Prior to commencement of Work, perform an audit to ensure site safety and submit proposed procedures and changes to minimize the risks and hazards of fire.

.2 Observe safety instructions recommended by manufacturer and local authorities.

.3 At the end of each workday, use a heat detector gun to identify smoldering fires. Jobsite organization must allow the presence of workers for at least 1 hour after the end of torch work.

.4 An inspection shall be carried out at the end of the work by an employee of the roofing contractor who is specialized in this type of work and, if necessary, with the assistance of a member of the municipal fire protection service.

.5 Never weld directly to combustible materials.

.6 Pay close attention to site cleanliness at all times. During Work, ensure that there is a fire hose (where possible) and at least one 14 kg, ULC Class A, B and C Permanent Pressure Fire Extinguisher in perfect working order within six meters of each torch. Apply the safety instructions that accompany the technical data sheets of sealants. Make sure that the torch is not placed near flammable or combustible products. The flame of the torch must in no case penetrate into a place where it is not visible or cannot be easily controlled.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Indicate following information on material packaging :

- .1 Name and address of manufacturer and product brand name.
- .2 Conformity of product to applicable norms, and material class.
- .3 Product weight.

.2 Storage and Handling Requirements:

- .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
- .2 Provide and maintain dry, off-ground weatherproof storage.
- .3 Store rolls of felt and membrane in upright position. Store membrane rolls with salvage edge up.
- .4 Remove only in quantities required for same day use.
- .5 Place plywood runways over completed Work to enable movement of material and other traffic.
- .6 Store sealants at +5 degrees C minimum.
- .7 Store insulation protected from daylight, weather, and deleterious materials.
- .8 Store emulsion-based adhesives and sealants at a temperature of at least 5 ° C.
- .9 Avoid accumulation of materials on roofs, which could, in specific locations, compromise the strength of structures by imposing loads greater than what is permissible.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Place in designated containers substances that meet the definition of toxic or hazardous waste.

.2 Ensure that empty containers are sealed and stored properly, out of the reach of children, for disposal.

.3 Collect and separate plastic, paper packaging and corrugated cardboard.

.4 Fold up metal banding, flatten and place in designated area for recycling.

.5 Plan and coordinate thermal insulation work to minimize waste generation.

.6 Recover and sort plastic waste and paper packaging for recycling.

.7 Provide preference to suppliers who accept the use of mineral fiber insulation materials for reuse or recycling.

.8 Use the least toxic sealants and adhesives that meet the requirements of this section.

.9 Close and seal partially used adhesive or sealant containers and store at moderate temperature in a well ventilated and fireproof location.

.10 Place tubes and other used containers of adhesive and sealant in areas designated for hazardous materials.

.11 Recover, pack and store containers of bitumen, sealant and primer, partially used or unwound felt rolls for return to a recycling facility in accordance with the waste management plan.

1.10 FIELD CONDITIONS

.1 Ambient Conditions

.1 Bituminous membranes shall be installed only when the ambient and surface temperatures are within the limits prescribed by the manufacturer.

.2 Do not install roofing materials when temperatures are below -10 degrees Celsius, taking into account the wind factor.

.2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

.3 Interrupt Work during rain or snowfall.

.4 Ensure every time the work is interrupted for any reason that the roof remains completely leakproof both for the protection of roofing materials and for those already installed inside and outside, Prevent any water penetration into the building and any subsequent damage.

.5 Comply with Workplace Hazardous Materials Information System (WHMIS) requirements for the handling, storage and disposal of bitumen, sealants, primers and caulking products.

1.11 WARRANTY

.1 For Work of this Section, 07 52 00 - Modified Bituminous Membrane Roofing, THE 12 month warranty period is extended to 120 months.

.2 The Contractor hereby certifies that the modified bitumen membrane and membrane flashings shall remain in place and maintain their water tightness for a Guarantee period of 24 months.

.3 The roofing manufacturer shall provide a written document issued in the name of the owner and valid for a period of 10 years indicating that it will repair any leakage in the membrane to restore the roof system to a dry and waterproof state, insofar as defects in manufacture or installation have led to water infiltration. The

guarantee must cover the total repair costs during the entire warranty period. The warranty must be transferable at no additional cost to subsequent purchasers of the building.

.4 Provide a written, signed document in the name of the owner stating that the sealants in this section are warranted against leakage, cracking, crumbling, loss of adhesion, contraction, loss of consistency and tarnishing of adjacent surfaces for a period of three years from the date of issue of the certificate of completion.

1.12 INSPECTION

.1 Inspection of roofing work shall be carried out by a test laboratory mandated by the owner.

Part 2 Products

2.1 PERFORMANCE CRITERIA

.1 Compatibility between components of roofing system is essential. Provide written declaration to Ministry Representative stating that materials and components, as assembled in system, meet this requirement.

.2 Roofing System: to CSA A123.21 for wind uplift resistance.

2.2 DECK COVERING

.1 19mm plywood. See section 06 10 11.

2.3 MULTILAYER MEMBRANE

.1 Color: granular surface of cap sheet shall be gray.

.2 Base sheet membrane: prefabricated sheet to CGSB 37-GP-56M, SBS modified bitumen reinforced with nonwoven polyester fibres, having nominal weight of 180 g/m², 3mm thick. Top and bottom surfaces covered with heat-weldable polyethylene film, to be torch applied.

.3 Cap sheet membrane (field and upstands): prefabricated sheet to CGSB 37-GP-56M, SBS modified bitumen reinforced with nonwoven polyester fibres, having nominal weight of 250 g/m², 4mm thick (not counting granules). Top surfaces covered with colored granules, bottom surface covered with plastic film.

.4 Base sheet primer: as recommended by manufacturer.

2.4 SLOPED POLYISOCYANURATE INSULATION

.1 Polyisocyanurate insulation, to CAN/ULC-S102-M88, rigid panel composed of closed-cell polyisocyanurate foam covered both sides with a fiberglass membrane, 2% sloped top surface, laminated with a high density wood fiber board, Rsi of 1.8 for 50mm . Minimum thickness: 25mm. Maximum thickness: depending on the slope and width of the roof

.1 Compression resistance : 125.2Kpa (18.21lbs/in²) for 38mm.

.2 Acceptable products : *Isolex II* by Lexcor, *Sopra-Iso* by Soprema, *Ikotherm* by Iko or other acceptable products.

2.5 SEALERS

.1 Where not exposed to UV radiation: SBS modified bitumen sealing compound with fibres, mineral contents and solvent.

.1 Where exposed to UV radiation: SBS modified bitumen sealing compound with fibres, mineral contents and solvent, containing aluminum.

2.6 FASTENERS

.1 Mechanical fasteners: stainless steel screw and plate assemblies.

.2 Membrane anchor strip: aluminum profile, 25 mm wide x 2 mm thick x 3050 mm long without sharp edges, with a reinforcing angle at the base and slotted holes at 152 mm o.c.

Part 3 Execution

3.1 QUALITY OF WORK

.1 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual and AMCQ roofing specifications, particularly for fire safety precautions, and to FM standards.

.2 Do priming in accordance with manufacturers written recommendations.

3.2 EXAMINATION OF ROOF DECKS

.1 Prior to commencement of work, the owner's representative and the foreman shall be responsible for inspecting and approving, in particular, the condition of the support (including, if any, slopes and nailers) and parapet walls, roof drains, plumbing vents, ventilation and other exits, and construction joints. If necessary, a notice of non-compliance will be given to the contractor for corrections. The commencement of the work will be considered as an acceptance of the conditions relating to the realization of this work.

.2 Examination and preparation of surfaces shall be carried out in accordance with the instructions contained in the technical documentation of the membrane manufacturer.

.3 Evaluation and Assessment:

.1 Prior to beginning of work ensure:

.1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.

.2 Curbs have been built.

.3 Roof drains have been installed at proper elevations relative to finished roof surface.

.4 Plywood and lumber nailer plates have been installed to deck, walls and parapets as indicated.

.5 Plumbing, finish carpentry and other prior work has been completed.

.4 Do not install roofing materials during rain or snowfall.

3.3 PROTECTION OF IN-PLACE CONDITIONS

.1 Cover walls, walks, and adjacent work where materials hoisted or used.

.2 Use warning signs and barriers. Maintain in good order until completion of Work.

.3 Clean off drips and smears of bituminous material immediately.

.4 Dispose of rain water off roof and away from face of building until roof drains or hoppers installed and connected.

.5 When transporting roofing materials over roofs and performing roofing work, protect exposed surfaces of finished structures to prevent damage. Make rigid panel sidewalks on the roofs, over the materials put in place, to allow the workers to come and go and transport the equipment. Assume full responsibility for any damage.

.6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.

3.4 DECK SHEATHING

.1 Mechanically fasten support panels to steel deck with mechanical attachments to FM requirements, in particular to PLPDSI-29, which addresses panel fastening at roof perimeters and corners. Cut panels so that each edge rests on the center of the top rib. Make straight cuts with a suitable tool.

.2 Panel joints shall be staggered, half-paneled and perfectly jointed. Joints in both directions shall be sealed with a heat resistant tape to prevent asphalt flow inside finished spaces.

3.5 MECHANICAL FASTENING OF SLOPED INSULATION

.1 Secure insulation with screws and pressure distribution plates.

.2 Comply with Factory Mutual requirements for layout and number of screws.

.3 Place panels in staggered, parallel rows, length in slope axis; panels shall be joined together in tight contact. Install insulation according to shop drawings. The joints between layers must be staggered by at least 150 mm.

.4 Cut end boards to suit

3.6 PRIMER APPLICATION

.1 Apply a coat of primer to the laminated support panel on the insulation boards as per manufacturer's reccommendations.. All application surfaces should be free of rust, dust and residue that could impair adhesion. The primer coated surface shall be covered with the roofing membrane as soon as possible.

3.7 BASE SHEET APPLICATION

.1 Installation of the base sheet shall be carried out in a single working day.

.2 Start at low point of roof, perpendicular to slope.

.3 Unroll base sheet dry over support panel, taking care to align the edge of the first sheet with the roof edge.

.4 Lap sheets 75mm on sides and 150 mm minimum for end laps..

.5 At end laps, cut the corner of the area to be covered by the following sheet.

.6 Torch base sheet.

.7 Application to be free of blisters, wrinkles and fishmouths.

3.8 CAP SHEET APPLICATION:

.1 Use double-flanged starting rolls for first edge. If a starting roll is not used, the longitudinal overlap covered with granules must be degranulated by driving the granules into the bitumen heated by torch over a width of 75 mm.

.2 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align and reroll from both ends, taking care to align the edge of the first sheet with the roof edge.

.3 At end laps, cut the corner of the area to be covered by the following sheet.

.4 Each edge will overlap the previous one laterally following the printed lines provided, and overlap by 150 mm at the ends. Space transverse seams at least 300 mm.

.5 Torch the cap sheet to base sheet, creating a slight overflow of bitumen (3 to 6 mm).

.6 Make sure that the membranes and reinforcement are not overheated.

.7 Application to be free of blisters, fishmouths and wrinkles.

.8 Avoid foot traffic on finished surfaces; use rigid panel protection as required.

.9 Install reinforcing membranes where indicated.

3.9 FLASHINGS:

.1 Install nailers at exposed surfaces of roof edges, providing sufficient backing for nails and / or screws to retain waterproofing membranes and flashings..

.2 Flashing installation: see 07 62 00.

3.10 PROTECTION OF FINISHED WORK

.1 Before installing protective panels, make sure that the sealing membrane is not damaged.

3.11 CLEANING

.1 Remove bituminous markings from finished surfaces.

.2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their instructions.

.3 Repair or replace defaced or disfigured finishes caused by work of this section.

END OF SECTION

PART 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM A653/A653M-09a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A792/A792M-09a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.

.2 CAN/CSA-S136-2007 – North American Specification for the Design of Cold Formed Steel Structural members.

1.2 SUBMITTALS

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

.2 Product data:

.1 Submit manufacturer's product data, instructions and literature. Technical data must include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit proof that the manufacturer is approved by CCMC with the manufacturer's approval number.

.3 Shop drawings: shop drawings shall bear the seal and signature of a professional engineer registered or licensed in Canada in the province of Quebec.

.4 Submit duplicate 300 x 300 mm samples of each sheet metal material.

1.3 QUALITY ASSURANCE

.1 Mock-up:

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

.2 Fabricate 1200 x 1200 mm sample roofing panel using identical project materials and methods to include typical seam.

.3 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment and material application.

.4 Locate where directed.

.5 Allow 24 hours for inspection of mock-up by Ministry Representative before proceeding with sheet metal flashing work.

.6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work.

.7 Approved mock-up may remain as part of finished Work.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials and equipment to site in original factory packaging, labeled with the name and address of the manufacturer.

.3 Storage and handling:

.1 Store materials so they do not rest on the floor in a clean, dry, well ventilated location according to the manufacturer's recommendations.

.2 Protect sheet metal from marks, scratches and scrapes.

.3 Replace damaged materials and equipment.

PART 2 Products

2.1 SHEET METAL MATERIALS

.1 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade 33 with AZ180 coating, 26 gauge, width 406mm.

2.2 PREFINISHED STEEL SHEET

.1 Prefinished steel with factory applied polyvinylidene fluoride.

.1 Colour selected from manufacturer's standard range.

.2 Specular gloss: 30 units +/-5 to ASTM D523.

.3 Coating thickness: not less than 22 micrometres.

.4 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:

.1 Outdoor exposure period 2500 hours.

.2 Humidity resistance exposure period 5000 hours.

2.3 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB-37.5.

.3 Underlay: High temperature self-adhesive membrane composed of two waterproofing materials, a rubberized asphalt adhesive and an anti-UV polymer film. The rubberized asphalt surface shall be coated with a non-stick backing with non-folded edge.

.1 Roll dimensions: 22.9 m x 914 mm.

.2 Colour: Grey-Black.

.3 Membrane thickness: 1.02 mm, to ASTM D3767, method A.

.4 Tear Strength: 33 lb/in longitudinal, 31 lb/in crossways, to ASTM D412 (matrix C modified).

.5 Elongation: 250 % to ASTM D412 (matrix C modified).

.6 Low Temperature Flexibility: no change a -29°C to ASTM D1970.

.7 Plywood Adherance: 525 N/m of width to ASTM D903.

.8 Max Permeability : 2.9 ng/m2s Pa to ASTM E96.

.4 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide.

.5 Fasteners: concealed.

.6 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.7 Touch-up paint: as recommended by sheet metal roofing manufacturer.

.8 Channel closures: EPDM, from the same manufacturer as the cover.

PART 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: prior to the installation of metal roofing, ensure that the condition of materials previously installed under other sections or contracts is acceptable and allows for work according to the manufacturer's written instructions.

.1 Perform visual inspection of materials in the presence of Ministry Representative.

.2 Immediately notify the Ministry Representative of unacceptable conditions detected.

.3 Proceed with installation only after correcting the unacceptable conditions and written approval of the Ministry Representative.

3.2 INSTALLATION

.1 Use concealed fastenings except where approved in writing by Ministry Representative before installation.

.2 Provide underlay under sheet metal roofing.

.1 Secure in place and lap joints 100 mm minimum.

.3 Apply slip sheet over asphalt felt underlay to prevent bonding between sheet metal and felt.

.1 Secure with minimum anchorage and lap joints 50 mm minimum in direction of waterflow.

.4 Install sheet metal roof panels using cleats spaced according to manufacturer's instructions.

.5 Secure cleats with two fasteners each and cover with cleat tabs.

.6 Stagger transverse seams in adjacent panels.

.7 Flash roof penetrations with material matching roof panels, and make watertight.

.8 Form seams in direction of water-flow and make watertight.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.2 Leave the place clean at the end of each working day.

.3 Final Cleaning: upon completion remove materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

.1 Protect equipment and items installed against damage during construction.

.2 Repair damage to adjacent materials and equipment.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 07 46 13 – Sheet Metal Cladding.

.2 Section 07 46 14 – Metal Board Cladding.

.3 Section 07 61 00 – Sheet Metal Roofing.

.4 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

- .1 ASTM A653/A653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM B32-04, Standard Specification for Solder Metal.

.2 American Architectural Manufacturers Association

- .1 AAMA 603,8, Voluntary Performance Requirements and Test Procedures for AAMA 2605, Pigmented Organic Coatings on Extrude, Canadian Roofing Contractors' Association (CRCA)
- .1 Roof specifications, latest edition.

.3 Canadian Standards Association (CSA International)

- .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

1.3 DOCUMENTS / SAMPLES TO SUBMIT

.1 Submit required documents and samples in compliance with section 01 33 00 - Submittal Procedures.

.2 Submit the required technical data sheets with regard to flashing manufacture materials, as well as the manufacturer's specifications and documentation. The technical data sheets must indicate product characteristics, performance criteria, dimensions, thicknesses, limits and finishing.

.3 The drawings must show the profiles, dimensions, types of materials and their finishes, the thicknesses of all elements used and indicate the area where they will be installed.

.4 Submit two 300 mm x 300 mm samples of each type of proposed sheet metal, showing each colour and finish.

1.4 COMPATIBILITY OF MATERIALS

.1 Materials must be protected from damaging chemical reactions and electrolytic processes.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle all materials and equipment in compliance with section 01 61 00 - Common Product Requirements.

PART 2 Products

2.1 SHEET METAL

.1 Zinc-plated steel sheets: caliber indicated in drawings, commercial quality, to ASTM A653/A653M, with Z275 zinc coating.

.2 Aluminum sheets: caliber indicated in drawings, to CAN/CGSB-93.1.

.3 Aluminum sheet finish : polyvinylidene difluoride (PVDF) such as Kynar 500. Dry film thickness to ASTM D1400 : 0.20 mil primer coat plus 1.0 mil color coat, total Dry Film Thickness of 1.2 mil. Colour: to be determined.

.4 The thickness required for pre-finished sheets is that of the bare metal.

2.2 WARRANTY

.1 Warrantee period: 10 years from the date of substantial completion.

2.3 ACCESSORIES

.1 Fasteners: made of the same material and same dip as the sheet used, at least 50 mm wide and the same gauge as the sheet to fasten.

.2 Fastening devices: made of the same material as the sheet used, compliant with the CSA B111 standard, flat-headed, grooved nails, appropriate length and width.

.3 Washers: made of the same material as the sheet used, 1 mm thick, with rubber seal.

.4 Sealing products: In accordance with provisions of section 07 92 00.

2.4 FORMING

.1 Form flashing and mouldings according to the profiles and dimensions shown on the drawings. All elements must be ready to install on the work site.

.2 Parts shall be formed in the longest possible lengths, to a maximum of 2400 mm. Plan sufficient space at joints for the expansion of elements.

.3 Exposed edges shall be folded 12 mm on their interior face. Corners must be mitred and sealed.

.4 The elements must be formed with precision so they are square and level, according to the required dimensions, and so they are free of deformations or other defects that could alter their appearance or efficacy.

PART 3 Execution

3.1 INSTALLATION

.1 Install sheet metal fabrications according to details.

.2 Hide fastenings, except where the ministerial representative agrees to leave them exposed.

.3 Install trim in the areas indicated, making sure it is plumb, level and square. Fasten to furrings at a maximum distance of 300 mm between screws.

.4 Close and seal end joints.

.5 Form joints in the direction of water flow and make them watertight.

.6 With a sealant, caulk flashing.

3.2 CLEANING

.1 Clean the metal to remove stains and dirt.

.2 Periodically remove waste and surplus material from the work to prevent their accumulation on the work site.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section covers all sealant and caulking materials not covered in other sections.

.2 Refer to relevant sections to obtain more instructions on sealant and caulking materials.

.3 When caulking work with sealant materials are shown in cross-section or in details, it is agreed that the joint(s) must be sealed along the entire perimeter and/or the length of work to seal.

1.2 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)

.1 CGSB19 GP 5M 1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Incorporating Amendment No. 1).

.2 CAN/CGSB 19.13 M87, Sealing Compound, One-Component, Elastomeric, Chemical Curing.

.3 CGSB19 GP 14M 84, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (confirmation of April 1976).

.4 CAN/CGSB 19.17 M90, One-Component, Acrylic Emulsion Base Sealing Compound.

.5 CAN/CGSB 19.24 M90, Multicomponent, Chemical-Curing Sealing Compound.

1.3 CONTRACTOR QUALIFICATIONS

.1 The Contractor must detain an operating license in a category giving it the right to installer sealing compounds.

.2 Only labour that is competent in the installation of sealing compounds, employed by a company with at least three years of experience in the installation of sealing compounds and possessing the adequate and necessary equipment to carry out such work may execute the work.

1.4 COMPATIBILITY

.1 The sealing compounds and their primers must be supplied by the same manufacturer.

1.5 SCOPE OF WORK

.1 Seal around all openings.

.2 Carry out the other required or necessary sealing work as described in the drawings.

1.6 PRODUCT SAMPLES

.1 Submit the samples in compliance with provisions of section 01001 – General Requirements.

.2 Submit two samples of each chosen colour and each type of material used.

.3 Once the preliminary choices are made, an on-site sample must be made over 3000 mm for final approval.

1.7 DELIVERY, HANDLING AND STORAGE

.1 Deliver and store materials in the original containers and packaging bearing the manufacturer's seal.

.2 The materials must be adequately protected and permanently stored in a dry, well ventilated shelter, away from open flames or welding sparks, protected from bad weather and harmful substances.

.3 Store water-based compounds at a temperature of 5 °C or higher. Store solvent-based compounds at a sufficiently high temperature to ensure the require malleability for their application.

1.8 GUARANTEE

.1 The contractor hereby guarantees the sealing work against leaks, cracking, crumbling, disintegration, loss of consistency, shrinkage, running, loss of adhesion and tarnishing of adjacent surfaces for a period of five (5) years starting from the date of substantial completion of the work.

1.9 PROJECT CONDITIONS

.1 Environmental limitations:

.1 Do not proceed with installation of joint sealants under following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4˚C.

.2 When joint substrates are wet.

.2 Joint-Width Conditions:

.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

.4 Ventilate work areas using approved portable force-draft fans and exhaust fans.

.5 Carry out all sealing compound installation work including waste management and disposal in accordance with provisions of local regulations as well as *ministère de l'Environnent du Québec* regulations.

1.10 ACCEPTABLE PRODUCTS OR MATERIALS

.1 When materials or products are prescribed by their trademark, consult the Instructions to Bidders in order to know the procedure concerning the request for approval of materials or substitutes.

Part 2 Products

2.1 SEALANT MATERIALS

.1 The sealants selected for the project must appear on the list of approved products drafted by the CGSB's sealant materials certification commission. With regard to sealants approved with a primer, only that primer may be used with said sealant.

.2 Sealant type 1: multi-part polyurethane sealant.

.1 Reference products: Sonolastic NP 2 by Sonneborn, Sikaflex 2C NS by Sika or Dymeric by Tremco or a replacement approved by addenda according to Instructions to Bidders.

.2 Locations:

.1 Fire-resistant joints.

.2 Exterior vertical joints that may experience movement.

.3 Sealant type 2: single part self-leveling polyurethane sealant.

.1 Reference products: Sonolastic SL 1 by Sonneborn, Sikaflex 1C SL by Sika or THC 900 by Tremco or a replacement approved by addenda according to Instructions to Bidders.

.2 Location: Sawn control joints in interior concrete floors with foot traffic loads only.

.4 Sealant type 3: single part aliphatic polyurethane sealant with high colour retention.

.1 Reference products: Sonolastic Ultra by Sonneborn, Sikaflex 1A by Sika or Spectrem II by Tremco or a replacement approved by addenda according to Instructions to Bidders.

.2 Location: joints in prepainted steel or white aluminum assemblies.

.5 Sealant type 4: single part sylil-finished polyether sealant.

.1 Locations:

.1 Joints around windows and doors with prepainted steel or aluminum frames (other than white).

.2 Joints that require strong adherence to glass.

.6 Sealant type 5: general purpose, mildew resistant, silicone sealant.

.1 Reference products: Sonolastic Omniplus by Sonneborn or Tremsil 200 by Tremco or a replacement approved by addenda according to Instructions to Bidders.

.2 Locations:

.1 Interior joints on countertops and around sinks and lavatories.

.2 Joints in sanitary facility rooms such as restrooms and shower rooms.

.3 Joints required to be mildew-resistant.

.7 Sealant type 6: acrylic latex sealant.

.1 Locations: Static interior joints not requiring fire resistance (such as around interior door and window frames.

.8 Sealant type 7: acoustic sealant, blended polymer and synthetic rubber base.

.1 Locations: at the top and bottom of sound-insulated interior walls.

.9 Primers: type recommended by the manufacturer.

.10 Colour will be chosen by the ministerial representative from the entire range offered by the manufacturer to match colour of adjacent materials.

2.2 SUPPORT MATERIALS

.1 Polyethylene, urethane, neoprene or vinyl foams.

.1 Back-up material in extruded foam.

.2 Elements oversized by 30 to 50%.

.2 Release agent

.1 Polyethylene bond breaker tape that does not adhere to the sealant.

2.3 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

2.4 COORDINATING LOCATIONS

.1 Contractor and subcontractors shall check all contractual documents to ensure the use of the right sealing compound at the right place. Any cases of conflict between specification sections or between the specifications and drawings shall be reported to the ministerial representative prior to the commencement of work.

Part 3 Execution

3.1 SITE PROTECTION

.1 Protect installed Work of other trades from staining or contamination.

3.2 SURFACE PREPARATION

.1 Rid the joint surfaces of any undesirable material, including dust, rust, oil, grease and other foreign materials which could harm the execution or effectiveness of the work.

.2 Using a wire brush, a grinding wheel or sand blast, remove rust, calamine and coatings covering ferrous metal surfaces. Using the joint cleaner, remove oil, grease stains and other coatings covering the surface of non-ferrous metal surfaces.

.3 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.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare concrete and masonry surfaces as well as glassy and vitreous surfaces in compliance with the sealant manufacturer's instructions.

.6 Check the joint dimensions and apply the necessary corrective actions so that the depth is equal to half its width, for a minimum depth and width of 6mm and a maximum depth and width of 13 mm.

.7 Prime the surfaces in compliance with the manufacturer's instructions.

.8 Starting the sealing work constitutes and acceptance of underlying surfaces and no claim may be brought to this chapter.

3.3 PRIMER

.1 Before applying the primer and caulking material, cover adjacent surfaces to prevent tarnishes, where necessary.

.2 Right before applying the caulking material, apply the primer on the lateral surfaces of masonry joints, in compliance with the sealant manufacturer's instructions.

3.4 BACK-UP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape.

3.5 PREPARATION OF SEALING PRODUCTS

.1 Mix materials while rigorously respecting the sealant manufacturer's instructions.

3.6 APPLICATION

.1 Sealant:

.1 Apply sealant in accordance with manufacturer's written instructions.

.2 Apply sealant in continuous beads.

.3 Apply sealant using gun with proper size nozzle.

.4 Use sufficient pressure to fill voids and joints solid.

.5 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.6 Tool exposed surfaces before skinning begins to give slightly concave shape.

.7 Remove excess compound promptly as work progresses and upon completion.

.8 Caulk exterior cladding joints with door frames and around new openings as well as anywhere else indicated on the drawings. Do not caulk exterior cladding joints at door frame or window frame heads, which are fitted with labels.

.9 Caulk around soundproof dividers and fire barriers where they meet different materials.

.10 Caulk the perimeter or frames, interior doors and windows as well as openings and objects that penetrate soundproof dividers and fire barriers.

3.7 CURING

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until proper curing has taken place.

.3 Protect compounds from bad weather and dirt for a period of 24 hours.

3.8 CLEANING

.1 Clean adjacent surfaces immediately and leave Work neat and clean.

.2 Remove excess and droppings, using recommended cleaners as work progresses.

.3 Remove masking tape after initial set of sealant.

.4 Cleaning:

.1 Clean adjacent surfaces immediately and leave Work neat and clean.

.2 Remove excess and droppings, using recommended cleaners as work progresses.

.3 Remove masking tape after initial set of sealant.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 04 05 10 – Common Work Results for Masonry: General requirements for work results in regards to grout injection and installation of frames in masonry.

.2 Section 07 92 10 - Joint Sealing: Caulking of joints between frames and other building components.

.3 Section 08 71 10 - Door Hardware - General: Supply of finish hardware, including weatherstripping and mounting heights.

.4 Section 08 80 50 - Glazing: Glazing.

.5 Section 09 91 13 – Painting – New Exterior Work

.6 Section 09 91 23 – Painting – New Interior Work.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM International)

- .1 ASTM A653/A653M-01a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM A366-85, Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
- .3 ASTME A525-86, Specification for General Requirements for Steel Sheet Zinc-Coated (Galvanized) by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .2 CSGB 1-GP-40M-97, Anticorrosive Structural Steel Alkyd Primer.
- .3 CSGB 1-GP-148-80, Removable Matte Touch-Up paint.

.3 Canadian Standards Association (CSA International)

- .1 G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA W59-M1989(R2001), Welded Steel Construction (Metal Arc Welding) (Metric Version).
- .3 CAN/CSA-G40.20-M87, General Requirements for Rolled or Welded Structural Quality Steel.

.4 Canadian Steel Door Manufacturers' Association, (CSDMA).

- .1 CSDMA, Specifications for Commercial Steel Doors and Frames, 1990.
- .2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 1990.

.5 National Fire Protection Association (NFPA)

- .1 NFPA 80-99, Standard for Fire Doors and Fire Windows.
- .2 NFPA 252-99, Standard Methods of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC)

- .1 CAN4-S104-80(R1985), Fire Tests of Door Assemblies.

.2 CAN4-S105-85(R1992), Fire Door Frames Meeting the Performance Required by CAN4-S104.

.7 CAN/ULC-S704-01, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 DESIGN REQUIREMENTS

.1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.

.2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazing, arrangement of hardware and fire rating and finishes.

.3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings finishes.

.4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

.5 Submit test and engineering data, and installation instructions.

1.5 REQUIREMENTS

.1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104M and NFPA 252 for ratings specified or indicated.

.2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with CAN4-S104, ASTM E152 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene or corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused paint and sealant materials from landfill to official hazardous material collections site approved by Engineer.

.5 Do not dispose of unused paint and sealant materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

.6 Divert unused metal materials from landfill to metal recycling facility approved by Engineer.

.7 Divert unused wood materials from landfill to recycling reuse composting facility approved by Engineer.

.8 Damaged or broken glazing materials are not recyclable. These materials must not de disposed of with materials destined for recycling.

PART 2 Products

2.1 MATERIALS

.1 Interior doors:

.1 Hot dipped galvanized steel sheet: for all doors and frames, to ASTM A924M-94, factory galvanized to Z275 (zinc phosphate): use galvanized elements at following locations: for all doors and frames. Minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

.2 Exterior doors:

.1 Galvanized steel sheet: commercial quality, to ASTM A924M-94, factory galvanized to Z275 (zinc phosphate): use galvanized elements at following locations: all anchors, fasteners and reinforcing.

2.2 DOOR CORE MATERIALS

.1 Honeycomb construction:

.1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m^3 minimum sanded to required thickness.

.2 Stiffened: face sheets laminated to core.

.1 Polyurethane: to CAN/ULC-S704 rigid, modified poly/isocyanurate, closed cell board. Density 32 kg/m^3. See door schedule for locations.

2.3 OTHER ELEMENTS

.1 Provide any other elements for doors and frames in accordance with requirements of CSDFMA.

2.4 PRIMER

.1 For galvanized steel sheet: to CSGB 1-GP-18M-77 (R1978).

.2 For cold-rolled steel sheet: to CSGB 1-GP-40M-79 and/or CSGB 1-GP-148M-80; depending on use.

2.5 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.2 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.

.3 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.6 TOUCH-UP PAINT

.1 Anti-rust touch-up paint to CAN/CGSB-1.181.

2.7 PAINT

.1 Field paint steel doors and frames in accordance with Section 09 91 21 Painting.

2.8 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.3 Door bottom seal: refer to Section 08 71 10 – Door Hardware – General.

.4 Metallic paste filler: to manufacturer's standard.

.5 Fire labels: metal riveted.

.6 Sealant: in accordance with Section Joint Sealants.

.7 Glazing: in accordance with Section 08 80 50 Glazing.

.8 Make provisions for glazing as indicated and provide necessary glazing stops.

.1 Design exterior glazing stops to be tamperproof.

.9 Top edge closure: exterior doors shall have inverted U-shaped PVC insert aligned with upper edge of door face.

2.9 GENERAL FRAME FABRICATION

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Frames for exterior or interior openings, dimensions as indicated, 1.6mm thick, welded, thermal break where indicated.

.4 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.5 Protect mortised cutouts with steel guard boxes.

.6 Prepare frame for door silencers, 3 for single door, 2 at head for double door.

.7 Manufacturer's nameplates on frames and screens are not permitted.

.8 Conceal fastenings except where exposed fastenings are indicated.

.9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.10 Insulate exterior frame components with polyurethane insulation.

.11 All hinge reinforcing to be “high frequency” or “intensive use” type folded sheet.

2.10 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforecement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

.4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm o.c. maximum.

2.11 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.

.2 Accurately mitre or mechanically joint frame product and weld continuously along entire length inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

.7 For each single door, install e simple, installer three door silencers on strike side of frame; for double doors, install 2 silencers on head of frame.

.8 Provide glazing as indicated and install required glazing stops.

2.12 GENERAL DOOR FABRICATION

.1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.

.2 Edges sealed with adhesive, visible square folded joint.

.3 Blank, reinforce, drill doors and tap for mortised, templated hardware.

.4 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.5 Reinforce doors where required, for surface mounted hardware.

.6 Provide flush PVC top caps to exterior doors.

.7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.8 Manufacturer's nameplates on doors are not permitted.

.9 Unless otherwise indicated, doors and frames to be fabricated according to details and requirements of "Canadian Manufacturing Specifications for Metal Doors and Frames," most recent edition, published by "Canadian Steel Door and Frame Manufacturers' Association" (CSDFMA).

.10 Factory prime cold-rolled steel sheet.

.11 Factory apply touch-up primer at places where galvanization has been damaged.

.12 All hinge reinforcing to be "high frequency" or "intensive use" type folded sheet.

.13 Top and bottom to be flush; provide steel shapes with full width of door welded to both faces.

2.13 THERMALLY BROKEN DOORS AND FRAMES

.1 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

.2 Fabricate thermally broken frames separating exterior parts form interior parts with continuous interlocking thermal break.

.3 Apply insulation.

PART 3 Execution

3.1 INSTALLATION GENERAL

.1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.2 FRAME INSTALLATION

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Caulk perimeter of frames between frame and adjacent material.

.6 Maintain continuity of air barrier and vapour retarder with additional self-adhesive membranes as indicated.

3.3 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 10 - Door Hardware - General.

.2 Provide even margins between doors and jambs and doors and finished floor[and thresholds] as follows.

.1 Hinge side: 3.0 mm.

.2 Latchside and head: 3.0 mm.

.3 Finished floor, noncombustible sill and thresholds: 13 mm.

.3 Adjust operable parts for correct function.

3.4 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.5 GLAZING

.1 Install glazing for doors in accordance with Section 08 80 50 - Glazing.

END OF SECTION

PART 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.105-M91, Quick-Drying Primer.

.2 CSA International.

.1 CSA G40.20/G40.21-F04 (C2009), General Requirements for Rolled or Welded Structural Quality Steel.

1.2 SUBMITTALS

.1 Submit documents and samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's product data, instructions and other documentation for sliding metal doors and hardware. The technical data must include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings stamped and signed by professional engineer registered or licensed in Canada, in the province of Quebec.

.2 Indicate each type of door, arrangement of hardware, and required clearances.

.4 Manufacturer's Field Reports:

.1 Reports of spot checks by the manufacturer submitted not later than three (3) days after the checks prescribed in section FIELD QUALITY CONTROL in PART 3, indicating that the work conforms to specified criteria.

1.3 CLOSEOUT SUBMITTALS

.1 Submit documents / information required in accordance with Section 01 78 00 – Closeout Submittals.

.2 Provide operation and maintenance data for sliding fire door hardware for incorporation into project manual.

1.4 QUALITY ASSURANCE

.1 Certificates: 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, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements, as well as manufacturer's instructions.

.2 Delivery and Acceptance Requirements: deliver materials and equipment to site in original factory packaging, labeled with the name and address of the manufacturer.

.1 Cover finished surfaces with a temporary protective coating. Remove this protective coating once the installation is complete.

.2 Protective coating shall be removed completely and leave no residue.

.3 Leave protective covering in place until the final cleaning of the building.

.3 Storage and handling:

.1 Store materials so they do not rest on the floor in a clean, dry, well ventilated location according to the manufacturer's recommendations.

.2 Protect sliding doors from marks, scratches and scrapes.

.3 Replace damaged materials and equipment.

PART 2 Products

2.1 DOOR DESIGN

.1 Design doors to:

.1 Operate manually

.2 Open horizontally, sliding to one side.

.2 Provide headrail track for surface-mounted horizontal installation – door slides in front of wall and opening.

2.2 MATERIALS

.1 Horizontal sliding doors: galvanized steel with Z275 zinc coating, internally reinforced, flush panel, with glass, no fire protection rating.

.2 Structural steel frame: to CAN/CSA-G40.21, Grade 300 W, built-up plate and angle, prime painted, with adjustable anchors.

.3 Head rail track: size, material and profile to manufacturers recommendations.

.4 Hardware: sliding fire door hardware to NFPA 80 and bearing certification label.

.5 Shop primer: to CAN/CGSB-1.105.

PART 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: Before installing metal sliding doors, ensure that the condition of materials previously installed under other sections or contracts is acceptable and allows for work according to the manufacturer's written instructions.

.1 Visually inspect materials in the presence of Ministry Representative.

.2 Immediately notify the Ministry Representative of unacceptable conditions detected.

.2 Begin installation only after correcting unacceptable conditions and written approval of the Ministry Representative.

3.2 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.3 INSTALLATION

.1 Fabricate and install sliding metal fire doors to NFPA 80 except where specified otherwise.

.2 Install doors in accordance with manufacturers' instructions.

.3 Install glazing in accordance with Certification Organizations requirements.

.4 Adjust door operating components to ensure smooth opening and closing of doors.

3.4 FIELD QUALITY CONTROL

.1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection and cleaning of its product[s], and submit written reports in acceptable format to verify compliance of Work with Contract.

.2 Manufacturer's field services:

.1 Submit a written report from manufacturer verifying compliance of works with regard to the handling, installation, implementation protection and cleaning of the Work at the latest three (3) days after completion.

.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.

3.5 CLEANING

.1 Progress cleaning: according to 01 74 11 – Cleaning.

.1 Leave jobsite clean at the end of each work day.

.2 Clean aluminum, metal and other components with damp rag and approved non-abrasive cleaner in accordance with manufacturer's instructions.

.3 Remove traces of primer, caulking; clean doors and frames.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers, according to section 01 74 11 – Cleaning.

3.6 PROTECTION

.1 Protect installed products and components against damage during construction.

.2 Repair damage to adjacent materials and equipment.

END OF SECTION

PART 1 General

1.1 SECTION CONTENTS

.1 Work under this section includes supply and installation of new wood doors.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 06 10 00 – Rough and Finish Carpentry.

.3 Section 08 11 00 – Steel Doors and Frames.

.4 Section 08 71 00 – Door Hardware.

.5 Section 08 80 50 – Glazing.

.6 Section 09 91 23 – Painting – New Interior Work.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

- .1 CSA O112.4 M1977 (R1999), Polyvinyl Adhesives for Wood.
- .2 CAN/CSA O132.2 Series-90(R1998), Wood Flush Doors.
- .3 CAN/CSA-O132.5-M1992(R1998), Stile and Rail Wood Doors.

.2 National Fire Protection Association (NFPA).

- .1 NFPA 80-07, Standard for Fire Doors and Other Opening Protective.
- .2 NFPA 252-08, Standard Method of Fire Tests of Door Assemblies.

.3 Underwriters' Laboratories of Canada (ULC).

- .1 CAN-4S104 M80, Fire Tests of Door Assemblies.
- .2 CAN4-S105M R1992, Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.4 SUBMITTALS

.1 Submit product data and samples according to Section 01 33 00 – Submittals.

.2 Submittals must include construction details and details of door faces and cores.

.3 Submit manufacturer's installation and operation instructions.

.4 Closeout Submittals: Submit maintenance instructions for inclusion in project manual specified in Section 01 78 00 – Closeout Submittals:

- .1 Name, type and operation.
- .2 Manufacturer's product number.

1.5 QUALITY ASSURANCE

.1 Fire-rated doors whose fire-rating has been indicated by the ministry representative shall have undergone testing in a Canadian test lab to CAN4 S104 and NFPA 252 and bear the label of testing organization in question.

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

.3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 PROTECTION

.1 Storage and Protection:

.2 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.

.3 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.

.4 Deliver doors individually wrapped and store them in such a way as to protect them from scratches, handling marks and other damage. Doors shall be stored horizontally, one above the other, according to manufacturer's instructions.

.5 Store doors away from direct sunlight.

1.7 WARRANTY

.1 Provide a written document, signed and issued to the owner stating that all wood doors are guaranteed against warping and buckling, defective joints, cracking, delamination, and sagging, for specified period from the date of completion certificate.

PART 2 Products

2.1 MATERIALS

.1 To CAN/CSA O132.2-Series 90.

2.2 WOOD FLUSH DOORS

.1 Standard doors: cellular core, density of 449 kg/m³, adhered to stiles and crosspieces according to CSA and ANSI A208.1, with following characteristics:

.1 Thickness: 5-ply, 45mm.

.2 Upper and lower crosspieces: Wood veneer of 3 mm of the same essence as the face of the door, longitudinally laminated by hot pressing using a structural adhesive type 1, with a total width 30 mm; all glued to core.

.3 Stiles: Wood veneer 3 mm thick, matched to front, longitudinally laminated by hot pressing using a structural adhesive type 1, including a piece of hardwood 22 mm; total width of 30 mm; all glued to the core, with blind joints.

.4 Reinforcement: integrated blocking for lockset, door closers, door-openers, panic bars, etc.

.5 Faces: white birch plywood, rotary peeled, continuous, painted grade.

.6 Adhesive: Type I, hot.

.7 Finish: factory painted by the manufacturer of doors according TR6 process; color choice by ministry representative

.2 Fire-rated wood doors: as per standard wood doors, but with mineral fiber core, complete assembly fire-rated as indicated.

2.3 FABRICATION

.1 To CAN/CSA O132.2 – Series 90.

.2 Prepare doors for hardware and glazing beads at factory by the manufacturer of doors in order to maintain security and to comply with regulatory requirements. Maximum allowable cutting during field installation is 16 mm at the bottom of the door and 3 mm at top.

.3 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.

.4 Before fabricating doors, check door opening for precise dimensions required in order to provide doors of maximum useful width.

.5 Affix labels on the doors of an accredited certification body.

PART 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

.1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.

.2 Install labelled fire rated doors to NFPA 80.

.3 Install doors and hardware in accordance with manufacturer's printed instructions.

.4 Adjust hardware for correct function.

.5 Install glazing in accordance with Section 08 80 50 - Glazing.

3.3 ADJUSTMENT

.1 Adjust door precisely for uniform clearances 3 mm at the head and jambs and 16 mm at the bottom, taking into account the thickness of the flooring and to ensure their full opening.

.2 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

3.4 CLEANING

.1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.

.2 Remove traces of primer, caulking; clean doors and frames.

.3 Clean glass and glazing materials with approved non-abrasive cleaner.

.4 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 07 92 00 – Joint Sealants.

.2 Section 08 80 50 – Glazing.

1.2 REFERENCES

.1 Unless otherwise indicated, build and install aluminum windows in accordance with the requirements of CSA-A440-M2000, levels A3, B7 and C-5.

.2 Criteria of technical performance and safety requirements - Correctional Service Canada, section A-4 1986.

1.3 SAMPLES

.1 Submit one complete full size window sample of each type, including all frame sections and accessories and at least one sealed glazing unit in accordance with Section 01 33 00 - Submittal Procedures

.2 Submit colour samples before beginning production.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate materials and details in full size, in plan and section, for head, jamb and sill for each window type; movement joints in frames and mullions and details provided in the head to absorb frame movement; glazing panes with chocks and inner and outer trim; sealants and fund gaskets, membranes, and insulation; interaction between frames and other work; finishes; dimensions, anchor details, and fasteners; location of the manufacturer's nameplate, visible and concealed hardware, junctions of combination units separated by mullions.

1.5 TEST REPORTS

.1 Submit test reports from approved independent testing laboratories, certifying compliance to CSA-A440-M2000, levels A3, B7 and C-5:

.1 Air tightness: Class A-3.

.2 Water tightness: Class B-7 (static pressure differential of 700 Pa).

.3 Wind load resistance: Class C-5 (static pressure differential across window of more than 2.5 kPa).

.4 Condensation resistance: Class I-58.3

1.6 CLOSEOUT SUBMITTALS

.1 Provide maintenance and cleaning information for aluminum windows.

1.7 CALCULATIONS

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

.2 Specify physical and structural properties of window elements and submit the calculations and dimensional constraints and special requirements.

1.8 EQUIVALENCE

.1 Proposed equivalent products to the type of window prescribed in this section shall be made in writing using the following procedures in order to be considered for substitution.

.2 Bidders must submit their proposal in writing to the office of the Ministry Representative, within ten (10) business days prior to the bid opening date, accompanied by required samples. ALL PROPOSALS RECEIVED AFTER BID OPENING WILL BE REFUSED.

.3 Proposals shall include the following information:

.1 Reasons for proposal.

.2 Proof of equivalence for each product.

.4 The principal evaluation criteria for determining equivalence are as follows:

.1 Respect design and performance criteria.

.2 Respect security performance criteria fo Corrections Canada.

.3 Achieves or exceeds specified performance levels.

.4 Material quality.

.5 Type of finish.

.6 Availability of replacement parts and material.

.7 Maintenance methods and risks.

.8 Warranty.

.9 Experience and skill of manufacturers and installers.

.5 Ministry Representative will be the only judge to determine if proposal is equivalent to the elements and materials prescribed in this section.

.6 Consult the Instructions to Bidders in order to know the procedure concerning the request for approval of materials or substitutes.

1.9 MEASUREMENTS

.1 Before beginning of production at factory, contractor shall check all the dimensions required, even those shown in drawings, to ensure that windows may be installed without conflict with materials already installed. This field information gathering shall take into account the installation of all hardware parts and other accessories that need clearances for proper operation. Shop drawings must show current space constraints and proposed solutions.

.2 The beginning of window fabrication constitutes acceptance of the position of the materials already installed; assume responsibility for any changes required due to site conditions upon prior approval by Ministry Representative.

.3 Windows that cannot be installed due to site conditions shall be replaced at contractor's expense.

1.10 WARRANTY

.1 Provide a written document, signed and issued in the name of Corrections Canada, stating that the aluminum windows are guaranteed against defects and seal loss in normal use for a period of five (5) years and ten (10) years for the exterior finish dated from signing of final acceptance certificate.

.2 Warranty for sealed units: see Section 08 80 50 - Glazing.

1.11 DELIVERY, STORAGE, AND HANDLING

.1 Follow manufacturer's instructions in regards to placing orders and lead time requirements in order to avoid construction delays.

.2 Deliver materials in manufacturer's original container, unopened, undamaged, identification labels intact.

.3 Store materials so as to protect against the elements. Handle windows and components carefully to avoid damage. Protect windows against damage that could be caused by the elements, construction work, etc., before, during and after installation.

1.12 COORDINATION

.1 Coordinate the work of this section with the installation of drip edges, sills, and other window accessories.

PART 2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Wind Resistance: Provide system, including anchor, resistant to pressure ratings to current standards for the geographical location of the building - Quebec Region, city of Donnacona. Pressure ratings are based on the Quebec Construction Code, 2005 Edition.

.2 Air Infiltration: test sample window in accordance with ASTM E 283. Air infiltration level shall not exceed 0.3 l / s • m2 at a static pressure differential of 300 Pa.

.3 Water resistance: test sample window to ASTM E 331. No water infiltration at a minimum static differential pressure of 383 Pa, as defined in AAMA 501.

.4 Uniform load: static air pressure load of Pa 958 shall be applied in a positive direction and in a negative direction, to ASTM E 330. No bending over L / 175 of the length of any frame member. At an equivalent structural load test at 1.5 times the specified load capacity, no glass breakage or permanent distortion of frame elements of more than 0.2% of their span.

.5 Seismic load: Provide system resistant to seismic motion loads and oscillating movements according to the standards required by the Quebec Construction Code, 2005 Edition

.6 Thermal transmission (U value): conforms to AAMA 1503.

.7 Condensation Resistance (CRF): conforms to AAMA 1503.

.8 Sound Transmission Class (STC) and indoor-outdoor transmission class (OITC): comply with ASTM E1425 ASTM E90 &E90

2.2 WINDOWS

.1 Window system with frames of extruded aluminum with thermal break and gaskets, screw assembly. Provide opening units where shown in drawings.

.2 Finish / colour: see 2.8 FINISH.

.3 All frames must be insulated with urethane and closed by suitable closing plates provided by the manufacturer.

2.3 MATERIALS

.1 Aluminum (frame components and other parts):

.1 Standard materials: to ASTM B 221; alloy 6063-T6, tempered.

.2 Extrusion wall thickness: Each frame element must have the structural strength to meet specified performance requirements.

.3 Tolerances: Dimensions mentioned as tolerances for the wall thicknesses and the other cross-sectional dimensions of aluminum window frame elements are nominal dimensions and are in compliance with standards and data for aluminum of the Aluminum Association (AA).

.4 Insulation bands for eliminating risk of galvanic corrosion:

.1 Self-adhesive high density tape, adhesive on both sides.

2.4 ACCESSORIES

.1 Fasteners: stainless steel.

.2 Gaskets: standard extruded EPDM.

.3 Perimeter anchors: Aluminium. When steel anchors are used, provide insulation between the steel material and the aluminum material to prevent galvanic action.

.4 Glazing beads: aluminum cut to fit frames.

.5 Low expansion urethane insulation.

2.5 FABRICATION

.1 General:

.1 Fabricate components according to the manufacturer's instructions with minimal compensation space and clearance around the perimeter of the assembly while enabling installation and dynamic movement of perimeter seal.

.2 Assemble corners and joints accurately. Joints must be flush, hair-thin and tight.

.3 Prepare components to receive anchor devices. Make anchors.

2.6 FINISHES

.1 Factory applied colored anodic coating, architectural Class I, designation AA-M12C22A42 / A44 dark bronze.

2.7 FIELD QUALITY CONTROL

.1 All windows shall come from same manufacturer.

.2 Fabricate aluminum windows to tolerances specified by manufacturer of frame components.

PART 3 Execution

3.1 INSPECTION

.1 Ensure conditions of substrates are acceptable for product installation in accordance with manufacturer's instructions. Check dimensions of openings to receive aluminum windows and ensure sill plate is level in accordance with acceptable tolerances specified by the manufacturer.

.2 Check measurements by measuring openings on site before production; indicate the measures on shop drawings. Coordinate actions on the site and the production schedule with the progress of construction work to prevent construction delays.

3.2 WINDOW INSTALLATION

.1 General: Install frame elements according to manufacturer's instructions and the AAMA manual.

.1 Incompatible materials: Isolate aluminum materials from sources of corrosion or contact points that can produce electrolytic action.

.2 Sealed assembly: Apply sealant or gasket to base elements and accessories so that entire assembly is sealed. Coordinate installation with wall flashings and other components of the assembly.

.3 Fasten to structure allowing sufficient adjustments to suit construction tolerances and other irregularities.

.4 Secure permanently to building structure with mounting clips and spacers.

.5 Install the system level, square, straight and aligned, without warping or deformation. Maintain assembly tolerances in alignment with adjacent work.

3.3 CAULKING

.1 Fill voids at frame perimeter with low-expansion polyurethane foam.

.2 Apply sealant between windows and other components in accordance with Section 07 92 00 - Joint Sealants, ensuring weathertightness and airtightness.

.3 Caulking shall be executed with the utmost care and in a continuous manner to prevent infiltration permitted at window perimeter. All necessary corrections, even after completion of the work, will be performed at the contractor's expense.

3.4 MANUFACTURER FIELD QUALITY CONTROL

.1 Installation of the products described in this section shall be the object of minimal on-site quality control by the manufacturer in order to verify installation methods and conditions and take note of any irregularity during installation.

3.5 ADJUSTMENT

.1 Ensure correct operation of all components once installation is finished.

.2 Adjust opening mechanism of each window to permit easy operation.

3.6 PROTECTION AND CLEANING

.1 Protection: Protect exposed surfaces against damage that may occur during construction. Protect aluminum elements against damage from grinding and polishing compounds, plaster, lime, acid and cement, or any other harmful elements.

.2 Cleaning: Repair or replace installed products that are damaged. Clean installed products in accordance with manufacturer's instructions prior to acceptance by the Ministry Representative. Remove debris in accordance with applicable laws.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 08 11 14 – Metal Doors and Frames.

.2 Section 08 14 16 – Wood Flush Doors.

1.2 REFERENCES

.1 CNB 1995 (non revised).

.2 ANSI/BHMA A 156.

.3 NFPA 80.

.4 NFPA 101.

1.3 REGULATORY REQUIREMENTS

.1 Hardware for exterior exit doors and for labeled doors in fire separations must be certified by a Canadian certification organization accredited by the CSA.

1.4 HARDWARE LIST

.1 Submit contract hardware list in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate specified hardware, including make, model, material, function, size, finish (ANSI) and other pertinent information.

.3 List to include door and frame information.

.4 Use numbering system established by Architect.

.5 Verification of the hardware list does not relieve contractor's responsibility to provide all hardware required for completion of Work.

1.5 CLOSEOUT PROCEDURES

.1 Provide operation and maintenance data for door closers, locksets, door holders electrified hardware and fire exit hardware for incorporation into manual specified in Section 01 78 00 - Closeout Submittals

.2 Explain correct hardware maintenance and cleaning methods to maintenance personnel.

.3 The list will be constantly revised to take change orders into account. Hardware supplier will provide revised copies to interested parties upon request.

.4 At closeout, provide all parties with one copy of "As built" list.

1.6 EXTRA MATERIALS

.1 Provide maintenance and extra material as required by section 01 78 00 – Closeout Submittals.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements

.2 Store finishing hardware in locked, clean and dry area.

.3 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.4 Draw up inventory list based on hardware list.

.5 Deliver hardware in its original packaging.

1.8 WASTE DISPOSAL AND MANAGEMENT

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Dispose of corrugated cardboard, polystyrene or plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

1.9 OUTILS D'AJUSTEMENT

.1 Provide Owner with two sets of special installation and adjustment tools furnished by manufacturer upon delivery of hardware.

1.10 EQUIVALENCE

.1 All requests for approval of equivalent products must be submitted in writing to Engineer before tender of bid in order to allow analysis of request and to permit other bidders to be informed.

1.11 WARRANTY

.1 Provide written warranty against any material or labor defect for a period of two years.

PART 2 Products

2.1 HARDWARE ITEMS

.1 Hardware in accord with relevant ANSI/BHMA standards.

.2 Use one manufacturer's products only for similar items.

.3 See list of hardware groups at end of this section for pieces of hardware included in the Work of this section.

.4 Provide required quantities as indicated by drawings, specifications, and door and hardware schedule.

.5 For any article required to complete the Work but not expressly specified in this section, request additional information before tendering bid, or take responsibility for providing these articles with no additional cost to Owner.

.6 Hardware to be installed with fasteners (screws, bolts, etc.) provided by the manufacturer.

.7 Provide all shims and accessories required for installation of various articles of hardware. Pay particular attention to door closers, weatherstripping, and soundproofing.

.8 All hardware components to be heavy-duty commercial grade. The hardware components installed on the outside must be designed for outdoor installation. The hardware components installed on doors bearing a fire rating must also be fire rated.

2.2 FASTENINGS

.1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.2 Exposed fastening devices to match finish of hardware.

.3 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners, unless otherwise indicated.

.4 Use fasteners compatible with material through which they pass.

.5 Use only fasteners provided or recommended by manufacturers.

.6 Do not use any thru-bolts unless expressly approved by the Engineer.

2.3 KEYING

.1 Provide three keys for each lock, keyed to **new** building key path.

.2 Locksets shall be provided with BEST-compatible cylinders. Core coding will be provided by the customer.

.3 Provide a master key controlling all Training Building doors of another for the Shooting Gallery and Bullet Collector buildings.

.4 Provide six (6) copies of each master key.

.5 Key blanks, cores, extractors (2) and master key to be shipped securely directly from the manufacturer to the ministerial representative.

.6 Even if they are not specifically described, provide cores required for securing all doors to the building key path. If in doubt, check with the engineer or take responsibility for providing at no additional cost.

PART 3 Execution

3.1 EXAMINATION

.1 Check plans, details, and hardware schedule for items of hardware to be installed. Include all door hardware and related items such as gaskets, screws, bolts, shims, door closer accessories, etc., that are necessary to complete the Work of this section.

.2 The hardware schedule is provided as a guide to the type, function, quality, and minimum weight of required articles, but is not to be interpreted as a quantity list.

3.2 MANUFACTURER'S INSTRUCTIONS

.1 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.2 Furnish manufacturers' instructions for proper installation of each hardware component.

3.3 INSTALLATION

.1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association. Pay particular attention to hinge placement: upper hinges shall be at 127mm from door top, lower hinges at 254mm from door bottom, third hinge centered between the first two.

.2 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.3 All hardware is to be adjusted to and solidly installed on doors and frames as specified.

.4 All hardware is to be installed level and plumb.

.5 All hardware is to function smoothly and perfectly.

.6 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.7 Commercial hardware must be installed according to industry standards by specially trained employees.

.8 Install hardware at heights recommended by manufacturers and according to applicable standards.

3.4 SCHEDULE

.1 The following hardware schedule is not exhaustive and thus does not constitute a quantity list. The groups are listed as a guide to the type, function, quality, and finish of required articles. Check groups against drawings and door schedule and provide any additional items not specified but required to complete the Work according to the intent of the construction documents.

.2 Hardware list:

	GROUP 01	
1	CONTINUOUS ANODIZED ALUMINUM HINGE	628
1	STAINLESS STEEL CANE-HANDLED LOCKSET	630
1	SPRING CUSH DOOR CLOSER	689
1	STAINLESS STEEL PROTECTION PLATE - 200h. Push side	630
1	OVERHEAD STOP	689
1	WEATHERSTRIPPING Head and sides	719
1	BRUSH-TYPE DOOR BOTTOM	628
1	EXTRUDED ALUMINUM THRESHOLD WITH NEOPRENE GASKET	AL
	GROUP 02	
1	CONTINUOUS ANODIZED ALUMINUM HINGE	628
1	STAINLESS STEEL CANE-HANDLED DEADBOLT LOCKSET. ALWAYS LOCKED, EXTERIOR OPENED BY KEY ONLY	630
1	SPRING CUSH DOOR CLOSER	689
1	STAINLESS STEEL PROTECTION PLATE - 200h. Push side	630
1	OVERHEAD STOP	689
1	WEATHERSTRIPPING Head and sides	719
1	BRUSH-TYPE DOOR BOTTOM	628
1	EXTRUDED ALUMINUM THRESHOLD WITH NEOPRENE GASKET	AL
	GROUP 03	
3	STAINLESS STEEL HINGES - 127 x 102	652
1	"GLOBE" HANDLED "PASSAGE" LOCKSET	626
1	SPRING CUSH DOOR CLOSER	689
1	STAINLESS STEEL PROTECTION PLATE - 200h. Push side	630
1	WEATHERSTRIPPING	BLACK
1	AUTOMATIC DOOR BOTTOM	682
1	WALL OR FLOOR-MOUNTED DOOR STOP, ACCORDING TO LOCATION	682

	GROUP 04	
3	STAINLESS STEEL HINGES - 127 x 102	652
1	"GLOBE" HANDLED "RESTROOM" LOCKSET	626
1	SPRING CUSH DOOR CLOSER	689
1	STAINLESS STEEL PROTECTION PLATE - 200h. Push side	630
1	WALL OR FLOOR-MOUNTED DOOR STOP, ACCORDING TO LOCATION	682
1	WEATHERSTRIPPING	BLACK
1	AUTOMATIC DOOR BOTTOM	682
	GROUP 05 (ULC)	
3	STAINLESS STEEL HINGES - 127 x 102	652
1	"GLOBE" HANDLED "STORAGE" LOCKSET	626
1	SPRING CUSH DOOR CLOSER	689
1	STAINLESS STEEL PROTECTION PLATE - 200h. Push side	630
1	WALL OR FLOOR-MOUNTED DOOR STOP, ACCORDING TO LOCATION	682
1	WEATHERSTRIPPING	BLACK
1	AUTOMATIC DOOR BOTTOM	682
	GROUP 06	
1	HEAVY-DUTY EXTRUDED ALUMINUM RAIL FOR BI-FOLD DOOR, ANODIZED FINISH	AL
2	SET OF HEAVY-DUTY BALL-BEARING DOOR GLIDES – 1 set of 2 glides per folding door, thus 2 sets per pair of doors.	626
2	SET OF HINGES FOR BI-FOLD DOORS – e set per folding door, thus 2 sets per pair of doors.	
2	BUTTON-TYPE DOOR PULLS	689
	GROUP 07	
1	CONTINUOUS ANODIZED ALUMINUM HINGE	628
1	ANTI-PANIC PUSH BAR, NO EXTERIOR HARDWARE	630
1	SPRING CUSH DOOR CLOSER	689
1	STAINLESS STEEL PROTECTION PLATE - 200h. Push side	630
1	OVERHEAD STOP	689
1	WEATHERSTRIPPING Head and sides	719
1	BRUSH-TYPE DOOR BOTTOM	628
1	EXTRUDED ALUMINUM THRESHOLD WITH NEOPRENE GASKET	AL

.3 Door and frame schedule: see drawings.

END OF SECTION

PARTIE 1 General

1.1 RELATED SECTIONS

.1 Section 08 11 14 – Steel Doors and Frames.

.2 Section 08 50 00 – Windows.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM C 542-94(1999), Specification for Lock-Strip Gaskets.

.2 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-12.12-M90, Plastic Security Glazing Panels.
- .2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.
- .3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
- .4 CAN/CGSB-12.8-97, Insulating Glass Units.
- .5 CGSB 19-GP-5 Sealing Compound, One Component, Acrylic Base, Solvent Curing.
- .6 CAN/CGSB-19.13-M87, Sealing Compound, One Component, Elastomeric, Chemical Curing.
- .7 CAN/CGSB-19.13-M87, Sealing Compound, One Component, Silicone Base, Solvent Curing.
- .8 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.

1.3 PERFORMANCE REQUIREMENTS

.1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
- .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

.2 Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass as measured in accordance with ANSI/ASTM E330.

.3 Limit glass deflection to 1/200 flexural limit of glass with full recovery of glazing materials.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

1.5 SAMPLE

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

.2 Submit single 150 x 150 mm samples of each type of glazing and sealant material.

1.6 WARRANTY

.1 Provide written document, signed and addressed to Owner, stipulating that insulating glass units are guaranteed against any loss of impermeability of enclosed air space and that all glass described by this section is guaranteed against any defect that might obstruct vision for a period of five (5) years starting with date of signature of Certificate of Final Acceptance.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Divert metal cut-offs from landfill by disposal at nearest metal recycling facility.

.2 Divert uninstalled materials for reuse at nearest used building materials facility or similar type facility.

.3 Divert unused caulking and sealant materials from landfill through disposal at special wastes depot.

1.8 PACKAGING MATERIALS

.1 Remove form site and dispose of packaging materials at appropriate recycling facilities.

.2 Dispose of corrugated cardboard, polystyrene or plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

PARTIE 2 Products

2.1 MATERIALS: FLAT GLASS

.1 Float glass: to CAN/CGSB-12.3, glazing quality, thickness as indicated.

.2 Sheet glass: to CAN/CGSB-12.2, glass thickness: 6.2 mm, grade B-Medium.

.3 Clear tempered glass : to CAN/CGSB-12.3, clear float glass, tempered, glazing quality, 6mm thick.

.4 Plastic panels: polycarbonate panels, to CANCGSB-12.1 M90, with anti-UV and anti-abrasion treatment, clear, 9mm thick.

2.2 LAMINATED UNITS

.1 Laminated glazing: laminated glass panel with the following properties :

.1 Exterior layer: clear tempered glass.

.2 Laminating film: 1.52mm PVB film, to CAN/CGSB-12.1 M90.

.3 Interior layer : clear tempered glass.

2.3 SEALED INSULATING GLASS

.1 Insulating glass units for windows: to CAN/CGSB-12.8, double unit, 25 mm overall thickness.

- .1 Clear glazing.
- .2 Glass thickness: 6.2 mm each light.
- .3 Inter-cavity space thickness: 12 mm with clear low conductivity spacers.
- .4 Inert gas fill: argon.
- .5 Transmittance: 13 %.
- .6 Shading coefficient : 0.26

2.4 ACCESSORIES

.1 Setting blocks: Neoprene, 50 Shore A durometer hardness to ASTM D2240, width to suit glazing method, glass light weight, thickness and area.

.2 Spacer shims: Neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

.3 Glazing tape:

- .1 Preformed butyl compound with continuous internal shim, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; 3 x 10 mm size; black colour.
- .2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2 %, designed for compression of 25 %, to effect an air and vapour seal; 3 mm size.

.4 Glazing splines: resilient steel, extruded shape to suit glazing channel retaining slot, to be painted same colour as door frame.

.5 Glazing clips: manufacturer's standard type.

.6 Lock-strip gaskets: to ASTM C542.

.7 Sealant: silicone-based mastic, single component, polymerization by solvent evaporation, to CAN/CGSB-19.18-M87, colour to match colour of frames.

.8 Glazing strips: recently manufactured neoprene, designed for dry method glazing, appropriate for aluminum shapes, black.

.9 Sealant primer and cleaning products: as recommended by glass manufacturer.

.10 Respirator tubes: as recommended be manufacturer.

2.5 LOCATIONS

.1 Plastic panels:

.1 Practice Cell windows.

.2 Shooting Gallery division walls.

.2 Sealed insulating glass: Training Building windows.

.3 Laminated units: Shooting Gallery windows.

PARTIE 3 Execution

3.1 EXAMINATION

.1 Verify that openings for glazing are correctly sized and within tolerance.

.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 GENERAL

.1 Glass shall be precision cut to tolerances required for installation. Glass shall be installed as to be free of any superimposed load or other factor that could cause warping or bending that could affect appearance or lead to breaking. At locations where glass edges will be visible, they are to be straight, smooth, polished, and non cutting. Use only normal glass cutting methods. Glazing stops of openings to be glazed will be well-aligned and will ensure adequate fit of glazing within openings.

.2 Glass installation will be rigid once finished and shall be adjusted to fit various building all direct contact between glass and metal or wood shall be avoided. Any tape, strip, or other glazing accessories will be flush with the glazing stops or other similar accessories. Glazing stops will be removable to allow replacement of glass as required.

.3 Each glass unit will be labelled with a removable label from the manufacturer identifying the manufacturer, glass type, and glass quality. Labels will only be removed once with Ministerial representative's written approval.

3.4 INSTALLATION: EXTERIOR - DRY METHOD, GLAZING TAPE

.1 Cut glazing tape to length and set against permanent stops, projecting 5 mm above sight line. Begin by taping entire width of glazing before taping vertical dimension. Seal corners by butting tape and sealing junctions with sealant.

.2 Place setting blocks at ¼ points, with edge block maximum 150 mm from corners.

.3 Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

.4 Install removable stops without displacing glazing tape. Exert pressure for full continuous contact.

.5 Trim protruding tape edge.

3.5 INSTALLATION: EXTERIOR – JOINT INSERTS

.1 Unwrap joint inserts and spread over warm, flat surface.

.2 Compress joint inserts into glazing profiles, starting at corners and working towards the centre.

.3 Drain condensation to exterior through holes pierced in horizontal support mullion.

3.6 INSTALLATION: PLASTIC PANELS

.1 Install plastic panels in Cell building windows and division walls in the Shooting Gallery as indicated in drawings.

3.7 CLEANING

.1 Remove glazing materials from finish surfaces.

.2 Remove labels after work is complete.

.3 All scratched, broken, or damaged glass is to be immediately replaced at no additional cost to Owner.

3.8 PROTECTION OF FINISHED WORK

.1 After installation, mark light with an "X" by using removable plastic tape or paste. Do not mark heat absorbing glass units.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry – Short Form.

.2 Section 07 21 16 – Blanket Insulation.

1.2 REFERENCES

.1 Unless otherwise indicated, perform work to ACNOR A82.31.

.2 ASTM D1037.

.3 ASTM A 118.9.

.4 CAN/ULC-S126.

.5 CAN/ULC-S107.M.

1.3 SAMPLES

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

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

1.5 SITE ENVIRONMENTAL REQUIREMENTS

.1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.

.2 Apply board and joint treatment to dry, frost free surfaces.

PART 2 Products

2.1 MATERIALS

.1 Fire separation board: to ASTM C36, high resistance Type X, thickness as indicated, 1200 mm wide x maximum practical length, ends square cut, edges squared or bevelled, containing at least 25% recycled content.

.2 High resistance boards: to ASTM C36, high resistance with fiberglass mesh reinforcing, thickness as indicated, 1200 mm wide x maximum practical length, ends square cut, edges squared or bevelled, containing at least 25% recycled content.

.3 Humidity resistant boards: to ASTM C36, humidity resistant, thickness as indicated, 1200 mm wide x maximum practical length, ends square cut, edges squared or bevelled, containing at least 25% recycled content.

.4 Regular boards: to ASTM C36, thickness as indicated, 1200 mm wide x maximum practical length, ends square cut, edges squared or bevelled, containing at least 25% recycled content.

.5 Steel drill screws: to ASTM C1002 and C954. Screws to be long enough for minimum 10 mm penetration into support.

.6 Corner beads and casing beads to be plaster-finished: galvanized steel, 26 gauge minimum, perforated flanges, one piece length per location.

.7 Expansion joints: zinc-coated, perforated flanges, with removable plastic film, one piece length per location.

.8 Sealants: in accordance with Section 07 92 10 - Joint Sealing.

.9 Acoustic sealant: in accordance with Section 07 92 10 - Joint Sealing.

.10 Joint compound: to ASTM C475, asbestos-free, premixed, all purpose.

.11 Joint tape: fiber-reinforced paper tape.

PART 3 Execution

3.1 ERECTION

.1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.

.2 Do application of gypsum sheathing in accordance with ASTM C1280.

.3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.

.4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.5 Install work level to tolerance of 1:1200.

.6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, and grilles.

.7 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.9 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.2 INSTALLATION

.1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.

.2 Apply single or double layer gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.

.3 Install boards horizontally or vertically as indicated. Stagger joints over different studs on opposite sides of wall.

.4 Where acoustic partitions with two layers of gypsum board are indicated, install the first layer with 6 mm spaces at joints between all panel edges. Seal joints with acoustic sealant. Orient gypsum boards perpendicular to each other on opposite sides of partition.

.5 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, and ducts in partitions where perimeter sealed with acoustic sealant.

.6 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre using contact adhesive for full length.

.7 Install corner beads on all external corners. Install casing beads where gypsum board butts against surfaces having no trim concealing junction, such as metal door and window frames, block walls, or any other non-plaster surface. Seal joints with thin bead of acrylic sealant.

.8 Install expansion joints along joint between floors in stair enclosure. Complete finish work before removing protective plastic film.

.9 Install access doors to electrical and mechanical fixtures specified in respective sections.

.1 Rigidly secure frames to furring or framing systems.

.10 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.11 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.12 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

.13 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.14 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

.15 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.

.16 Mix joint compound slightly thinner than for joint taping.

.17 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.

.18 Allow skim coat to dry completely.

.19 Remove ridges by light sanding or wiping with damp cloth.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 10 28 10 – Restroom Accessories.

1.2 REFERENCES

.1 Terrazzo Tile and Marble Association of Canada (TTMAC)

- .1 Tile Specification Guide 09300 2000, Tile Installation Manual.
- .2 Tile Maintenance Guide 2000.

1.3 PRODUCT DATA

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

.2 Include manufacturer's information on:

- .1 Ceramic tile, marked to show each type, size, and shape required.
- .2 Chemical resistant mortar and grout (Epoxy and Furan).
- .3 Cementitious backer unit.
- .4 Dry-set Portland cement mortar and grout.
- .5 Divider strip.
- .6 Elastomeric membrane and bond coat.
- .7 Reinforcing tape.
- .8 Leveling compound.
- .9 Latex-Portland cement mortar and grout.
- .10 Commercial Portland cement grout.
- .11 Organic adhesive.
- .12 Slip resistant tile.
- .13 Waterproofing isolation membrane.
- .14 Fasteners.

1.4 SAMPLES

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

.2 Base tile: submit duplicate 600 x 600 mm sample panels of each colour, texture, size, and pattern of tile.

.3 Floor tile: submit duplicate 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.

.4 Trim shapes, each type, colour, and size.

.5 Adhere tile samples to plywood and grout joints to represent project installation.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in containers with labels legible and intact and grade-seals unbroken.

.2 Store material so as to prevent damage or contamination.

.3 Store materials in a dry area, protected from freezing, staining and damage.

.4 Store hydraulic cementitious materials on a dry surface.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene or corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Unused adhesive, sealant and coating materials must be disposed of at an official hazardous material collections site as approved by the Ministerial representative.

.5 Unused adhesive, sealant and coating materials must not be disposed of into the sewer system, into streams, lakes, onto the ground or in other location where it will pose a health or environmental hazard.

.6 Broken ceramic materials must be diverted from landfill to a local recycling as approved by Ministerial representative.

1.7 ENVIRONMENTAL CONDITIONS

.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12° C for 48h before, during, and 48h after, installation.

.2 Do not install tiles at temperatures less than 12° C or above 38° C.

.3 Do not apply epoxy mortar and grouts at temperatures below 15° C or above 25° C.

1.8 EXTRA MATERIAL

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

.2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.

.3 Maintenance material to be of same production run as installed material.

PART 2 Products

2.1 FLOOR TILE

.1 Ceramic type 1:

- .1 Floor tile: to CAN/CGSB-75.1, type 4, Class MR1, 10 mm x 305 x 305 mm, slip resistant surface.
- .2 Wall base: cut tiles, same size, colour, and texture as adjacent floor tiles. Dimensions: 305 mm x 100 mm high.
- .3 Colour : 1 colour to be chosen from manufacturer's complete range..

.2 Ceramic type 2:

- .1 Wall tile: to CAN/CGSB-75.1, type 4, Class MR1, 6 mm x 190 x 510 mm, glazed surface.
- .2 Colour : 1 color to be chosen from manufacturer's complete range.

.3 Ceramic type 3:

- .1 Wall tile, accent colour: to CAN/CGSB-75.1, type 4, Class MR1, 6 mm x 190 x 510 mm cut to 95mm high, glazed surface.
- .2 Colour : 1 colour to be chosen from manufacturer's complete range.

2.2 MORTAR AND ADHESIVE MATERIALS

.1 Portland cement: to CSA-A5, type 10.

.2 Sand: to ASTM C144, passing 16 mesh.

.3 Hydrated lime: to ASTM C207-79(1984).

.4 Latex additive: formulated for use in portland cement mortar and thin set bond coat.

.5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

2.3 BOND COAT

.1 Dry set Portland cement mortar: to ANSI A108.1.

.2 Organic adhesive: to CGSB 71-GP-22M(1978).

.3 Thin set bond coat: Latex.

2.4 GROUT

.1 Colouring Pigments:

- .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.
- .2 Colouring pigments to be added to grout by manufacturer.
- .3 Job coloured grout are not acceptable.
- .4 Use in Commercial Portland Cement Grout, Dry-Set Grout, and Latex-Portland Cement Grout.

.2 Commercial Portland Cement Grout for thin-set tile: to CTI A118.6, compression strength 1940kg to ASTM C109, revised.

.3 Grout preparation: follow manufacturer's instructions.

2.5 ACCESSORIES

.1 Reinforcing mesh: 50 x 50 x 1.6 x 1.6 mm galvanized steel wire mesh, welded fabric design, in flat sheets.

.2 Bandes de transition : éléments extrudés spéciaux, en aluminium anodisé, présentant une pente maximale de 1:2.

.3 Bande terminale : éléments extrudés spéciaux, en aluminium anodisé, dessus carré.

.4 Transition Strips: purpose made metal extrusion; anodized aluminum, maximum slope 1:2.

.5 Cap Strips: Reducer Strips: purpose made metal extrusion; anodized aluminum, square edge.

.6 Sealant: in accordance with Section 07 92 10 - Joint Sealing.

.7 Floor sealer and protective coating: to tile and grout manufacturers recommendations.

2.6 PATCHING AND LEVELING COMPOUND

.1 Portland cement base, acrylic polymer compound, manufactured specifically for resurfacing and levelling concrete floors. Products containing gypsum are not acceptable.

.2 Have not less than the following physical properties:

- .1 Compressive strength - 25 MPa.
- .2 Tensile strength - 7 MPa.
- .3 Flexural strength - 7 MPa.
- .4 Density - 1.9.

.3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.

.4 Ready for use in 48 hours after application.

2.7 CLEANING COMPOUNDS

.1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and levelling compounds and elastomeric waterproofing membrane and coat.

.2 Materials containing acid or caustic material are not acceptable.

PART 3 Execution

3.1 WORKMANSHIP

.1 Do tile work in accordance with TTMAC Tile Installation Manual 2000, "Ceramic Tile", except where specified otherwise.

.2 Apply tile or backing coats to clean and sound surfaces.

.3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even.

.4 Maximum surface tolerance 1:800.

.5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.

.6 Lay out tiles so perimeter tiles are minimum 1/2 size.

.7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.

.8 Make internal angles square, external angles bullnosed.

.9 Use bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.

.10 Install divider strips at junction of tile flooring and dissimilar materials as well as at joint between baseboard and wall tiles. Install a cap strip on the top edge of wall tiles (over the accent colour band).

.11 Allow minimum 24 h after installation of tiles, before grouting.

.12 Clean installed tile surfaces after installation and grouting cured.

3.2 FLOOR AND WALL TILE

.1 Install in accordance with TTMAC detail.

3.3 FLOOR SEALER AND PROTECTIVE COATING

.1 Apply in accordance with manufacturer's instructions.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 09 21 16 – Gypsum Board Assemblies.

.2 Section 09 53 00 – Acoustic Ceiling Suspension Systems.

1.2 REFRENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM E1264-98, Standard Classification for Acoustical Ceiling Products.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

.2 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.

.3 Canadian Standards Association (CSA International)

.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.4 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S102-2003, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 SAMPLES

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

.2 Submit duplicate full size samples of each type acoustical units.

1.4 REGULATORY REQUIREMENTS

.1 Fire-resistance rated floor/ceiling and roof/ceiling assembly: certified by Canadian Certification Organization accredited by Standards Council of Canada.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect and separate paper, plastic, polystyrene or corrugated cardboard for recycling in accordance with Waste Management Plan (WMP).

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Permit wet work to dry before beginning to install.

.2 Maintain uniform minimum temperature of 15 degrees C and humidity of 20-40 % before and during installation.

.3 Store materials in work area 48 hours prior to installation.

1.7 EXTRA MATERIALS

.1 Provide extra materials of acoustic units in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide acoustical units amounting to 2 % of gross ceiling area for each pattern and type required for project.

.3 Ensure extra materials are from same production run as installed materials.

.4 Clearly identify each type of acoustic unit, including colour and texture.

.5 Deliver to Ministerial representative, upon completion of the work of this section.

.6 Store extra materials in location indicated by Ministerial representative.

PART 2 Products

2.1 MATERIALS

.1 Acoustic units for type 1 suspended ceiling system: to CAN/CGSB-92.1.

.1 Type: Standard mineral fibre, textured pattern.

.2 Flame spread rating of 25 or less in accordance with CAN/ULC-S102.

.3 Smoke developed 25 or less in accordance with CAN/ULC-S102.

.4 Noise Reduction Coefficient (NRC) designation of 55.

.5 Light Reflectance (LR) range of 0.80.

.6 Ceiling plenum sound transmission range of 35.

.7 Edge type square, flat shape.

.8 Colour: white.

.9 Size:

.1 Type 1: 1220mm x 610mm x 15mm thick.

.2 Type 2: 610mm x 610mm x 15mm thick.

.2 Adhesive: type recommended by acoustic unit manufacturer.

.3 Staples, nails and screws: to CSA B111 non-corrosive finish as recommended by acoustic unit manufacturer.

.4 Hold down clips: purpose made clips to secure tile to suspension system, approved for use in fire-rated systems.

PART 3 Execution

3.1 EXAMINATION

.1 Do not install acoustical panels and tiles until work above ceiling has been inspected by Ministerial representative.

3.2 INSTALLATION IN SUSPENSION SYSTEM

.1 Install acoustical panels and tiles in ceiling suspension system.

3.3 INSTALLATION ON SOLID SUBSTRATE

.1 Install acoustic elements as indicated by reflected ceiling plan.

.2 Scribe acoustic units to fit adjacent work. Butt joints tight.

3.4 INTERFACE WITH OTHER WORK

.1 Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Section 09 21 16 - Gypsum Board Assemblies.

.2 Section 09 51 13 - Acoustic Ceiling Panels.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM International)

.1 ASTM C635-00, Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.

.2 ASTM C636-96, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

1.3 DESIGN REQUIREMENTS

.1 Maximum deflection: 1/360th of span to ASTM C635 deflection test.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit reflected ceiling plans for special grid patterns as indicated.

.3 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, location of access splines change in level details, access door dimensions, and locations and acoustical unit support at ceiling fixture lateral bracing and accessories.

1.5 SAMPLES

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

.2 Submit one representative model of each type ceiling suspension system.

.3 Ceiling system to show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes, acoustical unit installation.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Divert unused metal materials from landfill to metal recycling facility approved by ministerial representative.

.3 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.4 Dispose of corrugated cardboard, polystyrene or plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

PART 2 Products

2.1 MATERIALS

.1 Heavy duty system to ASTM C635.

.2 Basic materials for suspension system: commercial quality cold rolled steel, zinc coated.

.3 Suspension system: non fire rated, made up as follows:

.1 Exposed tee bar grid for acoustic tile:

.1 Exposed tee bar grid components: shop painted satin sheen. Components die cut. Main tee with double web, rectangular bulb and 25 mm rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection

.2 Note: Suspension system to be provided by manufacturer of acoustic tiles.

.4 Hanger wire: galvanized soft annealed steel wire.

.1 3.6 mm diameter for "floating" island ceilings.

.2 2.6 mm diameter for other ceilings.

.5 Hanger inserts: purpose made.

.6 Carrying channels: 38 x 24 mm channel, of 2.6 mm thick painted galvanized steel.

.7 Accessories: splices, clips, wire ties, retainers and wall moulding flush, to complement suspension system components, as recommended by system manufacturer.

.8 Borders for "floating" island ceilings: Aluminum profil, clip assembly, powder-coat factory finish, around 100mm high, manufactured by suspension manufacturer, color chosen from manufacturer's complete range of colors.

PART 3 Execution

3.1 INSTALLATION

.1 Installation: in accordance with ASTM C636 except where specified otherwise.

.2 Install suspension system to manufacturer's instructions.

.3 Do not erect ceiling suspension system until work above ceiling has been inspected by ministerial representative.

.4 Secure hangers to overhead structure using attachment methods acceptable to ministerial representative.

.5 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.

.6 Lay out centre line of ceiling both ways, to provide balanced borders at room perimeter according to reflected ceiling plan.

.7 Install cross-tees at 610 mm on centre maximum for the gypsum board suspension system.

.8 Ensure suspension system is co-ordinated with location of related components.

.9 Install wall moulding to provide correct ceiling height.

.10 Completed suspension system to support super-imposed loads, such as lighting fixtures diffusers grilles and speakers.

.11 Support at light fixtures diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.12 Attach cross member to main runner to provide rigid assembly.

.13 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

.14 Install access splines to provide 10 percent ceiling access.

.15 Finished ceiling system to be square with adjoining walls and level within 1:1000.

.16 Install prefabricated extruded aluminum brders at perimeter of “floating” island ceilings.

3.2 CLEANING

.1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

END OF SECTION

PART 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM International)

- .1 ASTM F1066-99, Specification for Vinyl Composition Floor Tile.
- .2 ASTM F1344-00, Specification for Rubber Tile.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .2 CAN/CGSB-25.21-95, Detergent-Resistant Floor Polish.

1.2 SAMPLES

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

.2 Submit duplicate tile in size specified, and 300 mm long base, treads and edge strips.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for resilient flooring for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate paper, plastic, polystyrene or corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Dispose of unused finish and adhesive materials at official hazardous material collections site approved by Ministerial representative.

.5 Do not dispose of unused finish and adhesive materials into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.

1.5 ENVIRONMENTAL REQUIREMENTS

.1 Maintain air temperature and structural base temperature at flooring installation area above 18°C for 48 hours before, during and for 48 hours after installation.

1.6 EXTRA MATERIALS

.1 Provide maintenance materials of resilient tile flooring, base and adhesive in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide 2% of finished surface of each colour, pattern and type flooring material required for this project for maintenance use.

.3 Extra materials to be from same production run as installed materials.

.4 Clearly identify each container of floor tile and each container of adhesive.

.5 Deliver to Ministerial representative, upon completion of the work of this section.

.6 Store where directed by Ministerial representative.

PART 2 Products

2.1 MATERIALS

.1 Vinyl composition tile: to ASTM F1066, Composition 1 - non asbestos Class 2 - through pattern tile, 2.4 mm, 305 x 305 mm size.

.1 Plan one (1) shades: Polar White.

.2 Finish:

.1 Applied on-site as indicated:

.1 Apply three to five coats of acrylic commercial wax as recommended by manufacturer. Use a stain resistant sealant as recommended by manufacturer.

.2 Check for obvious limps, bugs, dust etc.

.3 When dry sand lightly, using 120 grit paper to ensure adhesion of subsequent application of finish.

.4 Vacuum thoroughly.

.5 Apply additional finish coatings as required.

.6 Allow 24 hours for the finish to dry before permitting foot traffic and 7 days for the finish to cure before placing furniture and other heavy objects.

.3 Resilient base: rubber, coved, minimum 1200 mm length and 102 mm high x 3.2 mm thick, including premoulded end stops and external corners for coved base only, colour Grey.

.4 Primers and adhesives: waterproof, recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade. Water based acrylic polymer, consistency of syrup, applied with trowel with 1.6 x 1.6 mm U-shaped teeth.

.5 Sub-floor filler and leveller: polymer modified cementitious patching compound, fast setting, high compressive strength.

PART 3 Execution

3.1 INSPECTION

.1 Using the methods recommended by the manufacturer, ensure that concrete surface is dry and ready to accept the finish. Determine moisture emission by calcium chloride test. The maximum acceptable moisture emission is 5.0 lbs per 1000 ft2 per 24 hours. Also perform an adhesion test to determine compatibility with the substrate. Test for alkalinity; a pH of 5 to 9 is suitable for the installation of flooring.

3.2 SUB-FLOOR TREATMENT

.1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.

.3 Prime and/or Seal concrete to flooring manufacturer's printed instructions.<

.4 Do not proceed with installation until all unacceptable conditions have been corrected.

3.3 TILE APPLICATION

.1 Provide a high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to the outside. Do not let contaminated air recirculate through a district or whole building air distribution system. Maintain extra ventilation for at least one month following building occupation.

.2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.

.3 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.

.4 Install flooring to square grid pattern with all joints aligned of room.

.5 As installation progresses, and after installation, roll flooring in 2 directions including resilient tile with 45 kg minimum roller to ensure full adhesion.

.6 Cut tile and fit neatly around fixed objects.

.7 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.

3.4 BASE APPLICATION

.1 Lay out base to keep number of joints at minimum. Base joints at maximum length available or at internal or premoulded corners.

.2 Clean substrate and prime with one coat of adhesive.

.3 Apply adhesive to back of base.

.4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.

.7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles, minimum 300 mm each leg. Wrap around toeless base at external corners.

3.5 INITIAL CLEANING AND WAXING

.1 Remove excess adhesive from floor, base and wall surfaces without damage.

.2 Clean, seal and wax floor and base surface to flooring manufacturer's instructions. In carpeted areas clean, seal and wax base surface before carpet installation.

3.6 PROTECTION OF FINISHED WORK

.1 Protect new floors from time of final set of adhesive until final inspection.

.2 Prohibit traffic on floor for 48 hours after installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C423-07, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.

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

.1 Material Safety Data Sheets (MSDS).

.4 Underwriter Laboratories of Canada (ULC)

.1 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.

1.2 SUBMITTALS

.1 Provide product data and samples as required.

.1 Submit duplicate 300mm x 300mm samples of proposed acoustical units.

.2 Submit technical data sheets.

1.3 QUALITY ASSURANCE

.1 Panels to be installed by qualified labour as certified by system manufacturer.

.2 Construct mock-up of proposed wall-mounted system (one panel).

.3 Construct mock-up of proposed ceiling-mounted system (two panels in a single structural bay).

.4 Allow 24 hours for inspection of mock-up by Ministry Representative before proceeding with work.

.5 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of the finished work.

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Commence installation after building enclosed and dust generating activities are completed.

.2 Permit wet work to dry prior to commencement of installation.

.3 Maintain uniform minimum temperature of 15 degrees C and relative humidity of 20- 40% prior to, during and after installation.

Part 2 Products

2.1 MATERIALS

.1 Acoustic units: to CAN/CGSB-92.1.

- .1 Type: "Lapendary" exterior panels.
- .2 Inflammability: Class A ASTM E84 25/0/50/ ULS 102.
- .3 Noise reduction coefficient (NRC) designation : 0.85.
- .4 Finish: "Cypress" exterior fabric, solid two faces.
- .5 Core: 3/4# fibreglass wool.
- .6 Edge type: sewn, natural form.
- .7 Colour: chosen by Ministry Representative.
- .8 Size: 1220 mm x 2440 mm x 50 mm thick.
- .9 Shape: flat.

.2 Attachments: stainless steel screws and plates. Provide concrete screws for wall units.

.3 Stiffener: anodized, predrilled aluminum bar for ceiling units.

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 Ensure substrate surface is straight to tolerance of plus or minus 3 mm over 3000 mm.

.2 Install acoustic units to clean, dry and firm substrate.

.3 Install acoustic units plumb and aligned.

.4 Arrange acoustic units such that each unit is centered on a Shooting Gallery stall, with the long dimension installed vertically. Predrill the concrete wall before installing the units. Provide 8 screws and plates per unit.

.5 Install two ceiling-mounted units per structural bay. Align the two units end to end, with the long end parallel to the ceiling joists. Screw the units to the steel deck with screws, plates, and stiffeners. Provide one stiffener at each end of each unit, installed across the width of the unit. Between the stiffeners, install 9 additional screw and plate attachments, 3 on each side and three in the middle.

.6 Do not cut acoustic units.

3.3 CLEANING

.1 Keep acoustic installation and all components clean. Remove blemishes immediately.

3.4 PROTECTION

.1 Use polyethylene to protect finished acoustical wall treatment from damage.

.2 Remove prior to substantial completion.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

.1 Toutes les sections nécessitant des travaux de peinture extérieure

1.2 REFERENCES

.1 Architectural Painting Specification Manual, Master Painters Institute (MPI).

.2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).

.3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA),

.4 National Fire Code of Canada.

1.3 QUALITY ASSURANCE

.1 Standard of Acceptance:

.1 Walls: No defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.4 SCHEDULING

.1 Submit work schedule for various stages of painting to Ministry Representative for approval. at least 48 hours in advance of proposed operations.

.2 Obtain written authorization from Ministry Representative for changes in work schedule.

1.5 SUBMITTALS

.1 Submit product data and manufacturer's instructions for paint products to be used in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance WHMIS requirements.

.3 Submit a complete dossier for all products used. Indicate all components of each system, stating the following information for each:

.1 Name, type and use of the product.

.2 The manufacturer's product number.

.3 Manufacturer's Safety Data Sheets (MSDS) for each product.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle paint products in accordance with Section 01 61 00 - Common Product Requirements.

.2 Labels: to indicate:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Provide and maintain dry, temperature controlled, secure storage.

.5 Observe manufacturer's recommendations for storage and handling.

.6 Store materials and supplies away from heat generating devices.

.7 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.

.8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Ministry Representative. After completion of operations, return areas to clean condition to approval of Ministry Representative.

.10 Remove paint materials from storage only in quantities required for same day use.

.11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.12 Fire Safety Requirements:

.1 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.7 REQUIRED SITE CONDITIONS

.1 Do not perform painting work unless ambient air temperature can be maintained within the limits recommended by the manufacturer.

.2 Ambient air and substrate temperatures must be maintained within the limits recommended by the manufacturer to the satisfaction of the Ministry Representative. Relative humidity shall not exceed 85%.

.3 Provide temporary heating equipment where permanent facilities are not available to meet minimum requirements.

.4 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.5 Apply paint only to surfaces that are dry, adequately cured, and correctly prepared

.6 Surfaces to be painted must be lit to at least 270 lux.

.7 Beginning of work implies that the contractor has accepted the surface to be painted and is responsible for it to the same measure as the person who prepared it.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.2 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.3 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.4 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:

- .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
- .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
- .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
- .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
- .5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.5 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.6 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

1.9 PROTECTION OF ADJACENT WORK

.1 Protect adjacent work against stains and colors with non-marking tape and masks and other appropriate types of protection.

1.10 SCOPE OF WORK

.1 Paint the following elements:

- .1 Firearms inspection tables.
- .2 Wood structure of division walls in Shooting Gallery.
- .3 Exterior steel doors and frames.

PART 2 Products

2.1 MATERIALS

.1 Only CGSB certified paint materials are acceptable for use on this project unless otherwise specified.

.2 Paint materials for paint systems: to be products of single manufacturer.

.3 When possible, use low-odor paints.

2.2 COLOURS

.1 Ministry Representative will provide Colour Schedule after Contract award.

.2 Colour list:

.1 One colour for exterior wood surfaces.

.2 One colour for exterior steel doors.

.3 One colour for exterior steel door frames.

.3 Selection of colours will be from manufacturers full range of colours.

2.3 EXTERIOR PAINTING SYSTEMS

.1 System for new wood surfaces:

.1 Apply 2 coats of pigment-saturated opaque stain, colour selected by Ministry Representative, with the following characteristics:

.1 Paint solids by volume: 18%.

.2 VOC: 32 g/l or less.

.3 Viscosity: #2 ZAHN Cup, 20°C – 18-22 sec.

.2 System for galvanized steel surfaces: MPI EXT 5.3D, pigmented polyurethane base, over epoxy primer.

2.4 CHOICE AND NUMBER OF COATS

.1 Notwithstanding indications at descriptions of paint systems above, use the sufficient number of additional coats of paint in order to obtain complete, uniform coverage (avoiding transparency) to the satisfaction of the Ministry Representative.

PART 3 Execution

3.1 GENERAL

.1 Sauf indication contraire, effectuer tous les travaux de peinture conformément aux exigences de la norme CAN/CGSB-85.100 et du devis général de peinture du fabricant.

.2 Appliquer les produits de peinture conformément aux instructions écrites du fabricant sur tous les nouveaux éléments apparents et toutes les nouvelles surfaces non finies, sauf indication contraire clairement indiquée aux plans et devis.

3.2 PROTECTION

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Ministry Representative.

.2 Protect windows and hardware from paint spatter near surfaces to be painted. Use non-staining masking.

.3 Protect factory finished products and equipment.

.4 Protect building occupants and general public near building.

.5 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Ministry Representative.

3.3 EXISTING CONDITIONS

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Ministry Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Check moisture content of surfaces to be painted. Do not start work before substrate is acceptable according to the manufacturer's recommendations.

.3 Maximum moisture content as follows:

.1 Wood: 15%.

3.4 PREPARATION

.1 Make sure the surface is free from defects or deterioration.

.2 Wash surface with a high pressure washing machine with a minimum of 3000 PSI. Use only clean water. Follow the instructions for use of the machine pressure.

.3 Sand the wood with a belt or orbital sander with 60 grit paper.

.4 Clean again with high pressure washing machin at 500 PSI, followed by vacuuming or dust collection.

3.5 PAINT MIXING

.1 Mix ingredients in paint container prior to and during use, so as to break up clots, to ensure complete dispersion of the pigment and to obtain uniform composition.

.2 Spray painting must be diluted according to the manufacturer's instructions. If there are no instructions on the container, obtain written instructions from the manufacturer and give a copy to the Ministry Representative.

3.6 APPLICATION OF OPAQUE STAIN ON NEW WOOD SURFACES

.1 Apply in suitable conditions, ideal temperature of 21º C with an approximate relative humidity of 50%. Do not apply at the hottest time of the day or in direct sunlight to avoid the formation of a surface film, limit the penetration of the product and cause chipping in the future. Do not apply on rainy days and / or seasons with cold nights. Product requires drying for 24 hours after application.

.2 Apply a generous coat of stain for maximum absorption and wipe excess with a brush a few minutes later.

.3 Continuously check the surface; wipe any puddle or drips.

.4 After first coat is dried, apply a second layer using a brush.

.5 Take care to mix the product before and during application.

.6 Always read the operating instructions before starting the project.

3.7 RESTORATION

.1 Remove protective coverings and warning signs as soon as practical after operations cease.

.2 Remove paint spatter on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.3 Protect freshly completed surfaces from paint droppings and dust to approval of Ministry Representative. Avoid scuffing newly applied paint.

.4 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Ministry Representative.

END OF SECTION

PART 1 General

1.1 REFERENCES

.1 Architectural Painting Specifications Manual, Master Painters Institute (MPI).

.2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).

.3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

.4 National Fire Code of Canada - 1995

1.2 QUALITY ASSURANCE

.1 Contractor: minimum of five years proven satisfactory experience. Provide list of last three comparable jobs including job name and location, specifying authority, and project manager.

.2 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work. Apprentices: working under direct supervision of qualified trades person in accordance with trade regulations.

.3 Conform to most recent MPI requirements concerning interior painting, including surface preparation and application of primer or print paint.

.4 All products used, including primers, print paints, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc., must be included in the List of Approved Products given in the MPI Architectural Painting Specification Manual, and all products making up a particular paint system must be supplied by a single manufacturer.

.5 Additional paint products, such as linseed oil, shellac, and turpentine, must be compatible with all other materials with which they come in contact, and be of high quality. They must be supplied by a manufacturer approved in the MPI Painting Specification Manual.

.6 Keep all order forms, bills and other documents that can be used to prove upon Ministerial representative's request that all work was done in accord with MPI requirements.

.7 Quality standards:

.1 Walls: no defect visible from a distance of 1000 mm at an angle of 90□ to the surface in question.

.2 Ceilings: no defect visible to observer standing at floor level at an angle 45□ to the surface in question, under final lighting conditions.

.3 Finish colour and gloss level must be uniform over the entire surface in question.

1.3 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Paint products must conform to the requirements for obtaining the MPI Environmentally Friendly classification as defined in "Green Performance Standard MPI GPS-1," based on the amount of volatile organic compounds (VOC) in the product as determined by method n 24 of the Environmental Protection Agency (EPA).

1.4 SCHEDULING

.1 Submit work schedule for various stages of painting to Ministerial representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Ministerial representative for changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants or people in the vicinity.

1.5 SUBMITTALS

.1 Submit product data sheets and manufacturers instructions in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit complete information for all products used. Indicate all products that make up each system, including the following information for each product:

- .1 Name, type and use of product.
- .2 Manufacturer's products number
- .3 Colour number
- .4 MPI Environmentally Friendly classification system rating.
- .5 Manufacturer's Product data sheet.

1.6 EXTRA MATERIALS

.1 Deliver extra materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Quantity: provide one four-litre can of each type and colour of primer and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Deliver extra material to Contractor and store at location indicated by Ministerial representative.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Pack, ship, handle and unload materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Identify products and materials with labels indicating:

- .1 Manufacturer's name and address.
- .2 Type of paint or coating.
- .3 Compliance with applicable standard.
- .4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Provide and maintain dry, temperature controlled, secure storage.

.5 Store and handle products as recommended by manufacturer.

.6 Store materials and supplies away from heat generating devices.

.7 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.

.8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.9 Keep areas used for storage, cleaning and preparation clean and orderly to the satisfaction of Ministerial representative. After completion of operations, return areas to clean condition to the satisfaction of Ministerial representative.

.10 Remove paint materials from storage only in quantities required for same day use.

.11 Respect WHMIS requirements respecting use, storage, handling and disposal of hazardous materials.

.12 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.8 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Before beginning work, verify if existing ventilation is adequate and continuous, If not, provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application.

.2 As needed, provide continuous ventilation for seven days after completion of application of paint.

.3 Coordinate use of existing ventilation system with Ministerial representative, as needed, and ensure its operation during and after application of paint as required.

.4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

.5 Provide minimum lighting level of 323 Lux on surfaces to be painted. Supplementary lighting systems needed to provide adequate lighting must be provided by Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless pre-approved written approval by Specifying body and product manufacturer, perform no painting when:

.1 Ambient air and substrate temperatures are below 10 degrees C.

.2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.2 Perform painting work when maximum moisture content of the substrate is below:

.1 12% for concrete and masonry (concrete or clay bricks or blocks).

.2 15% for wood.

.3 12% for plaster and gypsum board.

.3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".

.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.4 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

.5 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Ministerial representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.9 WASTE MANAGEMENT AND DISPOSAL

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

.2 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

.4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.6 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.7 Close and seal partially used containers of adhesive and sealant and store in well ventilated, temperature-controlled, fireproof location.

PART 2 Products

2.1 MATERIALS

.1 Certified Materials: for this project, use only products found on the list of certified materials issued by CGSB.

.2 Provide paint materials for paint systems from single manufacturer.

.3 Only qualified products with "Environmentally Friendly" rating as defined by Green Performance Standard MPI GPS-1 are acceptable for use on this project.

.4 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:

.1 Water-based, water soluble, water clean-up.

.2 Non-flammable.

.3 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.

.4 Do not contain toxic metal pigments.

.5 Water-borne products must be manufactured and transported so that every step of the process, including waste disposal during the work, respects all applicable laws and government regulations including, for work done in Canada, the Fisheries Act and the Canadian Environmental Protection Act

.6 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

.7 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes to meet minimum "Environmentally Friendly" as defined by Green Performance Standard MPI GPS-1.

2.2 COLOURS

.1 Ministerial representative will provide Colour Schedule after Contract award. Submit proposed Colour Schedule to Consultant for review.

.2 Colour schedule will be based upon selection of three base colours and eight accent colours. No more than eleven colours will be selected for entire project and no more than five colours will be selected in each area.

.3 Selection of colours from manufacturers full range of colours.

.4 Where specific products are available in restricted range of colours, selection will be based on limited range.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Ministerial representative for tinting of painting materials.

.2 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Gloss level ratings of painted surfaces as indicated for each specified product.

2.5 INTERIOR PAINTING SYSTEMS

.1 Concrete vertical surfaces:

.1 One coat emulsion primer for blocks, to CGSB 1-GP-188M (mod. Sept. 80).

.2 One coat emulsion primer, to CGSB 1-GP-119M (mod. Sept. 80).

.3 Two coats paint, matte finish, to CGSB 1-GP-118M.

.2 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:

.1 One coat emulsion primer, tinted for walls to be coloured, with less than 51g/L VOC contents, to CGSB 1-GP-119M (mod. Sept. 80).

.2 Two coats 100% acrylic latex paint, with less than 11g/L VOC contents, to CGSB 1-GP-57M.

.3 Galvanized metal:

.1 One coat reactive vinyl primer, to CGSB 1-GP-121M.

.2 One coat base enamel paint, to CGSB 1-GP-38M.

.3 Two coats enamel paint, semi-gloss, to CGSB 1-GP-57M.

.4 Choice and number of coats of paint

.1 Regardless of paint system descriptions indicated above, use sufficient number of additional coats to obtain complete and uniform coverage, with no effect of transparency, to the satisfaction of Ministerial representative.

PART 3 Execution

3.1 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Ministerial representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter. Report results to Ministerial representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:

.1 Stucco, plaster and gypsum board: 6%.

3.3 PROTECTION

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Ministerial representative.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect building occupants in and about the building.

.5 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.

.6 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.7 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Ministerial representative.

3.4 SURFACE PREPARATION

.1 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by vacuuming and wiping with dry, clean cloths.

.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.4 Allow surfaces to drain completely and allow to dry thoroughly.

.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.

.6 Use trigger operated spray nozzles for water hoses.

.7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

.2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.3 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.4 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes.

.5 Touch up of shop primers with primer as specified in applicable section. Major touch-ups, such as cleaning and painting of site-assembled components, welds, rivets, bolts, nuts, and washers as well as rusted or inadequately painted surfaces, must be performed by the supplier of the component in question.

.6 Do not apply paint until prepared surfaces have been accepted by Ministerial representative.

.7 Prepare galvanized steel surfaces to CGSB 85-GP-14M.

.8 Prepare masonry, stucco, and concrete surfaces to CGSB 85-GP-31M.

.9 Prepare plaster and gypsum surfaces to CGSB 85-GP-33M. Fill small cracks with wall patch compound.

3.5 APPLICATION

.1 Method of application to be as approved by Ministerial representative. Apply paint by brush, roller, or sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in uniform layer using brush and/or roller type suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple, unless accepted by Ministerial representative.

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:

.1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.

.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

.3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.

.4 Brush out immediately all runs and sags.

.5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access, and only with the express approval of Ministerial representative.

.5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove defects visible from a distance of 1.5 m.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.9 Finish inside of cupboards and cabinets as specified for outside surfaces.

.10 Finish closets and alcoves as specified for adjoining rooms.

.11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 FIELD QUALITY CONTROL

.1 Advise Ministerial representative when surfaces and applied coating are ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

3.7 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splash on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Ministerial representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Ministerial representative.

END OF SECTION

PARTIE 1 GENERAL

1.1 REFERENCES

.1 ASTM B 209M-92a, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
.2 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CAN/CSA-O80 Series-M89, Wood Preservation.
.4 CSA O121-M1978, Douglas Fir Plywood.
.5 CGSB 1-GP-12c-65, Standard Paint Colours:
.6 CAN/CGSB-1.28-M89, Alkyd, Exterior House Paint.
.7 CAN/CGSB-1.59-M89, Alkyd, Exterior Gloss Enamel.
.8 CAN/CGSB-1.94-M89, Xylene Thinner (Xylol).
.9 CAN/CGSB-1.99-92, Exterior and Marine Phenolic Resin Varnish.
.10 CAN/CGSB-1.104-M91, Semigloss Alkyd Air Drying and Baking Enamel.
.11 CAN/CGSB-1.132-M90, Zinc Chromate Primer, Low Moisture Sensitivity.
.12 CGSB 1-GP-189M-78, Primer, Alkyd, Wood, Exterior.
.13 CGSB 31-GP-3M-88, Corrosion Preventive Compound, Cold Application, Soft Film.

1.2 Design requirements

.1 Sign supports shall be designed in accordance with NBCC 2015 for Donnacona, Quebec.

.2 Structural deflections and vibration in accordance with American Association of State Highway and Transportation Officials (AASHTO), "Specifications for the Design and Construction of Structural Supports for Highway Signs".

1.3 Shop drawings

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop drawings to be stamped by a Professional Engineer licensed to practice in Quebec.

PART 2 PRODUCTS

1.4 Materials

.1 Sign supports.

.1 .1 Timber posts:

.1 Sawn timber posts:

.1 Species: Douglas Fir or Larch.

.2 Type: pressure treated.

.3 Grade: No.1.

.4 Dimensions: as indicated.

.2 Posts to be treated in accordance with CAN/CSA-O80 Series.

.3 Paint: to CAN/CGSB-1.28, white.

.2 Base plates for ground mounted signs: to ASTM B 209M.

.3 Fasteners: bolts, nuts, washers and other hardware to be cast aluminum alloy, or galvanized steel.

.2 Signboards

.1 Plywood: to CSA O121, 19 mm thick. Overlaid Douglas Fir, Medium Density, overlaid one side only with fibre or plastic sheet surfacing material.

.2 Aluminum sheet: to ASTM B 209M, precut to required dimensions. Thickness to be 1.6 mm for signboards up to 750 mm wide. Thickness to be 2.1 mm for signboards 750-1200 mm wide.

.3 Aluminum extrusions: to ASTM B 211M.

.4 T-shape stiffeners for signboards: to ASTM B 210M.

.5 Connecting straps and brackets: to ASTM B 209M.

.6 Aluminum materials: to ASTM B 209M.

.7 Xylene thinner: to CAN/CGSB-1.94.

.8 Primer for plywood: to CGSB 1-GP-189M.

.9 Chemical conversion coating for aluminum: to CGSB 31-GP-101Ma.

.10 Primer for aluminum: to CAN/CGSB-1.132.

.11 Finish paint: to CAN/CGSB-1.59.

.12 Silk screen ink:

.1 Transparent or opaque colours: to CGSB 1-GP-12c, and as indicated.

.13 Transparent tape: flexible, smooth-surfaced, moisture resistant tape with pressure sensitive adhesive.

.14 Clear varnish protective coat: to CAN/CGSB-1.99.

1.5 Fabrication

.1 Supports.

.1 Remove sharp edges and burrs.

.2 Signboards.

.1 Plywood blanks:

.1 Cut plywood blanks to required shapes and dimensions. Fill edges with wood filler suitable for outdoor use and sand smooth.

.2 Lightly sand surfaces, wipe clean with xylene thinner and allow to dry for 8 hours.

.3 Spray face with one prime coat and two finish coats of required colour. Spray signboard back and edges with one prime coat and two white finish coats in the same colour as the sign face.

.2 Aluminum blanks:

.1 Degrease, etch and bonderize with chemical conversion coating.

.2 Clean surfaces with xylene thinner. Dry.

.3 Spray face with one coat vinyl pretreatment coating and two finish coats of required colour.

.4 For aluminum signboards that are to be painted before installation, spray and bake face of signboards with two coats of enamel in accordance with CAN/CGSB-1.104.

.3 Lettering and Symbols: cut from vinyl film as specified in CGSB 62-GP-9M, or paint using required colour of finish paint or silk screen transparent ink.

.4 Clean signboards completely and apply transparent tape over top edge and extending 25 mm minimum down back and front of signboard.

.5 Protect finished signboard faces with one coat of clear varnish.

.6 Apply two coats of white paint to wooden sign posts. Allow initial coat to dry before applying second coat. Apply paint only when relative humidity is below 85 % and ambient temperature is above 5 degrees C.

.3 Sign identification:

.1 Apply sign number and date of installation with 25 mm high stencil painted black letters on lower left back face of each signboard.

PART 3 – EXECUTION

1.6 Installation

.1 Sign support.

.1 Wooden post installation:

.1 Excavate post holes to dimensions shown on drawings. Compact bottom of hole to provide firm foundation. Set post and backfill in 150 mm layers with excavated material. Compact each layer before placing each subsequent layer.

.2 Leave or make depression, approximately 150 mm deep, around posts until paint is dry, then backfill and compact with excavated material to ground elevation.

.2 Signboard

.1 Fasten signboards to supporting posts and brackets as indicated.

1.7 Protection

.1 Place temporary covering on signboards where indicated. Covering to be capable of withstanding rain, snow and wind and be non-injurious to signboard.

.2 Replace deteriorated covering and remove covers as directed by Departmental Representative.

1.8 Correcting defects

.1 Correct defects, identified by Departmental Representative, in sign message, colour or size. Correct angle of signboard for optimum performance during night conditions to approval of Departmental Representative.

1.9 Cleaning

.1 Cleaning during construction: perform cleaning operations in accordance with Section 01 74 11 – Cleaning.

.1 Leave work area clean at the end of each day.

.2 Final cleaning: After completion of work, dispose of surplus materials / materials, waste, tools and equipment in accordance with Section 01 74 11 – Cleaning.

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

END OF SECTION

PART 1 General

1.1 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's product data, instructions and other documentation for corner guards. The technical data must include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop drawings:

.1 Large-scale drawings indicating material dimensions and details, finish, fasteners, and assembly.

PART 2 Products

2.1 MATERIALS

.1 Metal corner guards: 100 mm x 100 mm x 1220 mm in length x 3mm thickness, corner radius 6mm, stainless steel grade 302, satin finish, with removable protective film, for surface mounting by mechanical fastening.

2.2 ACCESSORIES

.1 Fasteners: self-tapping stainless steel screws.

.2 Adhesive: water-resistant, as recommended by manufacturer according to substrate.

PART 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written requirements, recommendations, and specifications, including product technical bulletins, installation instructions specified in the product catalogs and on packaging cartons, and information factsheets.

3.2 INSTALLATION

.1 Install units on solid backing and erect with materials and components straight, tight and in alignment.

.2 Mechanically fasten corner guards to substrate at 300 mm on centre above baseboards.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Clean surfaces after installation using manufacturer's written recommended cleaning procedures.

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

.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

Repair damage to adjacent materials caused by wall and corner guards installation

END OF SECTION

PART 1 General

1.1 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's product data, instructions and other documentation for shoe scrapers. The technical data must include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop drawings:

.1 Large-scale drawings indicating material dimensions and details, finish, fasteners, and assembly.

PART 2 Products

2.1 MATERIALS

.1 Shoe Scraper: extruded aluminum blades with neoprene cushion base and black nylon brush insert on top, intetgral hinge, 11mm thick, width and depth indicated in drawings, with edge border cast in place in concrete slab.

PART 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written requirements, recommendations, and specifications, including product technical bulletins, installation instructions specified in the product catalogs and on packaging cartons, and information factsheets.

3.2 INSTALLATION

.1 Furnish square edged border moulding to concrete contractor during slab casting to permit installation at perimeter of depression in slab provided for this purpose.

.2 Lay shoe scraper in depression provided for this purpose.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Clean surfaces after installation using manufacturer's written recommended cleaning procedures.

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

.4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

END OF SECTION

PART 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM A167-99, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM B456-95, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.3 ASTM A653/A653M-99, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM A924/A924M-99, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.81-M90, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.

.2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.

.3 CAN/CGSB-12.5-M86, Mirrors, Silvered.

.4 CGSB 31-GP-107Ma-90, Non-inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.

.3 Canadian Standards Association (CSA)

.1 CAN/CSA-B651-95, Barrier-Free Design.

.2 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

1.3 SAMPLES

.1 Submit two samples of each item in accordance with Section 01 33 00 - Submittal Procedures.

.2 Samples to be returned for inclusion into work.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

1.6 EXTRA MATERIALS

.1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.

.2 Deliver special tools to Ministerial representative.

PART 2 Products

2.1 MATERIALS

.1 Sheet steel: to ASTM A653/A653M with ZF001 designation zinc coating.

.2 Stainless steel sheet metal: to ASTM A167, Type 304, with brushed finish.

.3 Stainless steel tubing: Type 304, commercial grade, seamless welded, 1.2 mm wall thickness.

.4 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 COMPONENTS

.1 Toilet tissue dispenser: single roll type, surface mounted, heavy-duty grey ABS, polished finish for visible surfaces, 255 mm roll capacity, roll under spring tension for controlled delivery.

.2 Paper towel dispenser: for "C-fold" type paper towels (400 capacity), surface mounted, 22 gauge stainless steel, #4 satin finish, with keyed lock and heavy-duty piano hinge.

.3 Sanitary napkin waste bin (Women's Restroom only): surface mounted in no. 304 stainless steel, satin finish, 22 gauge one piece front and sides, welded construction, with hooks inside for sack retention, 26 gauge for back and bottom.

.4 Soap dispenser: liquid soap, self contained heavy-duty ABS tank, stainless steel piston and valve assembly, tamper proof filler lock, surface mounted.

.5 Plain mirror: wall mounted unit, fixed 6 mm mirror, dimensions as shown in drawings, to CAN/CGSB-12.5, stainless steel frame:

.6 Hook: stainless steel, satin finish, 80 mm projection.

.7 Waste receptacle : surface mounted in no. 304 stainless steel, satin finish, 22 gauge one piece front and sides, welded construction, capacity of 24.5 l., with hooks inside for sack retention, 26 gauge for back and bottom.

2.3 FABRICATION

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

.9 Provide steel anchor plates and components for installation on studding and building framing.

2.4 FINISHES

.1 Chrome and nickel plating: to ASTM B456, satin finish.

.2 Manufacturer's or brand names on face of units not acceptable.

PART 3 Execution

3.1 INSTALLATION

.1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.

.2 Use tamper proof screws/bolts for fasteners.

.3 Fill units with necessary supplies shortly before final acceptance of building.

3.2 QUANTITY AND LOCATION

.1 Locate accessories where indicated in drawings.

.2 Install one hook on the back of the door in each restroom.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section contents

.1 This section treats the different types of portable extinguishers and cabinets for these extinguishers

1.2 REFERENCE STANDARDS

.1 National Fire Protection Association (NFPA)

.1 NFPA 10-2010, Standard for Portable Fire Extinguishers.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit [two] copies WHMIS MSDS – Material Safety Data Sheets in accordance with Section [02 81 01- Hazardous Materials].

PART 2 PRODUCTS

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

.1 Stored pressure rechargeable type with hose and shut-off nozzle, ULC labelled for 4A, 80B and C class protection.

.1 Size 4.5kg (10 lbs).

.2 Acceptable products: CFH WBDL-ABC10, Flag, Pyro-Chem or approved equivalent.

2.2 EXTINGUISHER BRACKETS

.1 Type recommended by extinguisher manufacturer.

2.3 IDENTIFICATION

.1 Identify extinguishers in accordance with recommendations of CAN/ULC-S508 ANSI/NFPA 10.

.2 Attach bilingual bar code or label to extinguishers, indicating month and year of installation. Provide space for service dates.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install or mount extinguishers in cabinets or on brackets as indicated, in accordance with NFPA 10.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 The Aluminum Association (AA)

.1 AA DAF-45-[R2003], Designation System for Aluminum Finishes – 9th Edition.

.2 ASTM International

.1 ASTM A53/A53M-[10], Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for flag poles and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.

.2 Indicate dimensions, finishes, base jointing, anchoring and support systems, cleats, halyard boxes, trucks, finials and base collar for flagpoles.

.3 Submit 1 copy of drawings of flagpoles and bases, showing general layout, jointing and complete anchoring and supporting systems.

.4 Manufacturer's Instructions: submit manufacturer's installation instructions for each type of flagpole.

1.3 QUALITY ASSURANCE

.1 Provide each flagpole as complete unit produced by single manufacturer, including fittings, accessories, bases and anchorage devices.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.1 Spiral wrap each flagpole with heavy kraft paper, wood strip and steel band, or polyethylene wrap and pack in tubing for shipment.

.2 Ship flagpole to installation site in one piece.

.3 Deliver flagpole in 2 pieces.

.1 When more than one piece is required, provide precision joints with self aligning internal splicing sleeve arrangement.

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect flagpoles from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Aluminum:

.1 Aluminum Association alloy AA 6063-T5 seamless extruded aluminum tubing.

.2 Fabricated from seamless extruded tubing in accordance with ASTM B241, alloy 6063 T6, having minimum tensile strength not less than 20 MPa and a yield point of 17 MPa. Heat treated and age hardened after fabrication.

.2 Isolation coating: alkali-resistant bituminous paint or epoxy resin solution.

2.2 DESIGN CRITERIA

.1 Flagpole, bases and anchorage devices to resist minimum wind velocity of 145 km/h unflagged, 100 km/h flagged.

.2 Description of canadian flag flagpole:

.1 Exposed Height: 10,7 m.

.2 Butt Diameter: 150 mm.

.3 Top Diameter: 65 mm.

.4 Wall Thickness: 4,7 mm.

.5 Options and Accessories: internal halyard, tile base, tilt anchor cage with anchor plate assembly and hinge pin, aluminum base cover, revolving ball, single halyard, retaining weighted loop, flag extension with two flag snaps, door, lock and key.

.6 Flag Size: 1 375 mm x 2 745 mm.

.3 Description of warning flag flagpole:

.1 Exposed Height: 10,7 m.

.2 Butt Diameter: 150 mm.

.3 Top Diameter: 65 mm.

.4 Wall Thickness: 4,7 mm.

.5 Options and Accessories: external halyard, tile base, tilt anchor cage with anchor plate assembly and hinge pin, aluminum base cover, revolving ball, single halyard, retaining weighted loop, flag extension with two flag snaps, door, lock and key.

.6 Flag Size: 1 375 mm x 2 745 mm.

2.3 FABRICATION

.1 Fabricate 10.7 m long flagpole as complete unit including base, anchorage and fittings.

.2 Cone tapered flagpole:

.1 Seamless, uniform, straight line tapered section above cylindrical butt section.

.2 Provide internal splicing, self-aligning sleeve of same material as flagpole for snug fitting, watertight field joints.

2.4 ACCESSORIES

.1 Finial: revolving cap, 1.6 mm minimum thick, aluminum anodized finish, colour to match flagpole finish.

.2 Truck assembly: stainless steel, stainless steel ballbearing, nonfouling, revolving double truck assembly.

.3 Halyard Canadian flag flagpole: internal, two continuous halyards per flagpole. Retaining loop and weights for internal halyard, stainless steel nylon covered.

.4 Halyard warning flags flagpole: external, two continuous halyards per flagpole nylon, braided, with steel core.

.5 Swivel snaps: two per halyard; stainless steel with neoprene or vinyl covers.

.6 Hinged, lockable door with lock and key.

2.5 FINISHES

.1 Aluminum:

.1 Finish exposed surfaces of aluminum components in accordance with AA DAF-45.

.1 Clear anodic finish: designation AA-M12.

.2 Appearance and properties of anodized finishes designated by the Aluminum Association as Architectural Class 1.

2.6 FIELD FABRICATION

.1 Fabricate ground-set foundation assembly for manual tilt installation of flagpole as indicated. Include locking lug on tilt pole.

.2 Fabricate mountings of galvanized steel where encased in concrete.

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 flagpole 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 Shop apply isolation coating to metal surfaces of flagpole and base that will be encased in concrete below grade level.

.2 Install flagpoles, base assemblies and fittings to shop drawings and manufacturer's instructions.

.3 Provide ground stakes, for positive lightning ground for each ground set flagpole installation as recommended by supplier.

.4 Check and adjust installed fittings for smooth operation of halyards.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by flagpole installation.

END OF SECTION

PART 1 GENERAL

1.1 PURPOSE

.1 The Contractor shall provide a bullet trap that will capture all rounds fired from the active range area. The Contractor shall provide a bullet trap that will be fully integrated with the engineered civil, structural and electrical works indicated in the drawings and specifications so that all other codes, regulations, guidelines and other conditions described herein are either met or exceeded.

.2 The bullet trap shall be installed in accordance with the manufacturer's recommendations and meet or exceed the Royal Canadian Mounted Police Range Design and Construction Guidelines, Latest Edition, for a Type II range.

.3 The bullet trap shall:

.1 Absorb and collect all fired projectiles though the use of a low-maintenance system;

.2 Prevent ricochets and provide complete bullet containment so that any bullets entering the trap will not re-enter the range;

.3 Prevent fired projectiles from becoming fragmenting or disintegrating "Smash plates" are not acceptable;

.4 Clearly reduce pulverized lead particles;

.5 Provide the maximum possible reduction of hazardous lead materials in an environmentally responsible manner; and

.6 Be self-supporting and completely integrated with the specified civil, structural and electrical works.

.4 The bullet trap and associated systems shall meet or exceed all Occupational Health and Safety Act requirements and minimize any clean up of hazardous materials.

.5 The bullet trap provided by the Contractor shall, but not be limited to, accepting rounds fired from the following weapons:

.1 C-8 (.556 mm)

.2 9 mm Pistols;

.3 12 Gauge Shotgun; and

1.2 SUBSTITUTIONS

.1 Minor variations in design to accommodate manufacturer's standard products are acceptable with Departmental Representative's approval prior to contact award. No variations are permissible in quality or material specified.

.2 Major variations in design or operation of equipment require submittal of a list of substitutions including explanation and detail drawings for the Departmental Representative's approval prior to contract award.

1.3 SUBMITTALS

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

.2 The Contractor shall submit a complete written commissioning and maintenance plan for approval by the Departmental Representative.

1.4 QUALITY ASSURANCE

.1 Range equipment manufacturers must meet the following qualifications:

.1 A firm having at least five (5) years of experience in fabrication and installation of work of the quality and scope required on this project.

.2 Acceptable products:

.1 Action Target;

.2 Meggit Training Systems; and

.3 Savage Range Systems.

PART 2 PRODUCT

2.1 BULLET TRAP

.1 Except where noted otherwise, provide the manufacturer's standard products and equipment.

.2 The bullet trap shall stop all bullets fired from the various firing lines directly into the bullet trap, while being subjected to constant use with all handgun ammunition including .22, .357, .38, .45, .44 magnum, with all handgun or machine gun ammunition including 9 mm, 10 mm, and .40 caliber, all lead shotgun ammunition including 12 gauge lead slugs, and all soft nose rifle ammunition with muzzle energies up to 8,100 foot pounds muzzle energy – including .308, 30 caliber, .223 and .338 Lapua.

.3 The bullet trap shall shelter the end of the range from wall to wall and from floor to the highest bullet path that can be expected from the firing line.

.4 The bullet trap shall recover bullet particles for periodic salvage. Spent lead sealed pails will collect the spent bullets. No auger, chain link or belt type conveyor is required.

.5 The bullet trap shall be constructed of special heat-treated steel. Frames support the impact plates at a low angle away from the shooter. Lower impact plates and over-trap plates arranged to assurer a multiplicity of impacts before the particles enter the chamber for final enervation.

.6 The bullet trap shall be self-supporting and assembled entirely by mechanical joints with no field cutting or welding required for erection or replacement of components. Sidewall and over-trap plates are suspended from the bullet traps skeletal support frames.

.7 For structural soundness and safety, the bullet trap's frame shall not require any tensioned cross cable supports. Seams between adjacent trap sections shall fall on the edges of firing lane boundaries.

.8 At a minimum, primary impact plates shall be able to absorb 8,100 foot-pounds of energy. Primary impact plates shall be9.525 mm (3/8") thick steel armor plate with a 500 BHN rating. Steel plating with thicknesses less than 9.525 mm are acceptable with the Departmental Representative's approval.

.9 The Steel Impact plates must butt together at their outer left and right edges and must not use any hold down plates or hardware to remain in their proper position during continuous heavy use.

.10 The mouth of the bullet trap must be set at an elevation minimizing the amount of time a round is on an impact plate surface and promotes the earliest possible dispersion into the scroll area in order to maximize lead containment.

.11 Any rear scrolls provided for the bullet trap must be bolted into place and removable. Accessibility to this area for inspection and cleaning is required. Welded scroll/deceleration chambers are not acceptable. The rear scroll must be totally removable. (Not Welded) to allow easy access for maintenance.

.12 All surfaces of the trap are factory primed on all sides.

.13 The bullet trap shall be divided into spaces corresponding to shooting points with targets approximately centered on respective impact plates. Divisions between impact plates shall occur approximately midway target centers.

.14 The bullet trap will not require any secondary means for de-energizing the bullets – such as sand, water or rubber – nor will the trap require any type of dust collection or filtration system.

PART 3 EXECUTION

.1 Install in exact accordance with manufacturer's instructions and submittals. Provide a Commissioning Plan for approval of Departmental Representative at least two weeks before completion of construction. The Contractor will be required to follow the Commissioning Plan and demonstrate to the satisfaction of the Departmental Representative that the bullet trap is ready for its intended use prior to substantial performance.

.2 Install equipment under the direct supervision of the equipment manufacturer.

.3 Adjust equipment for proper operation as requested by Departmental Representative.

.4 Demonstrate all aspects of operation and maintenance of the installed equipment to the Departmental Representative's satisfaction.

.5 All exposed steel shall have a prime coat to the Departmental Representative's approval.

.6 Provide a minimum of eight (8) hours of training for CSC/PWGSC staff by the supplier for operation and maintenance of the facility.

END OF SECTION

PART 1 GENERAL

1.1 DESIGN REQUIREMENTS

.1 The Contractor shall provide a complete odor treatment system that should reduce the concentration of unpleasant odors from the existing domestic water pumping station located near the new firing range. The Contractor shall provide an odor treatment system that will be fully integrated with the civil works, electricity and structure indicated on the plans and specifications in order to meet or exceed all codes, standards or guidelines.

.2 The system must be composed of a fan, a coal tank and any other accessories required for its operation. Stale air must be aspirated from the wet well of the wastewater pumping station, it must pass through the coal inside the tank and be discharged outside of the shed.

.3 Odor treatment system should be installed according to manufacturer's recommendations.

.4 Electrical equipment located inside the existing pumping station must be certified "explosion proof".

.5 Coal tank must be of sufficient sized to permit continuous operation for a period of 12 months.

.6 Coal tank will be installed in an insulated and heated shed. The inside minimum temperature must be 5 degrees Celsius. In summer, the shed will not be air conditioned. The chosen coal type must be effective under these conditions.

1.2 SUBMITTAL PROCEDURES

.1 Submit required documents and samples in accordance with Section 01 33 00 – Submittal procedures.

.2 Quality control: according to Section 01 45 00 – Quality Control.

.3 Documents / samples to be submitted before work.

.1 Prior the beginning of the work covered by this section, submit a list of major appliances and equipment that will be used for the realization of these.

1.3 QUALITY ASSURANCE

.1 Equipment manufacturers must meet the following requirements:

.1 The firm must have a minimum of five (5) years experience in manufacture and installation for the nature and quality of work required for this project

.2 Acceptable products are:

.1 .1 DGL 410 – H2S/MERC-150VAR450-P604H/CNS;

.2 Approved equivalent;

PART 2 PRODUCTS

2.1 FAN

.1 System configuration: The space in this station is restricted. The only fan configuration permitted is the configuration allowing the fan to sucks out from the damp well and delivers stale air into the bottom of the active charcoal tank located in the shed behind the pumping station.

.2 The fan should be able to fight and develop a 10-inch water column differential to compensate for the saturation of the coals over time.

.3 The fan control must make it possible to vary the flow according to the season: A ratio of 3 between the summer flow and the winter flow is to be envisaged: 450 cubic inch per minute in summer and 150 cubic inch per minute in winter. The flow of gas must be maintained during the winter to avoid compaction of the bed of coals. During operation, prolonged stops must be avoided.

.4 A detection system including low and high speed alarms is required.

.5 A flow sensor for speed evaluation is to be included.

.6 Equipment for transmitting flow rate and fan power % data is required.

.7 The maximum fan power must be 5 HP or 4 KW.

.8 The drive system must be direct to reduce maintenance of the equipment. Drive systems with pulleys and belts are rejected.

.9 Internal ventilator material (surface exposed to contaminants) should be treated to be "spark proof".

2.2 COAL TANK

.1 Coal tank must be of high density polyethylene.

.2 The tank must be completely sealed.

.3 The dimensions of the tank must allow the filling of 175 to 200 kg of coal.

.4 Maximum area available for installation of coal tank is 25 m^2 (5 mx 5 m).

2.3 ACTIVATED COAL

.1 Coals must not be impregnated with oxidizing chemicals.

.2 Two types of coals must be used: one that is very efficient for H2S and one for other contaminants.

.3 The preliminary ratio should be about 3 to 1 that is 3 times more coal to capture H2S than coal to capture other contaminants.

.4 The density of the coal shall not exceed 0.52 kg / liter.

.5 Pressure drop in virgin coal shall not exceed 4 inches of water column.

2.4 CONTROL PANEL

.1 Controller to display flow and percent fan power.

.2 Light indicators signaling low and high flow alarms are required.

.3 The control panel shall enable the activation of audible or silent alarms.

.4 Operating status indicators must be included.

.5 Dry contacts for alarm transmission are required.

.6 Main circuit breaker must be included.

2.5 PIPES AND ACCESSORIES

.1 The conduit to install from the wet well until the exit of the shed after the tank must be schedule 40 PVC.

.2 The conduit must be isolated. The insulation thickness must be 50 mm.

.3 The flanges must be of "Vanstone" (compression flange).

2.6 2.7 FLEXIBLE JOINT

.1 A flexible joint must be installed between the wastewater pumping station and the new shed.

.2 Acceptable products are:

.1 Fernico;

.2 Approved equivalent;

.3 The provision of flexible joint must include all accessories required for the installation.

2.7 PLATES, ADAPTOR AND OTHER ACCESSORIES

.1 The Contractor must provide all plates, adaptor and any other accessories required so that the odor treatment system installed and provided meets the requirements of suppliers and Departmental Representative.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install the odor treatment system in accordance with the manufacturer's instructions.

.2 All work inside the existing pumping station must be done according to this type of flow standards for safety installation. It is recommended to have a gas detector to work inside the existing pumping station.

.3 The repairs of the wall of existing pumping station and the new shed must be done according to the rules to not allow heat loss or gas loss in each building. The insulation of the walls and roof must be redone following the work according to the given details.

.4 After the installation, submit to Departmental Representative a commissioning plan for approval. The Contractor must follow the commissioning plan and demonstrate to the Departmental Representative that the odor treatment system is functional before it is turned on.

.5 Install the equipment under the direct supervision of the manufacturing equipment.

.6 Demonstrate to the Departmental Representative the operation and maintenance of the installed equipment.

.7 Any exposed steel surface should receive a coat of primer and be approved by the Departmental Representative.

.8 Provide a training by the manufacturer to the Donnacona Correctional Service staff for the operation and maintenance of the equipment.

3.2 TRAINING

.1 .1 The contractor must provide a training of system operators. In this formation, the Contractor must explain its operation, maintenance and present potential problems that might occur and ways to solve these problems.

END OF SECTION

PART 1 GENERAL

1.1 DESIGN BASIS

.1 The Contractor must supply the following flags:

.1 Canadian flag

.2 Red flag

.3 Green flag

.2 The flag must be made according the Federal Identity Program.

1.2 SUBMITTALS

.2 Submit required documents and samples in accordance with Section 01 33 00 – Submittal procedures.

.3 Quality control: according to Section 01 45 00 – Quality Control.

.4 Documents / samples to be submitted before work.

.1 Prior the beginning of the work covered by this section, submit a list of major appliances and equipment that will be used for the realization of these.

PART 2 PRODUCT

1.1 MATERIAL

.1 Flags must be made in accordance with the following specifications:

.1 200 denier nylon flag;

.2 Seam around the flag;

.3 Finish with rope and toggle.

1.2 DIMENSION

.2 Flags dimension must be 1 375 mm x 2 745 mm.

PART 3 EXECUTION

1.3 INSTALLATION

.2 Flags must be installed according to the flagpoles supplier recommendations.

END OF SECTION

Part 1 General

1.1 SECTION CONTENTS

.1 The work in this section consists of the provision and installation of the following:

.1 Prefabricated painted steel cabinets for the Training Building kitchenette.

.2 Stainless Steel counter top installed over prefabricated cabinets.

.2 The stainless steel counter tops and prefabricated cabinets may be supplied by different manufacturers. The contractor in charge of this section must plan the installation of both elements as well as the coordination between the two suppliers, including the cutting of the counter and cabinet in order to install the sink.

1.2 RELATED SECTIONS

.1 Section 06 40 00 – Architectural Woodwork.

.2 Plumbing equipment – See Engineer.

1.3 REFERENCES

.1 ASTM A 167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.2 ASTM A653/A653M-05a - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.4 SHOP DRAWINGS

.1 Submit complete shop drawings of the work of this section in accordance with the requirements of section 01 33 00.

.2 Drawings shall show the construction details of the cabinets, bases, drawers, doors, shelves, counter tops and other elements of the assembly. They must also indicate the location of service outlets for sinks and valves.

1.5 MAINTENANCE INFORMATION

.1 Provide instructions, written in French, regarding facility maintenance.

1.6 WARRANTY

.1 Provide a warranty certificate covering all components for a period of three (3) years from the date of completion of the work as defined in the Civil Code.

.2 This warranty shall cover all defective or faulty parts as well as labor.

Part 2 Products

2.1 MATERIALS

.1 Stainless steel for countertop: to ASTM A167 and with the following characteristics:

.1 Steel grade: stainless steel grade 316, 16 gauge, brushed finish #4.

.2 Painted steel sheet: of variable thickness according to the component, powder coat finish.

2.2 STAINLESS STEEL WELDING

.1 Method: Electric, rod composition close to that of stainless steel and equally corrosion-resistant.

.2 Manufacture: Top quality, free of deformations, dislocations, cracks and other mechanical defects.

.3 Seals: Invisible, smooth and polished to harmonize with the base metal finish.

.4 Neither welding nor finishing work shall impair the corrosion resistance of the finished article.

.5 Unless otherwise specified, all welds shall be continuous.

2.3 GENERAL CONSTRUCTION

.1 Cabinets shall be installed on a recessed base with a stainless steel face.

.2 All joints of exposed surfaces shall be perfectly fused, welded and polished. No bolts, spot welds or open joints will be accepted.

.3 All units shall be adequately reinforced to prevent inflation, deformation or other mechanical defects.

2.4 MARIN EDGE COUNTER TOP

.1 Build 16 gauge stainless steel countertop.

.2 All bent joints on top of counter should be welded and polished.

.3 Underneath of countertop will be L- or U-shaped reinforcements. Plan reinforcements according to sink location. Provide counter top cut-out for sink installation; Coordinate with the plumber for sink template.

.4 Counter top shall be soundproofed with Tremco # 440 butyl-polyisobutylene tape or an approved equivalent installed between the top and the frame.

.5 The top of the countertop will have a 15 mm nose over front of cabinets. The ends will be flush with the sides of the cabinets.

.6 Raise edges by 6 mm, then fold the 50 mm flanges and turn them inwards by 38 mm so that no bolts are required. Edges to be ground to eliminate sharp, cutting edges, corners rounded and welded to match the original finish.

.7 Make a 100 mm high folded backsplash, in continuity with top surface, minimum radius 13 mm, thickness 15 mm, rounded corners.

2.5 CABINETS

.1 Construct low cabinet enclosures in painted steel sheet. The top and bottom of the cabinets shall be made of 20 gauge sheet metal, sides of 18 gauge sheet metal, and reinforcements, posts, fasteners, etc., of appropriate size.

.2 Provide the following components depending on the type of cabinet identified in the drawings.

.1 Cabinet type 1:

.1 Cabinet: heavy-duty painted sheet metal housing, overall dimensions: 915mm W x 610mm D x 762mm H (36"x24"x30 ").

.2 Recessed base: stainless steel, 915mm W x 560mm D x 100mm H (36"x22"x4 "), with removable front cover in stainless steel.

.3 Drawer: pre-painted sheet metal drawer, 100mm (4 ") height, full free width of cabinet, stainless steel face, built-in handle, heavy-duty drawer slides, 400 lbs capacity, 100% opening, no dividers.

.4 Traverse: painted sheet metal, over the full width of the cabinet, to be installed between the drawer and the doors.

.5 Double doors: double doors, double painted sheet metal, factory installed below drawer to fill residual space, 180 degree opening, heavy-duty hinges, with standard lock and integrated handles, adjustable horizontally and vertically.

.6 Adjustable shelf: painted sheet metal, with folded edges and back, adjustable every 25mm, 400kg capacity, 1 per cabinet.

.2 Cabinet type 2:

.1 Cabinet: heavy-duty sink cabinet in painted sheet metal, overall dimensions: 762mm W x 610mm D x 762mm H (30"x24"x30 "), with top and rear openings for sink and plumbing installation.

.2 Recessed base: stainless steel, 762mm W x 560mm D x 100mm H (30"x22"x4 "), with removable front cover in stainless steel.

.3 Double doors: integrated double doors, full height and clear width, factory-installed painted metal wall, 180 degree opening, heavy-duty hinges, standard lock and integrated handles, adjustable horizontally and vertically.

Part 3 Execution

3.1 INSTALLATION

.1 Assemble and install all equipments plumb, square, level, free of warping.

.2 All adjustments, leveling and welds required must be carried out on site to complete a perfect installation.

.3 Secure adjacent cabinets to each other by means of bolts; the width of the joints shall not exceed 1 mm.

.4 Apply a thin bead of sealant along the joint between the counter top and the wall.

.5 After installation is complete, adjust hardware.

3.2 REPAIR, CLEANING AND PROTECTION

.1 Repair all damage caused by the contractor for this section to the work of other trades.

.2 At the end of the work, clean and polish to remove any traces of dirt, food, paint, grease, etc., in order to deliver perfectly sanitary counters.

.3 Protect elements from tarnish and damage, regardless of cause.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 The present section specifies copper and/or stainless steel piping incoming domestic water service (potable and non-potable), hard drawn copper domestic hot and cold water services inside buildings, soft copper tubing inside buildings, and buried soft copper tubing at building exterior (for example: in between potable water sources and meter inside buildings).

.2 Definitions

.1 Potable water: fit for human consumption. Corresponds to the so-called drinking or softened water (as applicable).

.2 Non-potable water: not fit for human consumption. Corresponds to the so-called laboratory water, pet store, process or softened (as applicable).

1.2 REFERENCES

.1 National Plumbing Code of Canada 2010 (CNP) with modifications for Quebec.

.2 "Lead-Free" construction certified 0.25 % lead maximum for plumbing supply fittings as per CSA B125.1 and B125.3.

.3 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).

.1 ANSI/ASME B31.9, Building Services Piping.

.2 ANSI/ASME, Boiler and Pressure Vessel Code :

.3 BPVC Section V : Non Destructive Examination.

.4 BPVC Section IX : Welding and Brazing Qualifications.

.4 Canadian Standards Association (CSA)/CSA International.

.1 CSA W178.1, Qualification des organismes d'inspection en soudage.

.2 CSA W178.2, Qualification des inspecteurs en soudage.

1.3 ACCEPTABLE MATERIALS AND PRODUCTS

.1 Where materials or products are prescribed by their brand name, consult the bidders instructions in order to know the procedure concerning the request for materials or products replacement approval.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit documents in accordance with the section on shop drawings, product data and samples.

.2 Shop drawings must be submitted for verification of the following documents:

.1 Type of piping

.2 Gate valves.
.3 Butterfly valves.
.4 Ball valves.
.5 Globe valves.
.6 Check valve.
.7 Screen.
.8 Gaskets, bolts and nuts.

PART 2 PRODUCTS

2.1 POTABLE WATER NETWORKS (COPPER)

	CALCULATED	OPERATING	HYDROSTATIC PRESSURE
PRESSURE kPa²	1,030	860	1,380
TEMP. °C max.	100	80	AMBIENT

PIPE AND FITTING STANDARDS

	DIAMETER		SPECIFICATIONS(*)	DESCRIPTION	MATERIALS AND ASTM STANDARDS
	FROM	TO			
PIPE	DN 15	DN 100	Hard drawn copper Type L bar	Aboveground piping	ASTM B88M
	DN 15	DN 50	Annealed copper Type K tubing	Embedded or buried piping	ASTM B88M
ASSEMBLIES	DN 15	DN 100		Weld: 95-5 tin-antimony	
FITTINGS	DN 15	DN 100	Forged copper	To ASME B 16.22	ASTM B75
			Bronze solder end	To ASME B 16.18	
			Bronze screw-in	To ASTM B 16.15 Class 125 and 150	
			Bronze flanged	To ASTM B 16.24 Class 150 and 300	
BOLTS	Heavy duty stainless steel				ASTM 193, grade B8
PACKING	Thickness: 3 mm (1/8 in.)				EPDM 150 psi

	DIAMETER		SPECIFICATIONS(*)	DESCRIPTION
	FROM	TO		
GATE (2) (4)	DN 15	DN 50	Class 125 screw-in	
	DN 65	+	Class 125 flanged	
BALL (2) (3) (4)	DN 15	DN 50	Class 600 screw-in	
	DN 65	DN 80	Class 600 screw-in	
BUTTERFLY (1) (4)	DN 65	+	Class 200	
CHECK (4)	DN 15	DN 50	Class 150 screw-in	
	DN 65	+	Wafer type	
DRAINAGE BALL VALVES (4)	DN 20	–	Class 600 screw-in	

VALVES FOR MIXED NETWORKS (POTABLE WATER AND FIRE PROTECTION)	NSF "Lead Free" construction certified, FM, ULC and supervised: • Victaulic type butterfly model 7B2, DN 65 to DN 250, grooved, c/w flanges 744. • If located upstream of fire protection pump, gate, OS&Y, flanged Nibco model F-607-RW, Zurn 48FF.

NOTES:

(*) indicated class is minimum.
(1) operating mechanism for butterfly type: up to DN 100 lever lock, DN 150 and greater manual gear operator
(2) valves up to DN 25 may be soldered
(3) also applies for installation of pressure gauges, filters, bypass, etc.
(4) with NSF "LF" suffix for "Lead Free" certification. For potable water networks, lead-free fittings destined for consumption are: sinks, kitchen valves, water distribution (fountains), shut-offs, checks, thermostatic mixers.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 PIPING INSTALLATION

.1 Install in accordance with NPC.

.1 Assemble piping using fittings manufactured to ANSI standards.

.2 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.

.3 Connect to fixtures and equipment in accordance with manufacturer's written instructions, unless otherwise indicated.

.4 Buried piping:

.1 For discharge pipe to be buried in the ground, install piping to bury on a clean bed of sand, washed, with a thickness of 150 mm, shaped to fill the shape of couplings and fittings, females of interlocking pipes. With the required slope, lines and levels indicated. Backfill and compact with a layer of washed sand 150 mm thick or as indicated.

.2 Bend tubing without crimping or constriction. Minimize use of fittings.

3.3 VALVES

.1 Isolate splitter conduits as well as supply lines of sanitary fixtures and branches with gate, butterfly and/or ball valves as indicated.

3.4 PRESSURE TESTS

.1 Perform testing for four (4) hours at pressure corresponding to the higher of the following values: 50% above maximum system operating pressure or 700 kPa.

.2 The pressure must be held stable for a minimum period of two (2) hours. At the request of the engineer, the tests could be held for four (4) hours if the pressure is not correctly maintained.

3.5 FLUSHING AND CLEANING

.1 Potable water network cleaning must be performed by a specialized company. Clean pipes with an alkaline-chlorinated solution as recommended by the specialized company to eliminate all organic deposits such as: slime, biofilm, grease, etc. Flush entire system and refill network with clean potable water and rinse for eight (8) h. Drain and fill networks and let water stand for 24 hours, then draw samples off from each run. Submit to testing laboratory to verify that system is clean to provincial potable water guidelines. Let system flush for additional two (2) hours, then draw off another sample for testing from each run.

.1 Once cleaning is complete, submit testing laboratory reports regarding domestic water quality to the Professional.

.2 The Plumbing Contractor must provide and install all valves and fittings and all temporary pumps (including temporary electrical connection) for flushing, cleaning and sampling work.

.3 Potable water networks must not be connected to a non-potable water network.

3.6 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.1 Verify that system can be completely drained.

.2 Ensure that boosters function correctly.

.3 Ensure that air chambers and expansion compensators are installed properly.

3.7 PRE-START-UP INSPECTIONS

.1 Timing: start up once:

.1 pressure tests have been completed;

.2 disinfection procedures have been completed;

.3 certificate of static completion has been issued;

.4 water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 establish circulation and ensure that air is eliminated;

.2 check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation;

.3 commission water conditioning, such as softeners (if required);

.4 bring HWS storage tank up to design temperature slowly;

.5 monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed;

.6 check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.8 PERFORMANCE VERIFICATION

.1 Scheduling:

.1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.

.2 Procedures: verify that flow rate and pressure meet design criteria.

.1 TAB HWC in accordance with Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

.2 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.3 Sterilize HWS and HWC systems for Legionella control Refer to regulation codes and procedures.

.4 Verify performance of temperature controls.

.5 Verify compliance with safety and health requirements.

.6 Check for proper operation of water hammer arrestors. Run one (1) outlet for ten (10) seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.

.7 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

.3 Reports:

.1 Include certificates of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.9 OPERATING

.1 Coordinate requirements with regard to operations and maintenance, including cleaning and maintenance of products, materials and equipment as part of the present works.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 The section includes cast iron and copper drainage waste and vent piping.

1.2 REFERENCES

.1 ASTM International Inc.

.2 Canadian Standards Association (CSA International).

.3 ASTM International Inc.

1.3 SUBMITTALS

.1 Product data

.1 Provide manufacturer's printed product literature and data sheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

PART 2 PRODUCTS

2.1 SUSTAINABLE MATERIAL

.1 Maximum VOC limit to SCAQMD Rule 1168, GSES GS-36.

2.2 COPPER TUBE AND FITTINGS

.1 Aboveground sanitary, storm and vent, type DWV to: ASTM B306.

.1 Fittings:

.1 wrought copper: to CAN/CSA-B125.3;

.2 cast brass: to CAN/CSA-B125.3.

.2 Solder: tin-lead, 50:50, type 50A to ASTM B32.

2.3 CAST IRON PIPING AND FITTINGS

.1 Buried sanitary, storm and vent piping and fittings, gray cast iron, Class 4000, minimum NPS 50, to: CAN/CSA-B70, with one layer of protective coating.

.1 Joints:

.1 mechanical joints (M.J):

.1 ASTM C564 neoprene or butyl rubber compression gaskets: to ASTM C564 or CAN/CSA-B70;

.2 stainless steel clamps.

.2 Aboveground sanitary, storm and vent piping and fittings: to CAN/CSA-B70:

.1 mechanical joints (M.J.):

.1 neoprene or butyl rubber compression gaskets with stainless steel clamps.

.3 Manufacturer, diameter, fabrication date and CSA logo will appear along entire pipe length.

.4 Sanitary piping

.1 Install couplings, Series 2000, for DN 50 to DN 150.

.2 All joints DN 100 and greater located below street level will be secured using flange elevations secured using threaded rods (except for buried piping).

.3 All cleanouts located below street level will be secured using flange elevations secured using threaded rods.

.5 Sanitary and storm drainage fittings:

.1 Gray cast iron, Class 4000, with bituminous coating. Equipped with notches for positioning of couplings. Manufacturer, diameter and CSA seal to be cast in metal, in accordance with CAN3-CSA B70-M1997. For pipes DN 50 and greater, from Bibby-Ste-Croix or approved equivalent:

.1 mechanical joints (MJ).

2.4 MECHANICAL JOINTS

.1 Standard couplings, Series 2000, for gray cast pipes and fittings with mechanical joints (MJ):

.1 Mechanical joints with neoprene gasket, reinforced with stainless steel sheath 0.008 inches thick, equipped with stainless steel clamp T-304, conforming to CSA-B70-97, CSA-B-602 and CAN/ULC-S102. Series 2000 Bibby-Ste-Croix as manufactured by Tyler or equivalent approved product.

.2 Heavy duty couplings, Series 4000, gray cast pipes and fittings with mechanical joints (MJ):

.1 Mechanical joints with neoprene gasket, reinforced with corrugated stainless steel sheath 0.016 inches thick, equipped with stainless steel clamp T-304 with hexagon bolt 3/8 in. tightened to 80 psi, conforming to CSA-B70-97, CSA-B-602, ASTM C1277-94, UPC-IAPMO, FM and CAN/ULC-S102. HUSKY SD-4000 de Bibby-Ste-Croix tel que fabriqué par ANACO ou équivalent approuvé

.3 Joints for gray cast iron pipes and fittings with compression joints (HUB):

.1 Neoprene BI-SEAL compression joints, Series 2900, in accordance with CAN3-CSA-B70-M1997, CSA-B-602.

.2 Lead solder and caulking, in accordance with CSA-B67-1992.

.3 PC4 cold caulking compound.

.4 Couplings between gray cast iron pipes with mechanical joints (MJ) and DWV copper pipes:

.1 Mechanical joints with neoprene gasket, reinforced with stainless steel sheath 0.008 inches thick, equipped with stainless steel clamp T-304, conforming to CSA-B70-97, CSA-B-602 and CAN/ULC-S102. Série 2400 de Bibby-Ste-Croix tel que fabriqué par ANACO ou produit équivalent approuvé.

.2 Threaded cast iron fittings to receive brass male adaptor. Use an approved pipe joining compound or 100% Teflon tape.

.3 50/50 lead-tin solder, in accordance with ASTM B32-89.

PART 3 EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code.

.2 Cap pipes and fittings to prevent debris from entering during work.

3.3 TESTING

.1 Pressure test buried systems before backfilling.

.2 Perform hydrostatic tests to ensure pipes are not blocked and that slope is appropriate.

3.4 PERFORMANCE VERIFICATION

.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Verify that cleanout rods can probe as far as the next cleanout, at least. Test to ensure traps are fully and permanently primed.

.2 Storm water drainage:

.1 Verify domes are secure.

.2 Ensure weirs are correctly sized and installed correctly.

.3 Verify provisions for movement of roof system.

.3 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.1 Turn on faucets and flush cisterns and operate each device to ensure that the evacuation is done correctly and that there are no leaks.

.2 Réseaux enfouis : effectuer les essais avant de procéder au remblayage; procéder à des essais hydrostatiques destinés à confirmer les pentes et le libre écoulement des eaux. Buried Networks: carry out tests prior to backfilling; perform hydrostatic tests to confirm the slopes and the free flow of water..

.3 Check that traps are well filled

.4 Affix applicable label (storm, sanitary, vent, pump discharge, etc.) c/w directional arrows on every floor according to section 23 05 53.01 – Mechanical Identification

3.5 VENT

.1 Horizontal ventilation piping must be sloped 1 mm per metre toward vertical networks.

.2 Extend vents up to 600 mm above roof.

3.6 FLASHING

.1 In locations where pipes extend through the roof, create a weatherproof joint using a copper sheet 3 kg per m². This sheet must cover at least 500 mm on either side of the pipe and extend up to the shoulder of the pipe and curve into the pipe. Coordinate with the trade responsible for roofing for a perfect sealtight fit. Flashings must be in accordance with ACNOR LRP-3.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies procedures, materials and accessories for electric domestic water heaters and storage tanks as well as information on installation instructions.

1.2 REFERENCES

.1 American National Standards Institute/Canadian Standards Association (ANSI/CSA)

.1 ANSI Z21.10.1-2004/CSA 4.1-2004, Gas Water Heaters – Volume I, Storage Water Heaters With Input Ratings of 75,000 Btu Per Hour or Less.

.2 ANSI Z21.10.1A-2006/CSA 4.1A-2006, Addenda 1 to ANSI Z21.10.1-2004/CSA 4.1-2004, Gas Water Heaters Volume I, Storage Water Heaters With Input Ratings of 75,000 Btu Per Hour or Less.

.3 ANSI Z21.10.1b-2006/CSA 4.1b-2006, Addenda 2 to ANSI Z21.10.1-2004/CSA 4.1-2004, Gas Water Heaters – Volume I, Storage Water Heaters With Input Ratings of 75,000 Btu Per Hour or Less.

.4 ANSI Z21.10.3A-2007/CSA 4.3-2007, Gas Water Heaters – Volume III – Storage Water Heaters, with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous.

.2 Canadian Standards Association (CSA International)

.1 CSA B51-03(R2007), Boiler, Pressure Vessel, and Pressure Piping Code.

.2 CAN/CSA C22.2 No.110-94(R2004), Construction and Test of Electric Storage Tank Water Heaters.

.3 CAN/CSA-C191-04, Performance of Electric Storage Tank Water Heaters for Household Service.

.4 CAN/CSA-C309-M90(R2003), Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

1.3 SUBMITTALS

.1 Product data

.1 Provide manufacturer's printed product literature and data sheets for domestic water heaters and components, and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop drawings:

.1 indicate:

.1 equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.4 WARRANTY

.1 For the work of this section, the 12-month warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to the number of 3 years for water heater.

.2 Contractor warrants the water heaters according to the number of years indicated for each product.

PART 2 PRODUCTS

2.1 ELECTRIC WATER HEATER

.1 To CAN/CSA C22.2 No.110, CAN/CSA-C191 and CAN/CSA-C309 for glass-lined storage tanks, with immersion type elements and surface mounted or immersion type adjustable thermostats.

.2 Tank: glass lined steel, 50 mm mineral wool or fibreglass insulation, enamelled steel jacket, 3 year warranty certificate.

.3 Descriptions : see tables on drawings.

.4 Acceptable products: Giant Factories Inc., John Wood or approved equivalent.

2.2 ACCESSORIES AND INSTRUMENTATION

.1 Drain valve: DN 15 with hose end.

.2 Thermometer: 100 mm dial type with red pointer and thermowell filled with conductive paste.

.3 Pressure gauge: 75 mm dial type with red pointer, syphon, and shut-off cock.

.4 Thermowell filled with conductive paste for control valve temperature sensor.

.5 ASME rated temperature and pressure relief valve sized for full capacity of heater, having discharge terminating over floor drain and visible to operators.

.6 Magnesium anodes adequate for 20 years of operation and located for easy replacement.

2.3 ANCHOR BOLTS AND TEMPLATES

.1 Supply anchor bolts and templates for installation on concrete floor.

.2 Size anchor bolts to withstand seismic zone of acceleration and velocity forces.

PART 3 EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.

.2 Supply and install the steel elements necessary for the assembly of the horizontal reservoirs and instant water heaters.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's factory trained, certified Engineer to start up and commission DHW heaters.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 The present section specifies plumbing specialities, materials and related installation methods.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM).

.2 American Water Works Association (AWWA).

.3 Canadian Standards Association (CSA)/CSA International.

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

.5 Plumbing and Drainage Institute (PDI).

.6 National Sanitation Foundation/American National Standard Institute (NFS/ANSI).

1.3 SUBMITTALS

.1 Product data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing appliances and devices.

.2 Product data to include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit copies of WHMIS MSDS in accordance with system.

.4 Indicate VOC's for adhesives and solvents during installation and setting period.

.2 Shop drawings:

.1 Drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories for plumbing appliances and devices.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Instructions: submit manufacturer's installation instructions.

.5 Product data to include the following:

.1 Description of plumbing specialities including the manufacturer, type, model, year of manufacture, performance criteria, flow or capacity.

.2 Pertinent details such as operation, handling and maintenance data.

.3 Recommended list of spare parts.

1.4 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

PART 2 PRODUCTS

2.1 FLOOR DRAINS

.1 Floor drains to CSAB79.

.2 Floor drains: All floor drains are equipped with a sewer anti-gas valve

.3 RP-1 Purpose: cast iron, round, adjustable grid, 13 mm thick, strainer nickel plated bronze catch pan incorporated and sealing collar

.1 Acceptable products: Zurn ZXN-415-A-Y, JR Smith, Watts.

.4 RP-2 funnel type: cast iron body, built-in collector tray, sealing collar, adjustable nickel bronze grill, with built-in funnel, oval.

.1 Acceptable Products: Zurn ZN-415-B-F-Y, JR Smith, Watts.

2.2 OPEN DRAINS AND FUNNELS

.1 Provide and install as shown on drawings, all open drains with or without funnel, as indicated on drawings, for disposal of indirect waste.

.2 Open drains will receive indirect waste from cooling equipment evaporators and will be bell shaped, DN 75, and rim at 150 mm from finished floor and equipped with a cast iron grate.

.3 Funnels will be made of copper and of suitable size to receive waste without splashing. Air space between the funnel or open drain and the waste pipe extremity must comply with the Plumbing Code of Canada. Extremities of waste pipes will be bevelled to 45°.

.4 Drains will be equipped with a deep seal P-trap (or as otherwise shown on drawings). Drains, funnels and P-traps will be chrome plated when installed in finished rooms.

2.3 CLEANOUTS

.1 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.1 Products of acceptance: Zurn Z-1446, JR Smith, Watts.

.2 Access covers:

.1 Wall access: face or wall type, polished nickel bronze, square or round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.

.1 Products of acceptance: Zurn ZANB-1460, JR Smith, Watts.

.2 Floor access: rectangular cast iron body and frame with adjustable secured nickel bronze top.

.1 Plugs: bolted bronze with neoprene gasket.

.2 Replacement products: approved by addenda in conformity with bidder instructions.

.1 Products of acceptance: Zurn ZN-1602-VP, JR Smith, Watts CO-200-S-1-6.

.3 Cover for tile and linoleum floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

.1 Products of acceptance: Zurn ZN-1608-VP, JR Smith, Watts/Ancon CO-200-T-1-6.

2.4 WATER HAMMER ARRESTORS

.1 Protect plumbing against hydrostatic shocks using single piece, piston-type water hammer arrestors, with seals or diaphragm and composed of stainless steel or copper construction. All water hammer arrestors must bear CSA and NSF/ANSI Standard 61 "Lead Free" seal.

.2 Install water hammer arrestors:

.1 On supply pipework connected to sanitary appliances (sink, wash tubs, shower, toilet, urinal, etc.) or each sanitary block on shared supply.

.1 Products of acceptance: Sioux Chief series Hydra-Rester, Watts, Zurn.

.2 At top of vertical hot water and cold water pipes.

.1 Products of acceptance: Sioux Chief series Hydra-Rester, Watts, Zurn.

.3 Upstream of quick action control valves such as solenoid valves.

.1 Products of acceptance: Sioux Chief series Mega-Rester, Watts, Zurn.

.3 Provide and install trap primers for inaccessible arrestors in suspended ceilings or equipment counters.

.4 Air chambers constructed of pipes will not be accepted as an equivalent. Unless otherwise indicated, water hammer arrestors must always be concealed.

2.5 BACKFLOW PREVENTERS

.1 Preventers: to CSA-B64 Series and NSF/ANSI Standard 61 "Lead Free", application as indicated on drawings, reduced pressure type with double check valve assembly backflow preventer with intermediate vacuum breaker.

.2 Check valve type with atmospheric vent (high risk)

.1 Products of acceptance: Apollo RP-4A-LF-1-2XX-T2X (½" to 2"), RP-4A-LF-1-2XX-0X (2½" to 10") c/w Air Gap, Wilkins, Watts.

.3 Double check detector assembly (moderate risk)

.1 Products of acceptance: Apollo DCDA-4A-LF-1-1XX-T2X (½" to 2"), DCDA-4A-LF-1-1XX-0X (2½" to 10"), Wilkins, Watts.

.4 Backflow preventers with intermediate atmospheric vent or vacuum breaker (low risk)

.1 Products of acceptance: Watts 9D, Apollo, Zurn.

2.6 VACUUM BREAKERS

.1 Breakers: CSA-B64 Series and NSF/ANSI Standard 61 "Lead Free".

.2 Atmospheric vacuum breakers.

.1 Products of acceptance: Apollo series SVB4WLF, Watts, Zurn.

.3 Hose connection vacuum breakers.

.1 Products of acceptance: Watts LF8, Apollo, Zurn.

2.7 PRESSURE REGULATORS

.1 Pressure regulators: up to DN 40, bronze bodies, screwed, as per ASTM B62 and NSF/ANSI Standard 61 "Lead Free".

.2 Products of acceptance: Watts modèle U5B or approved equivalent

2.8 WATER METERS

.1 Meters comply with AWWA standard.

.2 Acceptable products: Lecomte modèle LP, or approved equivalent.

2.9 BACKWATER VALVES

.1 Coated extra heavy cast iron, bronze seat with revolving bronze flapper and threaded cover.

.1 Surface access.
.2 Access pipe with cover.
.3 Cast iron housing with gasketted nickel bronze cover.
.4 Products of acceptance: Watts BV-230-R, Zum, J.R. Smith, Watts.

.2 Backwater check valves: PVC or ABS for buried pipework equipped with screwed bonnet and access sleeve (note: for "metal fabrication" cover, refer to cleanouts section).

.1 Surface access.
.2 Access pipe with cover.
.3 Plastic housing and cover with gasket.
.4 Products of acceptance: Canplas, Ipex.

2.10 INLINE FLOOR DRAIN TRAP SEALER

.1 Barrier-type inline drain trap sealer for installation in floor drain made of elastomeric materials, in compliance with ASSE1072 and RBQ approved.

.1 Products of acceptance: Sure Seal Manufacturing model 3000 – 75 mm dia., model 4000 – 100 mm dia.

2.11 STRAINERS

.1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen with NSF/ANSI Standard 61 "Lead Free" certification.

.2 DN 50 and under, bronze body, screwed ends, with brass cap.

.1 Products of acceptance: Watts series LF-777SI, Apollo, Zum.

2.12 DEEP SEAL P-TRAPS

.1 Cast iron deep seal P-traps, tapped inlet and/or threaded outlet with water trap seal minimum 125 mm high.

2.13 WALL WATER FAUCETS

.1 Fixtures to CSA series B64 and NSF/ANSI Standard 61.

.2 PE-1 : freeze-proof water faucets

.1 Built in wall faucet equipped with a vacuum breaker, DN20 flexible hose end with body of cast bronze and nickel and a removable operating key, finished polished bronze.

.1 Acceptable products : Zum modèle 1320 VB, Watts, JR Smith.

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 data sheets.

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada and local authorities having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks and rainwater leaders, at locations required by code, and as indicated.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum DN 100.

3.4 BACKFLOW PREVENTERS

.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.

.2 Pipe discharge to terminate over nearest drain.

3.5 BACKWATER VALVES

.1 Install where indicated.

3.6 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Install at bottom of risers and at low points to drain systems, and as indicated.

3.7 STRAINERS

.1 Install with sufficient room to remove basket for maintenance.

3.8 START-UP

.1 Timing: start-up only after:

.1 pressure tests have been completed;
.2 disinfection procedures have been completed;
.3 certificate of static completion has been issued;
.4 water treatment systems operational.

.2 Provide continuous supervision during start-up.

3.9 TESTING AND ADJUSTING

.1 Test and adjust plumbing specialities and accessories:

.1 after start-up deficiencies rectified;
.2 after certificate of completion has been issued by authority having jurisdiction.

.2 Application tolerances:

.1 pressure at fixtures: +/- 70 kPa;
.2 flow rate at fixtures: +/- 20%.

.3 Adjustments

.1 Verify that flow rate and pressure meet design criteria.

.4 Floor drains

.1 Check security, accessibility and removability of strainer.
.2 Clean out baskets.

.5 Vacuum breakers, backflow preventers, backwater valves

.1 Test tightness and accessibility for O&M of cover and of valve.
.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers and backflow preventers.

.3 Verify visibility of discharge from open ports.

.6 Access doors

.1 Verify size and location relative to items to be accessed.

.7 Cleanouts

.1 Ensure that cleanouts are accessible and that their cover is located at a suitable location.
.2 Ensure that the cover is gas-tight, is secured in place and is easy to remove.
.3 Open the cleanout, apply linseed oil and seal tightly.
.4 Ensure that cleanout rod inserted into the cleanout can go at least until the next cleanout.
.5 Verify covers are gas-tight and secure, yet readily removable.

.8 Water hammer arrestors

.1 Verify proper installation and correct type of water hammer arrester.

.9 Wall and Ground Water Faucets

.1 Ensure that the faucets drain completely and that they are protected from freezing.
.2 Check that the vacuum breaker functions properly.

.10 Pressure regulators, PRV assemblies

.1 Adjust settings to suit locations, flow rates and pressure conditions.

.11 Strainers

.1 Clean out repeatedly until clear.
.2 Verify accessibility of cleanout plug and basket.
.3 Verify that cleanout plug does not leak.

END OF SECTION

PART 1 GÉNÉRALITÉS

1.1 SUMMARY

.1 Content of section

.1 This section specifies the commercial lavatories and water closets, the materials and their installation methods.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)/CSA International)

.1 CAN/CSA-B45 Series-02 (C2008), Plumbing Fixtures.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for washroom fixtures (lavatories, water closets and urinals) and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Indicate for each of the fixtures and proposed accessories:

.1 Dimensions, construction details as well as the diameter of the services inlets

.2 Factory-set water consumption per flush at recommended pressure

.3 For water closets, minimum pressure required for flushing.

1.4 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

1.5 CLOSEOUT SUBMITTALS

.1 Provide the operation and maintenance technical sheets of the lavatories, water closets and urinals.

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 According to Green Seal GS-36 according to regulation 1168 of SCAQMD.

PART 2 PRODUCTS

2.1 FIXTURES AND ACCESSOIRES

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series

.2 Trim, fittings: manufacture in accordance with CSA B125.3

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: according to indications on drawings.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

2.2 WATER CLOSET

.1 CA-1: water closet with flush reservoir

.1 Porcelain cabinet, two parts, high efficiency, vitrified with antimicrobial coating, elongated bowl, jet siphon flushing action, 76 mm flush valve, siphon channel 54 mm completely vitrified, chrome spud, consumption 4.8 liters per flush.

.1 Acceptable Product: American Standard model cadet pro 215AA.105, Zurn, Toto or approved equivalent

.2 Seat of solid plastic for elongated bowl, open front, without cover, stainless steel check hinges with stainless steel rods.

.1 Acceptable Product: Centoco #500STSCC.001, Zurn, Olsonite.

.3 Toilet supply piping with extra strong ball valve DN 15 compression, removable handles/key vandal proof, escutcheon, polished chrome finish.

.1 Acceptable Product: McGuire #LFH172BV, Zurn, BrassCraft.

2.3 LAVABO

.1 L-1: countertop lavatory with single-handle faucet

.1 Vitreous china, oval shaped, with splash lip, rear overflow, Dimensions 533 x 445 mm.

.1 Acceptable products: American Standard model 9494.001, Zurn, Kohler.

.2 Open waste drain with « Daisy » grill incorporated, cast brass body, 32 mm, finished with polished chrome.

.1 Acceptable products: Mc Guire model 155A, OS et B model 3737, Zurn.

.3 Waste « P » adjustable, brass, 32 mm, cleanout fixture, deep wall escutcheon, polished chrome finish.

.1 Acceptable products: McGuire #8872C, Zurn, Bélanger.

.4 Single-Handle lavatory faucet, cast brass body, ceramic disc cartridge, lever handle, polished chrome finish, high adjustable temperature limiter, laminar output of 5.7 Lpm (1.5 gpm).

.1 Acceptable products: Chicago Faucets #420-ABCP, Zurn, American Standard.

.5 Locking-angle ball valves extra sturdy combined removable handles/key, vandal-proof, wall escutcheons, polished chrome finish.

.1 Acceptable products: McGuire #LFH170BV, Zurn, Powers.

PART 3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, instructions for handling, storage and implementation of products and indications on datasheets.

3.2 INSTALLATION OF WASHROOM FIXTURES

.1 Mounting heights:

- .1 Standard: to manufacturer's recommendations, measured from finished floor.
- .2 Wall-hung fixtures: measured from finished floor.
- .3 Barrier-free: to most stringent NBC, CSA B651.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

- .1 Adjust water flow rate to design flow rates.
- .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:

- .1 Water closets, urinals: flushing action.
- .2 Aerators: operation, cleanliness.
- .3 Vacuum breakers, backflow preventers: operation under all conditions.

3.4 CLEANING

.1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section contents

.1 This section specifies the commercial type lavatories and sinks, the materials and related installation methods.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International

.1 CAN/CSA-B45 Series-02 (R2008), Plumbing Fixtures.

.2 CAN/CSA-B125.3-F05, Plumbing Fittings.

.3 CAN/CSA-B651-F04, Accessible Design for the Built Environment.

.2 Fixtures, pipes and fittings must be labeled CSA, be new and be free from imperfections

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data

.1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

1.5 CLOSEOUT SUBMITTALS

.1 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

PART 2 PRODUCTS

2.1 FIXTURES AND ACCESSOIRES

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures to be product of one manufacturer.

.6 Trim to be product of one manufacturer.

2.2 SERVICE SINK

.1 E-1 : service sink with single-handle faucet

.1 Sink in counter, a basin with rear deck, stainless steel grade 302, 20 gauge satin finish coating on the entire inner surface, accessories for installation, drain hole strainer-basket 89 mm, in single central hole. Exterior Dimensions 508 x 521 x 208 mm.

.1 Acceptable products: Franke #LBS6808-1/1 or approved equivalent Kindred Commercial, Zurn.

.2 Sink "P" trap adjustable tubular construction with outlet elbow cast brass, inlet 38 mm, polished chrome finish.

.1 Acceptable products: McGuire #8912CB ou équivalent approuvé Powers, OS et B.

.3 Single-handle sink faucet, cast brass body, lever handle, high temperature limiter, cast spout with a range of 229 mm, aerator 5.7 Lpm (1.5 gpm).

.1 Acceptable products: Chicago Faucets #430-ABCP ou équivalent approuvé Powers, Zurn.

.4 Locking-angle ball valves extra sturdy, combined removable handles/key, vandal-proof, wall escutcheons, polished chrome finish.

.1 Acceptable products: McGuire #LFH170BV ou équivalent approuvé Powers, Zurn.

2.3 MOP SINK

.1 C-1 : mop sink with wall faucets

.1 Mop sink of high-density composite material, sides 44 mm x 16 mm, discharge connection PVC with stainless-steel domed debris filter, gasket of compressible rubber for DN pipe 80. Exterior dimensions: 610mm x 610mm x 254mm. Drain connection with stainless steel body, curved grille and secondary grit filter of stainless steel, gasket of compressible rubber hose DN 80.

.1 Acceptable products: Zurn modèle Z1996-24-SDL, Franke, Stern-Williams co.

.2 Reinforced, heavy-duty hose 16 mm x 762 mm in length with mating connector and stainless steel hook wall bracket, and soft jaws.

.1 Acceptable products:: Zurn modèle Z-1996-HH, Franke, Stern-Williams co..

.3 Wall support in stainless steel 610 mm x 76 mm, with 3 softjaw hooks, for mops

.1 Acceptable products:: Zurn modèle Z-1996-MH, Franke, Stern-Williams co.

.4 Set of splashguard wallboard for corner installation, stainless steel cal. 20 satin finish, height 305 mm, 2 corner moldings, 610 mm.

.1 Acceptable products: Zurn modèle Z-1996-WG24 Franke, Stern-Williams co..

.5 Wall-mounted dual controls, cast brass body, swivel joints misaligned, adjustable spacing from 184 to 222 mm, maneuver to stop valves incorporated by screwdriver, ceramic disc cartridges, polished chrome finish, 64 mm with lever handles color-coded index, vandal proof, fixed spout with vacuum break, wall mount, hook for buckets and threaded outlet hose, axis of the output at 232 mm from the wall.

.1 Acceptable products: Zurn modèle Z-843M1-XL, Franke, Stern-Williams co..

PART 3 EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Mounting heights:

.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

.2 Wall-hung fixtures: as indicated, measured from finished floor.

.3 Physically handicapped: to comply with most stringent of either NBC or CAN/CSA-B651.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified in this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:

.1 Aerators: operation, cleanliness.

.2 Vacuum breakers, backflow preventers: operation under all conditions.

.3 Wash fountains: operation of flow-actuating devices.

.4 Thermostatic controls:

.1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies thermometers and pressure gauges, materials and components including related installation methods.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.2 Canadian General Standards Board (CGSB)

1.3 SUBMITTALS

.1 Submit manufacturer's data sheets for the following instruments, devices and components:

.1 thermometers;
.2 pressure gauges;
.3 shut-off valves;
.4 siphons;
.5 thermowells;

1.4 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are indicated by their trademerk, consult the instructions to bidders in order to understand the steps to go through to reqeust approval of replacement materials or products.

PART 2 PRODUCTS

2.1 GENERAL

.1 Measuring point for thermometers and selected pressure gauges to be at the midline of the graduated range.

.2 Temperature/pressure ranges: as indicated.

2.2 DIRECT RECORDING THERMOMETERS

.1 Industrial applications thermometers, adjustable angle, liquid expansion, 225 mm long scale, conforming to CAN/CGSB14.4 and ASME B40.200.

.1 Products of acceptance: Trerice BX9 (2 or 3)403 or approved equivalent Ashcroft, Morrisson.

2.3 THERMOWELLS AND THERMOMETERS STEM

.1 Copper piping system: copper or bronze well/ thermometer stem

.2 Steel piping system: stainless steel well/ thermometer stem

2.4 PRESSURE GAUGES

.1 Pressure gauges, 112 mm diameter dial face, conforming to ASME B40.100, category 2A, stainless steel Bourdon tube, accuracy 0.5%, unless otherwise indicated.

.1 Products of acceptance:

.1 Liquids network: Trerice model 450 LFSS, Ashcroft, Morrisson.

.2 The following characteristics or elements must be anticipated for each installed thermometer and pressure gauge, as per the case:

.1 siphon for steam networks;
.2 damper for networks that are subject to pressure pulsations;
.3 membrane separator for corrosive liquid networks;
.4 collar and safety relief vent on rear, and reinforcing edge on front;
.5 bronze shut-off valve;
.6 oil bath type for installations that are subject to strong vibrations.

PART 3 EXECUTION

3.1 GENERAL

.1 Install instruments so that reading can be done from floor or operating platform. Otherwise, install telethermometers and telepressure gauges.

.2 Install instruments between equipment and the first downstream or upstream valve or fitting, as per the case.

3.2 THERMOMETERS

.1 Place thermometers in thermowells with thermoconducting material.

.2 Install thermometers at locations indicated on drawings and at the inlet and outlet of the following equipment:

.1 domestic water heaters.

.3 Elsewhere only, install thermowells for network balancing purposes.

.4 Use extenders when thermometers are installed on insulated piping.

3.3 PRESSURE GAUGES

.1 Install pressure gauges in the following locations:

.1 upstream and downstream of pressure reducers;
.2 upstream and downstream of control valves;
.3 elsewhere as shown on drawings.

.2 Elsewhere only, install shut-off valves on pressure gauges for network balancing purposes.

.3 Use extenders when pressure gauges are installed on insulated piping.

3.4 NAMEPLATES

.1 Provide and install nameplates of fluid transferred, in engraved laminated plastic (lamicoid), in compliance with Section 23 05 53.01 – Mechanical Identification.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies concrete housekeeping pads, hangers and supports for mechanical piping, ducting and equipment. This section does not include seismic restraints.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.2 ASTM International

.3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.4 Underwriters' Laboratories of Canada (ULC).

.5 NFPA.

1.3 SUBMITTALS

.1 Product data

.1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop drawings:

.1 Submit drawings for:

.1 bases, hangers and supports;

.2 connections to equipment and structure;

.3 structural assemblies.

.3 Manufacturers' instructions:

.1 Provide manufacturer's installation instructions.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Design requirements:

.1 Construct pipe hanger and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.

.3 Ensure that supports, guides and anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

.6 Ensure all pipe supports (cold and hot) are on the outside of insulation.

.2 Performance requirements:

.1 Design supports, platforms, catwalks and hangers to withstand seismic events.

2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.

.2 The components listed in this section must be used for support purposes only. They must not be used to lift, raise or mount other elements or equipment.

2.3 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: galvanized or painted with zinc-rich paint after manufacture.

.2 Use electro-plating galvanizing process or hot dipped galvanizing process.

.3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:

.1 Cold or hot piping DN 50 maximum and ventilation ducts: malleable iron C-clamp, UL listed to MSS-SP58, type 19. Use carbon steel retaining clip if load exceeds 100 kg.

.1 Acceptable product: ANVIL, fig. 86 and 89, CCTF Corporation, B-Line

.2 Cold or hot piping DN 65 or greater: malleable iron beam clamp, ULC listed to MSS-SP58, type 28 or 29.

.1 Acceptable product: ANVIL, fig. 292, CCTG Corporation, B-Line

.3 Upper attachment to concrete:

.1 Galvanized steel, recessed concrete insert compliant with MSS-SP58-2002, type 18, UL listed for pipes DN 20 to DN 200.

.1 Acceptable product: ANVIL, fig. 281–285, CCTF Corporation, B-Line.

.2 Carbon steel plate with clevis, for flush mounting, with eye nut, weldless, forged steel, and at least two expansion anchors and two bolts for each hanger.

.1 Acceptable products: ANVIL: plate fig. 49, eye nut fig. 290 and expansion anchors designed to resist seismic loads, CCTF Corporation, B-Line

.3 Hot piping DN 32 and greater: protection shield for piping with insulation.

.1 Acceptable products: ANVIL, fig. 160 and 166, CCTF Corporation, B-Line.

.4 Upper attachment to steel beams

.1 Cold or hot piping, up to DN 50: steel washer plate with two blocking nuts.

.1 Acceptable product: ANVIL, fig. 60, CCTF Corporation, B-Line.

.2 Cold piping DN 65 and greater and hot piping of all sizes: steel washer plate with two blocking nuts, carbon steel welded beam attachment and malleable iron eye nut.

.1 Acceptable products: ANVIL: steel washer plate, fig. 60; welded beam attachment, fig. 66; eye nut, fig. 290, CCTF Corporation, B-Line.

.3 For ventilation ducts, use C-clamp. When the load exceeds 100 kg, use a retaining clip.

.1 Acceptable products: ANVIL, fig. 92 or 93 and 89X, CCTF Corporation, B-Line.

.5 Shop and field-fabricated assemblies

.1 Trapeze hanger assemblies.

.2 Steel brackets.

.6 Hanger rods: threaded rod material to MSS SP58:

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Threaded rod, carbon steel, electro-galvanized finish.

.1 Acceptable product: ANVIL, fig. 146, CCTF Corporation, B-Line.

.3 Provide linkages where lateral or axial movement of pipework is anticipated.

.7 Pipe attachments: material to MSS SP58:

.1 Attachments for steel piping: carbon steel black galvanized.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation shields for hot and cold pipework.

.4 Oversize pipe hangers and supports.

2.4 EQUIPMENT SUPPORTS

.1 Equipment supports will be black or copper plated as described or galvanized as per notes on drawings.

.2 Cold steel or cast iron piping, hot steel piping, horizontal movement less than 25 mm; suspended by hanger rods more than 300 mm long: adjustable clevis, in accordance with MSS-SP58, type 1, ULC listed.

.1 Acceptable product: ANVIL, fig. 260, CCTF Corporation, B-Line

.3 Cold copper piping, hot copper piping, horizontal movement less than 25 mm, suspended on hanger rods at least 300 mm long: adjustable clevis, in accordance with MSS-SP58, type 1, copper plated.

.1 Acceptable product: ANVIL, fig. CT-65, CCTF Corporation, B-Line

.4 Hot suspended steel and copper piping, horizontal movement of more than 25 mm, suspended by hanger rods 300 mm long or smaller: clevis roller in accordance with MSS-SP58, type 41 or 43.

.1 Acceptable product: ANVIL, fig. 171 or 181, CCTF Corporation, B-Line

.5 Hot suspended steel and copper piping, horizontal movement less than 25 mm, suspended by hanger rods 300 mm long or smaller: adjustable clevis, in accordance with MSS-SP58, type 1, ULC listed.

.1 Acceptable product: ANVIL, fig. 260, CCTF Corporation, B-Line

.6 Hot steel and copper piping, supported from below, roll base in accordance with MSS-SP58, type 45.

.1 Acceptable product: ANVIL, fig. 271, CCTF Corporation, B-Line

.7 Non-metallic piping: adjustable clevis in accordance with MSS-SP-69, type 9.

.1 Acceptable product: ANVIL, fig. 97c, CCTF Corporation, B-Line

.8 Hanger types:

.1 Pipe rollers must be installed as per the following cases:

Case no. 1

For piping networks operating at 60°C and higher, when the hanger rod is 500 mm and smaller. However, for a rod greater than 500 mm, the ratio between pipe expansion and hanger rod length must be greater than 1:24 (0.041) to install pipe rollers.

Example: expansion 50 mm, rod 1,000 mm, ratio 1:20 (= 0.05). In this case, pipe rollers are necessary.

Case no. 2

For pipe networks operating between 43°C and 60°C when a hanger rod is 300 mm and smaller. However, for a rod greater than 300 mm, the ratio between the pipe expansion and rod suspension must be greater than 1:24 (0.041).

Acceptable products:

Pipe roll stands.

Diameter including insulation	ANVIL	# of rods per hanger
DN 25 to DN 750	171*	2
DN 65 to DN 500	181	1

*** Case no. 3**

For vertical movement up to maximum 40 mm expansion, add springs fig. 178 using pipe roll fig. 171. Spring forces will be selected based on the weight of piping and its content.

Case no. 4

For pipe networks operating at 43°C and above, when piping is supported by angle irons or another type of metallic member.

Acceptable products:

Diameter including insulation	ANVIL fig.
DN 200 and greater	271

Case no. 5

Except in the above-mentioned cases, hangers will be vertical adjustment type.

Acceptable products:

Diameter including insulation	ANVIL	# of rods per hanger
Horizontal piping	260	1
Vertical piping	261	–

2.5 RISER CLAMPS

.1 Steel or cast iron pipes: galvanized black carbon steel to MSS SP58, type 42, UL listed.

.2 Copper piping: carbon steel copper plated to MSS SP58, type 42.

.3 Non-metallic piping: carbon steel in accordance with MSS-SP-69, type 8.

.1 Acceptable product: ANVIL, fig. 261c, CCTF Corporation, B-Line

.4 Bolts: in accordance with ASTM A307.

.5 Nuts: in accordance with ASTM A563.

2.6 SADDLES AND INSULATION PROTECTION SHIELDS

.1 Insulated piping (hot, cold and tempered)

.1 Galvanized steel protection shields.

.2 For pipes up to 32 mm, provide and install protective shields only.

.3 For pipes 32 mm to 125 mm Ø, provide and install shields and high density insulation between the pipe and the shield.

.4 Acceptable product: ANVIL, fig. 167, CCTF Corporation, B-Line.

.5 High density insulation

.1 Provide and install insulation by the present Subcontractor.

.2 Insulation must cover entire shield surface.

.3 Insulation must resist compression and be suitable to the operating conditions of the pipe network.

.4 Refer to the table in Part 3 for required insulation thickness.

.5 Acceptable products: Foamglas Industry model PSH, Buckaroos model 2550FS.

.2 Saddles for Insulated piping (hot, cold and tempered)

.1 Black steel saddles.

.2 Provide and install saddles for pipes larger than 150 mm.

.3 Provide and install saddles for pipes equipped with pipe rollers.

.4 Saddles to include inner insulation.

.5 Acceptable products: ANVIL, fig. 160 to 166A, CCTF Corporation, B-Line.

2.7 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).

.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.8 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with two (2) springs in series in single casing.

.3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.

.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with ± 5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.9 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with shop drawings.

.2 Provide and install metal supports required for equipment, exchangers, tanks and accessories mentioned on drawings and in specifications, and in the present section.

.3 These supports will be made of welded metal channels fabricated to trade practices, as well as to provincial standards and codes. This work is to be performed by qualified workers.

.4 Equipment loads will be transferred via angle irons or other devices to horizontal metal sections and from there to steel columns equipped with anchor plates as shown on drawings.

2.10 AIR DUCT SUPPORTS

.1 In general, ductwork will be suspended by rods in accordance with Chapter 5 of the above-mentioned SMACNA standard.

.2 In addition, the following restrictions must be followed:

.1 Each duct transverse joint will have a hanger on either side.

.2 Spacing

.1 Rectangular ducts

Hangers and components will be in compliance with Table 5.1 of the above-mentioned standard. However, rods will only be accepted if their minimum diameter is 6 mm (1/4") and the maximum spacing between hangers is 2,400 mm (8').

.2 Round ducts

Hangers and components will be in compliance with Table 5.2 of the above-mentioned standard. However, rods will only be accepted if their minimum diameter is 6 mm (1/4") and the maximum spacing between hangers is 2,400 mm (8') for smooth ducts; and 3,600 mm (12') for spiral-wound ducts.

.3 Hanger type

All ducts will be suspended with a pair of rods with U-bolts made of bent plate or rolled structural steel angle.

Characteristics will comply with Table 5.3 M, but respecting the lower limit of 62 kg for each trapeze hanger.

For round ducts, use flat iron duct straps with eye bolts and a pair of rods.

.3 Hanger rods will be equipped with threaded bolts. Spring bolts will not be accepted, nor will wire strap or perforated hangers be permitted.

.4 For attachment to structural steel members, use prefabricated C-type clamps with jam nut, similar to ANVIL, fig. 92 or 93.

.5 For hangers subjected to a load of 100 kg and greater, install hangers using a retaining clip fig. 89X.

.6 Friction materials such as spring clips will not be accepted.

.7 Hold-down bolts will be expansion type and equipped with a coupling nut for fastening hanger rod.

.8 Anchor rods are only to be fastened to the steel decking. However, if the deck has concrete applied to it, anchor rods may be installed through deck and bent to 90° at 20 mm minimum above deck plate before concrete is poured.

2.11 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

2.12 HOUSEKEEPING PADS

.1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment; chamfer pad edges.

.2 Concrete: by General Contractor.

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 data sheets.

3.2 INSTALLATION

.1 Install in accordance with manufacturer's instructions and recommendations.

.2 When pipework may undergo stresses (i.e. stresses from safety valves or overloads due to seismic jolts), the hangers must be equipped with retaining devices, dampers, stabilizers to eliminate pipe movement due to fluid displacement inside pipework, and other similar devices.

.3 Vibration control devices:

.1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.

.4 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to industry standards.

.3 Steel pipes: install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: install below joint.

.5 Clevis plates:

.1 Attach to concrete with four (4) minimum concrete inserts, one at each corner.

.6 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.7 Use approved constant support type hangers where:

.1 vertical movement of pipework is 13 mm or more;

.2 transfer of load to adjacent hangers or connected equipment is not permitted.

.8 Use variable support spring hangers where:

.1 transfer of load to adjacent piping or to connected equipment is not critical;

.2 variation in supporting effect does not exceed 25% of total load.

3.3 HANGER SPACING

.1 Plumbing piping: to Canadian Plumbing Code.

.2 Fire protection: to applicable fire code.

.3 Gas and fuel oil piping: up to DN 15: every 1.8 m.

.4 Copper piping: up to DN 15: every 1.5 m.

.5 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.

.6 Within 300 mm of each elbow.

Maximum Pipe Size (NPS)	Rod dia. (mm)	Maximum Spacing Steel (m)	Maximum Spacing Copper (m)	Maximum Spacing Non-metal (m)
up to 32	10	2.1	1.8	1.2
40	10	2.7	2.4	1.5
50	10	3.0	2.7	1.5
65	12	3.6	3.0	1.8
80	12	3.6	3.0	1.8
100	16	4.2	3.6	1.8
125	16	4.8	4.2	1.8
150	19	5.1	4.2	1.8
200	22	5.7		
250	22	6.6		
300	22	6.9		
400	25	6.9		
400	32	6.9		

.7 Pipework greater than DN 12: to MSS SP69.

3.4 AIR DUCT HANGERS

.1 Straps

.1 Install straps in compliance with SMACNA requirements.

.2 To be used for round and oval ducts up to 500 mm, with the same material as that used for the duct but one thickness greater.

.2 Trapeze type hangers

.1 To be used for ducts with diameter greater than 500 mm, as per SMACNA.

.3 Angles and hanger rods

.1 Equipped with blocking nuts and washers.

.2 Galvanized steel angles fastened using galvanized steel rods to the following table.

Duct Diameter (mm)	Angle Diameter (mm)	Rod Diameter (mm)
up to 750	25 x 25 x 3	6
from 751 to 1,050	40 x 40 x 3	6
from 1,051 to 1,500	40 x 40 x 3	10
from 1,501 to 2,100	50 x 50 x 3	10
from 2,101 to 2,400	50 x 50 x 5	10
2,401 and up	50 x 50 x 6	10

.4 Hanger spacing: as per SMACNA requirements.

.5 Hanger fastening devices

.1 For securing to concrete: prefabricated concrete anchors.

.2 For securing to steel beams: clevis or steel backing plate, prefabricated.

.3 For fastening to steel beams: prefabricated clevis.

.6 When seismic restraints are required, they replace hangers and supports.

3.5 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hanger height to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.6 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.7 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies vibration isolation materials and components, seismic control measures and their installation.

1.2 REFERENCES

.1 *Code de construction du Québec*, Chapter 1, Buildings, and National Building Code of Canada, Canada 2010 (modified).

1.3 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

PART 2 PRODUCTS

2.1 GENERAL

.1 Size and shape of bases type and performance of vibration isolation as indicated.

2.2 ELASTOMERIC PADS

.1 Type EP1 – neoprene waffle or ribbed; 9 mm minimum thick; 50 durometer; maximum loading 350 kPa.

.1 Equivalent to model "N" from Vibro Acoustics.

.2 Type EP2 – rubber waffle or ribbed; 9 mm minimum thick; 30 durometer natural rubber; maximum loading 415 kPa.

.1 Equivalent to model "R" from Vibro Acoustics.

.3 Type EP3 – neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.

.1 Equivalent to model "NSN" from Vibro Acoustics.

.4 Type EP4 – rubber-steel-rubber; 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

.1 Equivalent to model "RSR" from Vibro Acoustics.

.5 Acceptable products: Vibro Acoustics, Korfund, Mason, Vibron.

2.3 ELASTOMERIC MOUNTS

.1 Type M1 – colour coded; neoprene in shear; maximum durometer of 60; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.

.1 Acceptable products: Vibro Acoustics, model "MD", Korfund, Mason, Vibron.

2.4 SPRINGS

.1 Design stable springs: ratio of lateral to axial stiffness is equal to or greater than 1.2 times ratio of static deflection to working height. Select for 50% travel beyond rated load. Units complete with levelling devices.

.2 Ratio of height when loaded to diameter of spring between 0.8 to 1.0.

.3 Cadmium plate for 100% relative humidity exterior installations.

.4 Colour coded springs.

2.5 SPRING MOUNT

.1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.

.2 Type M2 – stable open spring: support on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad.

.3 Type M3 – stable open spring: 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad, bonded under isolator and on isolator top plate; levelling bolt for rigidly mounting to equipment.

.1 Equivalent to model "FS" from Vibro Acoustics.

.4 Type M4 – restrained stable open spring: supported on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.

.5 Type M5 – enclosed spring mounts with snubbers for isolation up to 950 kg maximum.

.1 Equivalent to model "C" from Vibro Acoustics.

.6 Performance: 90% minimum.

.7 Acceptable products: Vibro Acoustics, Korfund, Mason, Vibron.

2.6 HANGERS

.1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30 degrees arc without metal-to-metal contact.

.2 Type H1 – neoprene – in-shear, moulded with rod isolation bushing which passes through hanger box.

.1 Equivalent to model "HD" from Vibro Acoustics.

.3 Type H2 – stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.

.1 Equivalent to model "SH" from Vibro Acoustics.

.4 Type H3 – stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.

.1 Equivalent to model "SHH" from Vibro Acoustics.

.5 Type H4 – stable spring, elastomeric element with precompression washer and nut with deflection indicator.

.6 Performance: 90 % minimum.

.7 Acceptable products: Vibro Acoustics, Korfund, Mason, Vibron.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install vibration isolation equipment in accordance with manufacturer's instructions and adjust mountings to level equipment.

.2 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.3 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm minimum static deflection as follows:

.1 up to DN 100: first three (3) points of support. DN 125 to DN 200: first four (4) points of support. DN 250 and over: first six (6) points of support;

.2 first point of support: static deflection of twice deflection of isolated equipment, but not more than 50 mm.

.4 Where isolation is bolted to floor use vibration isolation rubber washers.

.5 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies seismic restraint systems.

.2 Related sections

.1 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.2 National Fire Protection Association

.3 FM Global

.4 ASHRAE – Practical Guide to Seismic Restraint.

.5 SMACNA – Seismic Restraint Manual Guidelines for Mechanical Systems.

1.3 SCOPE OF WORK

.1 All mechanical and electrical work must meet the seismic protection requirements of the *Code de construction du Québec*, version 2010.

To that effect, each subcontractor in each specialty trade must retain the services of a specialist, a standing member of the *Ordre des ingénieurs du Québec*, to perform calculations and specify seismic supports and their layout. At the end of work, an inspection will be performed by this engineer and a compliance report submitted to the Ministerial Representative by the engineer.

1.4 SEISMIC RESTRAINT SYSTEM DESCRIPTION

.1 The seismic restraint system must be fully integrated into and compatible with:

.1 noise and vibration controls specified on drawings and in specifications;

.2 building design characteristics as well as mechanical and electrical equipment.

.2 Site classification

.1 For the purposes of this project, the site classification for seismic reaction is to be determined by the specialist engineer

1.5 SUBMITTALS

.1 Submit a design report for each electromechanical system, including:

.1 The project title and number as they appear on drawings and specifications.

.2 The electromechanical system to which the report applies.

.3 the design criteria for the project seismic protection, including:

- .1 project location;
- .2 the $S_a(0.2)$ value, such as that given in the CCQ for project location;
- .3 the project location category based on the site seismic response;
- .4 the Fa value according to the location category and the $S_a(0.2)$ value;
- .5 the risk class posed by the building;
- .6 the risk coefficient for loads and effects due to a seismic event I_E.
- .7 the building aboveground height hn.
- .8 the technical components (TC) exempted and the reason for the exemption;
- .9 the TC list that must be held against seismic loads.

.4 The earthquake-resistant loads calculation created by seismic applied force for all TC which must be part of a calculation showing:

- .1 TC identification as shown on drawings and in specifications;
- .2 TC location including its h_x;
- .3 TC type (i.e. heat pump, heat exchanger, etc.);
- .4 manufacturer's model;
- .5 TC weight and its coefficients C_p, A_r and R_p;
- .6 TC calculated lateral design load V_p.
- .7 loads on the building structure.

.5 The equipment calculation overturning on a floor, slab or roof, showing:

- .1 TC dimensions, including the length L, the width or depth P, the height H and the gravity centre h_{cg};
- .2 overturning moments;
- .3 overturning resistant moments.

.6 The means to counter the seismic load calculated including:

- .1 how to resist seismic loads;
- .2 a sketch showing the planned installation to mitigate the seismic load;
- .3 drawings showing the seismic restraints' location and type – longitudinal, transverse, longitudinal and transverse.
- .4 acceptable products and each item which will be used for seismic protection, including anchors, bolts and nuts, aircraft cables and equipment items specifications.

.7 The engineer's signature who prepared the design reports and membership number in the *Ordre des ingénieurs du Québec*, business address, telephone number and e-mail address.

.2 At the end of work, the SRS will undergo an inspection and a compliance report issued for each electromechanical system, including:

- .1 the project title and number, as they appear in the specifications;
- .2 the discipline to which the report applies;

.3 the design report title whose compliance is analyzed;

.4 each TC seismic restraint analysis for which the design report called for a seismic protection system;

.5 photographs showing the seismic restraint system applied to each TC;

.6 a finding that the seismic protection system installed meets the design report and codes and reference standards requirements;

.7 the engineer's signature who prepared the design reports and membership number in the *Ordre des ingénieurs du Québec*, business address, telephone number and e-mail address.

PART 2 PRODUCTS

2.1 GENERAL

.1 The design engineer of the seismic restraint systems must ensure that the components that are part of this system and provided by the Contractor meet the requirements listed in the design engineer's design report.

2.2 SRS MATERIALS AND EQUIPMENT

.1 Power-driven fasteners and anchors simply placed must not be used to resist tensile loads.

.2 Friction materials such as C-clamp style beam clamps are prohibited for fastening TC, unless they are provided with a retaining mechanism such as:

.1 25 mm wide retaining strap, 16 gauge, for hanger rods between 10 mm and 15 mm.

.2 32 mm wide retaining strap, 14 gauge, for hanger rods between 18 mm and 20 mm.

.3 Friction materials such as C-clamp style beam clamps are prohibited for seismic fasteners.

.4 Spring elements and anti-vibration bearings must be earthquake resistant, i.e. they must be fabricated with a blocking system preventing shifting during an earthquake. Retaining wires will not be an acceptable means of resisting seismic loads.

2.3 SERVICE UTILITIES ENTRANCE INTO BUILDING

.1 Provide flexibility to prevent breakage in the event of earthquake activity.

PART 3 EXECUTION

3.1 GENERAL

.1 The design engineer of the seismic restraint systems must ensure that the components installed as part of this system by the Contractor meet the requirements listed in the design engineer's design report.

3.2 SRS INSTALLATION CRITERIA

.1 The earthquake resistant devices must not interfere with the building and its TC normal operation.

.2 The diffusers in exit corridors' suspended ceilings must be anchored to the suspended ceiling or building structure.

.3 Florescent lighting fixtures in suspended ceilings shall be secured to the structure in at least two opposite corners by a 16 gauge aircraft cable, or by a 12 gauge steel wire.

.4 Any hanging lighting fixtures must be secured to the structure by a flexible mounting—cable or steel wire—with a load capacity at least equal to twice the fixture weight. In addition, the lighting fixture must be able to swing 45° without touching anything.

3.3 INSTALLATION

.1 Install seismic restraint systems for each electromechanical system as described in the design report.

3.4 CONTRACTORS IMPLEMENTING PERSONNEL TRAINING

.1 The engineer designing the seismic protection system is responsible for ensuring that the Contractor and his personnel have the necessary competence and training to install a seismic restraint system that respects the requirements outlined in his design report.

.2 To this end, the engineer must ensure that the Contractor and his personnel have taken the following into consideration:

.1 piping thermal expansion and contraction;
.2 TC vibration;
.3 springs and dampers used to support the TC;
.4 waterproofing roof membrane protection.

3.5 FIELD QUALITY CONTROL

.1 Inspection and certification.

.1 SRS: inspected and certified by design engineer upon completion of installation.
.2 Provide certificate of compliance once all deficiencies have been corrected (if applicable).

.2 Commissioning documentation:

.1 Certificate of compliance to be submitted to Professional before system commissioning.
.2 Upon completion and acceptance of certification, hand over a complete set of construction documents, revised to show "as-built" conditions.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies identification of piping systems and air duct networks, fittings and control components, identification methods used, as well as the location and related installation methods.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.2 National Fire Protection Association (NFPA)

1.3 SUBMITTALS

.1 Submit technical data sheets for products described in this section, including colour samples.

.2 Samples

.1 Submit samples of nameplates, labels and tags, as well as proposed label schedules.

PART 2 PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplates mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers must be raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity, flow;

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 NETWORK NAMEPLATES

.1 Colours

.1 Hazardous materials: red lettering on white background.

.2 Elsewhere: black lettering on white background (except where required otherwise by applicable codes).

.2 Construction

.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes

.1 Conform to following table:

Size #	Sizes (mm)	No. of Lines	Lettering Height (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Identification for PWGSC Preventive Maintenance Support System (PMSS):

.1 Use arrangement of Main identifier, Source identifier, Destination identifier.

.2 Equipment in Mechanical Room:

.1 Main identifier: size #9.

.2 Source and Destination identifiers: size #6.

.3 Terminal cabinets, control panels: size #5.

.3 Equipment elsewhere: sizes as appropriate.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from the Ministerial Representative.

2.4 PIPEWORK GOVERNED BY CODES

.1 Identification

.1 Automatic extinguishers: NFPA 13.

2.5 PIPE LABELS

.1 Identify contents by background colour marking, pictogram (as necessary) and/or legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms

.1 Where required: Workplace Hazardous Materials Information System (WHMIS).

.3 Legends

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows indicating flow direction

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent to background colour marking

.1 Height: to full circumference of pipe or insulation.

.2 Length: to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive plastic-coated cloth or vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100 RH and continuous operating temperature of 150°C and intermittent temperature of 200°C.

.7 Colours and legends

.1 Where not listed, obtain direction.

.2 Colours for legends and arrows: to following table.

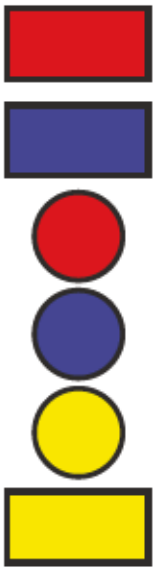
Type of piping to identify	Abbreviation on the labels (in French)	Prime Colour	Secondary Colour
Domestic hot water	EAU CHAUDE POT.	Green	None
Domestic cold water	EAU FROIDE POT.	Green	None
Water, fire protection	EAU INCENDIE	Red	White
Water, automatic extinguishers	EAU EXTINCT. AUTO	Red	White
Cold water	EAU FROIDE	Green	None
Potable water inlet	ARR. EAU POT.	Green	None
Potable water return	RET. EAU POT.	Green	None
Domestic hot water inlet	ARR. EAU CH. DOM.	Green	None
Domestic hot water recirculation	RECIRC. EAU CH. DOM.	Green	None
Make-up water	EAU APP.	Yellow	Black
Boiler water supply	EAU ALIM. CHAUD.	Yellow	Black
Treated water	PURGE	Green	None
Waste water	EAUX USÉES	Green	None
Storm sewer	ÉGOUT PLUV.	Green	None
Sanitary sewer	ÉGOUT SAN.	Green	None
Combined sewer	ÉGOUT UNIT.	Green	None

Type of piping to identify	Abbreviation on the labels (in French)	Prime Colour	Secondary Colour
Vent (plumbing)	EV. PLOMB.	Green	None
Vent	EV.	Yellow	Black

.3 Natural gas and liquefied petroleum networks:

.1 Paint entire network. Only remove, with the approval of competent authorities, contents and flow direction in inhabited areas when there is no risk of confusion whatsoever.

.4 Include following identification on ceiling channels (T-BAR):



Serpentin
(red rectangle)

Trappe d'accès
(blue rectangle)

Boîte de fin de course
(red circle)

Volet coupe-feu
(blue circle)

Robinet d'arrêt
(yellow circle)

Contrôle
(yellow rectangle)

2.6 IDENTIFICATION – DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: Black, or coordinated with base colour to ensure strong contrast.

2.7 IDENTIFICATION – VALVE CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position and location of tagged item.

2.8 INSCRIPTIONS LANGUAGE

.1 Identifications for the identification of the systems and elements must be in French.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliant: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 TIMING

.1 Provide identification only after interior painting has been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and CSA label registration plates as required by respective agency.

.3 Identify systems and equipment to conform to PWGSC PMSS.

3.4 NAMEPLATES

.1 Locations

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection

.1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors and partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually-operated or automatically controlled valves and dampers. Where this is not possible, place identification as close as possible, preferable on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 VALVES AND CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures or heat radiators, or where in plain sight of equipment they serve: secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schematics mounted in frame behind non-glare glass where directed by the ministerial representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 TAB is used throughout this section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with the requirements of Contract Documents and to do all other work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to the ministerial representative within 90 days of award of contract.

.2 Provide documentation confirming qualifications and successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems – Testing, Adjusting and Balancing-2002.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures and requirements are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, and evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve 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 full operating ranges.

1.4 SCOPE OF WORK

.1 Perform TAB for air and liquid systems shown on drawings and described in specifications of 22 and 23 of the present specifications such as:

.1 Supply and exhaust registers and grilles touched by the work

.2 Air exchanger including its distribution and exhaust network

1.5 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.6 COORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.7 REVIEW OF TERMES OF THE CONTRACT DOCUMENTS CONCERNING TAB

.1 Review Contract Documents before project construction is started confirm in writing to the ministerial representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to the ministerial representative in writing proposed procedures which vary from standard.

.3 During construction, coordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.8 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.9 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by the ministerial representative for verification of TAB reports.

1.10 START OF TAB

.1 Notify the ministerial representative seven (7) days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

- .1 installation of ceilings, doors, windows, and other construction affecting tab;
- .2 application of weatherstripping, sealing, and caulking;
- .3 pressure, leakage, other tests specified elsewhere Division 23;
- .4 provisions for TAB installed and operational;
- .5 start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
  - .1 proper thermal overload protection in place for electrical equipment;
  - .2 air systems:
    - .1 filters in place, and clean;
    - .2 duct systems clean;
    - .3 ducts, air shafts, ceiling plenums are airtight to within specified tolerances;
    - .4 correct fan rotation;
    - .5 fire, smoke, volume control dampers installed and open;
    - .6 coil fins combed, clean;
    - .7 access doors, installed, closed;
    - .8 outlets installed, volume control dampers open.

1.11 APPLICATION TOLERANCES

.1 Do TAB until actual values accurate to within plus or minus design values.

.2 HVAC (including lab) and liquid systems: plus 10 %, minus 0 %.

.3 HVAC run-outs: plus 5 %, minus 5 %.

1.12 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 5% of actual values.

1.13 MEASURING INSTRUMENTS

.1 Prior to TAB, submit to the ministerial representative list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within three (3) months of TAB. Provide certificate of calibration to the Professional.

1.14 SUBMITTALS

.1 Submit, prior to commencement of TAB: proposed methodology and procedures for performing TAB if different from referenced standard.

1.15 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of the ministerial representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 details of instruments used;
.2 details of TAB procedures employed;
.3 calculations procedures;
.4 summaries.

1.16 TAB REPORT

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 project record drawings;
.2 system schematics.

.3 Submit three (3) copies of TAB Report to the ministerial representative for verification and approval, in French, in D-ring binders, complete with index tabs.

1.17 VERIFICATION

.1 Reported results subject to verification by the ministerial representative.

.2 The ministerial representative reserves the right to require on-site verifications to confirm reported results. These tests may verify either 40 points or 20 % of total points in the project, whichever represents the larger of the two numbers.

.3 If after tests, less than 95 % of the verifications differ from the reported values in a proportion that exceeds the values indicated in article “Application Tolerances”, entire work must be repeated without inconvenience to the ministerial representative. Pay costs to repeat TAB as required to satisfaction of the Owner. This may imply work to take place at night, on the weekend or during periods determined by the ministerial representative.

1.18 SETTINGS

.1 After TAB is completed to satisfaction of the ministerial representative, replace drive guards, close access doors, lock devices in set positions and ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.19 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by the ministerial representative.

1.20 AIR SYSTEMS

.1 Standard: TAB to most stringent requirement of this section or TAB standards of AABC, NEBB, SMACNA and ASHRAE.

.2 Do TAB of systems, equipment, components, controls specified in Division 23 and the following systems, equipment, components, controls:

.1 Refer to mechanical drawings for scope of work.

.3 Qualifications: personnel performing TAB qualified to standards of AABC or NEBB.

.4 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC or NEBB.

.5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.6 Locations of equipment measurements: to include as appropriate:

.1 inlet and outlet of dampers, filters, coils, humidifiers, fans, other equipment causing changes in conditions;

.2 at controllers, controlled devices.

.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.21 OTHER TAB REQUIREMENTS

.1 General requirements applicable to work specified in this paragraph:

.1 Qualifications of TAB personnel: as for air systems specified in this section.

.2 Quality assurance: as for air systems specified in this section.

PART 2 PRODUCTS

.1 Not Used.

PART 3 EXECUTION

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies insulation for ductwork and ductwork accessories for flexible and rigid applications associated with commercial type application, but not industrial.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1-04, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ASTM International Inc.

.1 ASTM B209M-07, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

.2 ASTM C335-05ae1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.

.3 ASTM C411-05, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.

.6 ASTM C553-02e1, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.7 ASTM C612-04e1, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

.8 ASTM C795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.9 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Green Seal Environmental Standards (GSES)

.1 Standard GS-36-00, Commercial Adhesives.

.5 Thermal Insulation Association of Canada

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).

1.3 DEFINITIONS

.1 For the purposes of this section, definitions are as follows:

.1 "CONCEALED" – insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces (floors, underfloor space, walls, wells, etc.).

.2 "EXPOSED" – means "not concealed" as previously defined. When elements are installed in a partially open structure and they are visible from floor operating height, these elements must be considered "EXPOSED" (such as mechanical rooms, technical areas, horizontal wells, service corridors, accessible construction interstitial spaces, etc.).

.3 "INSULATION THICKNESS" corresponds to the required insulation thickness to cover overall components such as flanges, access openings, etc.

.4 TIAC: Thermal Insulation Association of Canada.

1.4 SUBMITTALS

.1 Product data:

.1 Provide manufacturer's printed product literature and data sheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Description of equipment giving manufacturer's name, type, model, year and capacity.

.2 Manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 The Thermal Insulation Association of Canada (TIAC) Mechanical Insulation Best Practices Guide, as well as its additions and amendments, must be used as a reference standard and is part of the specifications of the present project.

.2 Installer specialist in performing work of this section, and have at least three (3) years successful experience in this size and type of project, member of TIAC.

1.6 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

1.7 SCOPE OF WORK

.1 The Insulation Contractor must check with other contractors as to the nature of ductwork and equipment to be insulated.

.2 Become acquainted with overall mechanical drawings to determine the nature and location of insulation work.

.3 Unless otherwise indicated, "CONCEALED" insulation does not need a jacket other than that applied in the factory. However, joints must be made sealtight.

.4 Unless otherwise indicated, "EXPOSED" insulation must have a jacket.

.5 Provide and install all necessary insulation and jacketing on existing networks to be modified and new ductwork in compliance with drawings and the present specifications.

.6 Provide and install insulation and jacketing for existing ducts over a distance of one (1) metre on both sides of a connection point for new ducts on the existing network.

.7 This list is not exhaustive and does not relieve the Contractor of his responsibility to provide a complete installation in accordance with trade practices.

.8 With the exception of systems and elements identified hereafter and/or on drawings as not to be insulated, the Insulation Contractor must thermally insulate all ducts and accessories, components and related equipment, even if they are not specifically indicated on drawings, in articles or on the table of the present section.

.1 Elements not to be insulated:

.1 when acoustic insulation (other than silencers) is to be applied in an air duct (plenum included), thermal insulation may be eliminated;

.2 transfer ducts treated with an acoustic insulation;

.3 exhaust ducts, located more than four (4) metres from an upstream motorized damper.

.9 All ducts as well as accessories, components and related equipment, even if insulation type and thickness are not specified on drawings, in articles or on the table of the present section, must be considered as insulated with the following insulation classes:

.1 C-1 type insulation for square and rectangular ducts (plenums included), thickness: 50 mm.

.2 C-2 type insulation for round and oval ducts, thickness: 50 mm.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.

.3 **TIAC Code C-1 for square, rectangular ducts and plenums:** rigid mineral fibre board to ASTM C612, with factory-applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).

.1 Minimum density of products to be used: 26 kg/m^3.

.2 Maximum thermal conductivity: 0.035 W/m °C at a mean temperature of 24 °C.

.3 Acceptable product: Manson model "AK Board F.S.K.", Johns Manville, Knauf Fiber Glass, Owens Corning.

.4 **TIAC Code C-2 for round and oval ducts:** mineral fiber blanket to ASTM C553, with factory-installed vapour barrier and in compliance with CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).

.1 Minimum density of products to be used: as indicated

12 kg/m^3	1" (25 mm) thick
16 kg/m^3	1 1/2" (38 mm) thick
16 kg/m^3	2" (50 mm) thick
24 kg/m^3	2" (50 mm) thick for outdoor ducts

.2 Maximum thermal conductivity: 0.035 W/m °C at a mean temperature of 24 °C.

.3 Acceptable product: Manson AK Flex Snap Wrap with AP jacket, Johns Manville, Knauf Fiber Glass, Owens Corning.

.5 High density insulation (for all ductwork)

.1 High compressive strength insulation, suitable for operating conditions, to be used when the insulation is compressed under the weight of ventilation ducts (plenums included).

.2 Acceptable product: Foamglas, Extol, Buckaroos.

.3 Insulation thickness: as scheduled in PART 3 of this section.

2.3 JACKETS

.1 ULC listed canvas jackets:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.1 VOC limit in accordance to SCAQMD Rule 1168 or GSES GS-36.

.2 Indoor vapour retarder finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating cement: hydraulic setting on mineral wool, to ASTM C449.

.4 Outdoor vapour retarder mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: fibrous glass, untreated 305 g/m^2.

.5 Tape: self-adhesive, aluminum, 75 mm wide.

.6 Insulation adhesive: to suit insulation.

.1 VOC limit in accordance to SCAQMD Rule 1168 or GSES GS-36.

.7 Contact adhesive: quick-setting.

.1 VOC limit in accordance to SCAQMD Rule 1168 or GSES GS-36.

.8 Canvas adhesive: washable.

.1 VOC limit in accordance to SCAQMD Rule 1168 or GSES GS-36.

.9 Tie wire: 1.5 mm dia. stainless steel.

.10 Banding: 19 mm wide, 0.5 mm thick stainless steel.

.11 Facing: 25 mm stainless or galvanized steel as per application with hexagonal wire mesh.

.12 Fasteners: 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

PART 3 EXECUTION

3.1 APPLICATION

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

3.2 PRE-INSTALLATION REQUIREMENTS

.1 Pressure testing of equipment and adjacent piping systems complete, witnessed and certified.

.2 Surfaces clean, dry and free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's instructions and as indicated on drawings.

.3 Use two (2) layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Ensure hangers and supports are outside vapour retarder jacket.

.5 Hangers and supports:

.1 Hangers and supports in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

.2 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork, such as:

.1 all plenums;

.2 all ducts.

.3 The Departmental Representative may, at any moment, inform the General Contractor, Ventilation Contractor or Insulation Contractor of deficiencies concerning locations where insulation has been crushed. If this is the case, the Ventilation Contractor and Insulation Contractor will be obliged to re-do work to the satisfaction of the Departmental Representative

.6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum two (2) rows each side.

.7 Install spacers to create distance between the control devices and the duct walls. Seal perimeter of spacers with insulation vapour barrier.

Install 1 mm thick galvanized steel reinforcements on insulated corners of air ducts located in accessible and exposed locations at least 2,400 mm high and in mechanical utility rooms.

3.4 TABLE – DUCTWORK INSULATION SCHEDULE

.1 Insulation thickness: conform to following table.

Ductwork (plenums included)	Temperature °C	Location	Code	Insulation Thickness (mm)
Air return duct and/or air exhaust duct		From outside wall or roof up to motorized isolating damper.	C-1	75
Air return duct and/or air exhaust duct		From motorised isolating damper to the air exchanger	C-1	50
Outside air inlet duct		From outside wall or roof up to motorized isolating damper.	C-1	75
Outside air inlet duct		From motorised isolating damper to the air exchanger	C-1	50
Air supply duct.		From the air exchanger up to the grills and registers	C-1, C-2	38
Other ducts not specified in the present drawings or specifications		Everywhere	C-1, C-2	50

3.5 FINISHES

.1 Exposed rectangular and square ducts, and plenums inside building: canvas jacket.

.2 Exposed rectangular and square ducts, and plenums located in mechanical utility rooms: canvas jacket.

.3 Exposed round and oval ducts inside building: canvas jacket.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies thermal insulation for piping and related accessories.

1.2 REFERENCES

.1 ASHRAE Standard 90.1, 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).

.3 National Research Council Canada

.1 Insulation thicknesses included in the table in article 3.4 are according to the National Energy Code of Canada for Buildings 2011 – Revisions and Errata – November 2013

.4 Canadian General Standards Board (CGSB).

.5 Department of Justice.

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

.7 Material safety data sheets (MSDS).

.8 Thermal Insulation Association of Canada (TIAC).

.9 Underwriters' Laboratories of Canada (ULC).

1.3 DEFINITIONS

.1 For the purposes of this section, definitions are as follows:

.1 "CONCEALED" – insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces (floors, underfloor space, walls, wells, etc.).

.2 "EXPOSED" – means "not concealed" as previously defined. When elements are installed in a partially open structure and they are visible from floor operating height, these elements must be considered "EXPOSED" (such as mechanical rooms, technical areas, horizontal wells, service corridors, accessible construction interstitial spaces, etc.).

.3 "NETWORK" signifies piping including accessories, gasketing, etc., such as valves, bends, T's, etc., that are incorporated.

.4 "DOMESTIC" signifies potable and not to be used exclusively for this purpose.

.5 "WASTE WATER" signifies all drainage water except storm water.

.6 "DRAINS" signifies floor drain, roof drain, funnel, etc., connected to waste water drain or storm water piping.

.7 "CONDENSATE" signifies water resulting from steam condensation or chilled air condensation, i.e. through a cooling coil. This water could include softened water, potable water or steam within the same definition.

.8 "INSULATION THICKNESS" corresponds to the required insulation thickness to cover overall components such as flanges, access openings and cleanouts, etc.

.9 TIAC: Thermal Insulation Association of Canada.

.10 CRF: Code Rectangular Finish.

.11 CPF: Code Piping (Plumbing) Finish.

1.4 SUBMITTALS

.1 Product data:

.1 Provide manufacturer's printed product literature and data sheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Description of equipment giving manufacturer's name, type, model, year and capacity.

.2 Manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 The Thermal Insulation Association of Canada (TIAC) Mechanical Insulation Best Practices Guide, as well as its additions and amendments, must be used as a reference standard and is part of the specifications of the present project.

.2 Installer: specialist in performing work of this section, and have at least three (3) years successful experience in this size and type of project, member of TIAC.

1.6 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

1.7 SCOPE OF WORK

.1 The Insulation Contractor must check with other contractors as to the nature of pipework and equipment to be insulated.

.2 Become acquainted with overall mechanical drawings to determine the nature and location of insulation work.

.3 Unless otherwise indicated, "CONCEALED" insulation does not have to have a jacket other than the factory applied one. However, joints must be perfectly sealed.

.4 Unless otherwise indicated, "EXPOSED" insulation must have a finish.

.5 Provide and install all necessary insulation and jacketing on existing networks to be modified and new pipework in compliance with drawings and the present specifications.

.6 Provide and install insulation and jacketing for existing pipework over a length of one (1) metre on either side of connection points for new piping to existing piping.

.7 This list is not exhaustive and does not relieve the Contractor of his responsibility to provide a complete installation in accordance with trade practices.

.8 With the exception of the elements identified below as not to be insulated, the Insulation Contractor must insulate all piping, accessories, components and related equipment, including valves, flanges, D.A.R, etc., even if they are not specifically identified in the present section.

.1 Elements not to be insulated:

.1 on building exterior:

.1 oil piping;

.2 piping for sprinklers and fire protection lines;

.3 underground piping unless otherwise indicated in the article in part 2 or on drawings.

.2 in unheated areas located within the building:

.1 oil piping;

.2 pipework for sprinklers and fire protection lines if they are pressurized with air or use an antifreeze agent.

.3 in heating areas within the building:

.1 Backflow preventer on fire protection network

.2 chrome-plated piping;

.3 Piping of medical gases such as for the vacuum, oxygen, nitrous oxide, helium and carbon dioxide, unless located in the walls of concrete blocks.

.4 compressed air piping more than five (5) metres, within the thermal envelope, toward the building interior if passing from an unheated or outside space to a heated space within the building;

.5 pipework for sprinklers and fire protection lines and test pipes more than five (5) metres, within the thermal envelope, toward the building interior if passing from an unheated or outside space to a heated space within the building;

.6 pipework for sprinklers and fire protection lines of sub-air and tests pipe systems more than five (5) metres, within the thermal envelope, toward the building interior if passing from an unheated or outside space to a heated space within the building;

.7 oil piping more than five (5) metres, within the thermal envelope, toward the building interior if passing from an unheated or outside space to a heated space within the building;

.8 filling pipework and vent pipework for oil tanks more than five (5) metres, within the thermal envelope, toward the building interior if passing from an unheated or outside space to a heated space within the building;

.9 Natural gas piping, more than 5 meters, within the thermal envelope, to the inside of a building if it passes an unheated space or outside the building, to a heated space to inside the building.

.10 Vent piping for natural gas (pressure regulator) more than 5 meters, within the thermal envelope, to the inside of a building if it moves from an unheated space or outside, to a heated space inside the building.

.11 Propane piping, over 5 meters, within the thermal envelope, to the inside of a building if it moves from an unheated space or outside the building to a heated space inside the building.

.12 Vent piping for propane gas (pressure regulator), more than 5 meters, within the thermal envelope, to the inside of a building if it moves from an unheated space or outside the vessel to a heated space inside the building.

.13 sanitary drainage piping unless otherwise located in concrete block walls or if otherwise indicated in the present section or on drawings;

.14 underground piping or if otherwise indicated in the present section or on drawings;

.15 all polypropylene piping and accessories of the deionized water network by reverse osmosis or tempered water;

.16 pipework located in heating cabinets unless otherwise indicated on drawings;

.17 vent piping more than five (5) metres within the thermal envelope unless otherwise indicated on drawings;

.18 Drain piping of flue gas systems with natural gas or propane gas to more than 5 meters, within the thermal envelope, to the inside of a building, if it passes a unheated space or outside the building, to a heated space inside the building.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.

.3 Insulation with **TIAC Code A-1**: molded mineral fiber, without factory-applied vapor barrier jacket.

.1 Sleeve mineral fiber: comply with CAN/ULC-S702 and ASTM C547.

.2 Maximum coefficient ("k") compliant with CAN/ULC-S702.

.3 Acceptable products: Manson/Alley K, Johns Manville, Knauf Fiber Glass, Owens Corning.

.4 Insulation with **TIAC Code A-3**: molded sleeve mineral fibers with factory-applied vapor barrier jacket.

.1 Duct mineral fiber: comply with CAN/ULC-S702 and ASTM C547.

.2 Barrier: comply with CGSB 51-GP-52Ma.

.3 Maximum coefficient ("k") compliant with CAN/ULC-S702.

.4 Acceptable products: Manson/Alley K with FSK jacket, Johns Manville, Knauf Fiber Glass, Owens Corning.

.5 Insulation with **TIAC Code C-2**: mineral fiber blanket with or without factory-applied vapor barrier jacket.

.1 Mineral fiber blanket: comply with CAN/ULC-S702 and ASTM C547.

.2 Barrier: comply with CGSB 51-GP-52Ma.

.3 Maximum coefficient ("k") compliant with CAN/ULC-S702 and ASTM C547.

.4 Acceptable products: Manson/AK Flex with FSK jacket, Johns Manville, Knauf Fiber Glass, Owens Corning.

.6 Insulation with **TIAC Code A-6** : flexible sheet or tube, in unicellular elastomer

.1 Coefficient "k" Maximum: to CAN / CGSB-51.40M80 standard.

.2 Thermal insulation certified by the manufacturer as being free of agents capable of causing cracks by stress corrosion.

.3 For application on elements to insulate subject to operating temperatures between -40 ° C to 80 ° C, according to the specified applications.

.4 Armafix System Armaflex tubular pipe insulation.

.5 Acceptable products: Armstrong, Armaflex, Rubatex.

.7 Removable, pre-fabricated insulation and enclosures

.1 Application: installation to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.1 The expansion joints, primary devices for flow measurement, flanges and fittings connecting pipes to appliances serviced from steam pressure reducing valves and steam traps.

.2 Also install on the valves if they are not insulated according to the standard method of fiberglass or elstomer.

.2 Description

.1 Insulation, products or fasteners and finish coats: complex corresponding to adjacent insulation.

.2 Jacket: corresponding to the complex adjacent insulation.

.3 Acceptable products: TexFab VTEX 500 or 1000, Prodimax PRO-500 or PRO-1000, IPI Isotex Thermal Insulation.

.8 High compressive strength insulation

.1 High compressive strength insulation, suitable to operating conditions, when there is no saddle or shield or when a saddle is compressed under the piping weight (pipework 65 mm and greater).

.2 Acceptable products: Foamglas, Extol, Buckaroos/model 2550FS.

.3 Insulation thickness: as indicated in table in PART 3 below.

2.3 ACCESSORIES

.1 Tape: self-adhesive, reinforced aluminum, at least 50 mm wide.

.2 Contact adhesive: quick-setting.

.1 VOC limit in accordance to SCAQMD Rule 1168 or GSES GS-36.

.3 Canvas adhesive: washable.

.1 VOC limit in accordance to SCAQMD Rule 1168 or GSES GS-36.

.4 Adhesive for insulation bearing the code ACIT A-6

.1 Acceptable products: Armstrong, Armaflex, Rubatex.

.5 Tie wire: 1.5 mm dia. stainless steel.

.6 Banding: 19 mm wide, 0.5 mm thick stainless steel.

.7 Insulation system for support with the use of tubular insualtion bearing the code ACIT A-?

.1 Acceptable products: Système Armafix de Armalfex, Armstrong, Rubatex.

.2 Thickness of insulation: according to table in part 3.

2.4 CEMENT

.1 Thermal insulating and finish

.1 Hydraulic setting or air drying on mineral wool: ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 VAPOUR RETARDER FINISH FOR INDOOR PIPING

.1 Vinyl emulsion, acrylic type, compatible with insulation.

2.7 JACKETS

.1 Polyvinyl Chloride (PVC)

.1 One-piece moulded type and sheets to CAN/CGSB 51-GP-53M with pre-formed shapes as required.

.2 Jackets used on accessories (valves, fittings, elbows, etc.) concealed and exposed: single-piece premoulded jacketing, shaped to insulation.

.3 Joining: longitudinal and sectional joints with 50 mm laps.

.4 Colours: to match adjacent finish paint or as chosen by the Professional.

.5 Minimum service temperature: -20°C.

.6 Maximum service temperature: 65°C.

.7 Moisture vapour transmission: 0.02 perm.

.8 Thickness: 0.38 mm.

.9 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Canvas Jackets

.1 Cotton cloth of a weight of 220 g / m², plain weave, coated with fire retardant lagging adhesive, diluted, per ASTM C921 and ULC approved.

.2 Lagging adhesive: compatible with insulation material.

.3 Latex Enamel Finish

.1 Insulation bearing the code ACIT A-6.

.2 Acceptable product : Armaflex WB coverage 10 m²/L, Armstrong, Rubatex.

PART 3 EXECUTION

3.1 APPLICATION

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

3.2 PRE-INSTALLATION REQUIREMENTS

.1 Pressure testing of equipment and adjacent piping systems complete, witnessed and certified.

.2 Surfaces clean, dry and free from foreign material.

3.3 INSTALLATION

.1 Perform work in accordance with manufacturer's instructions, the requirements of the present section and in compliance with TIAC National Standards.

.1 Hot equipment: to TIAC code 1501-H.

.2 Cold equipment: to TIAC code 1501-C.

.3 Underground equipment: to TIAC 1501-U.

.2 Apply at least two (2) coats of vapour retardant finish.

.3 Use two (2) layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Ensure hangers and supports are outside vapour retarder jacket.

.5 Hangers and supports:

.1 Hangers and supports in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

.2 Ensure hangers and supports are outside vapour retarder jacket.

.3 Apply high compressive strength insulation suitable to operating conditions for pipework at both ends of anti-vibration or flexible bearings to suitably secure the piping while respecting vertical and horizontal lines.

.1 Acceptable products: Foamglas, Extol, Buckaroos/model 2550FS.

.2 Insulation thickness: as indicated in table in PART 3.

.4 Apply high compressive strength insulation suitable to operating conditions for pipework 50 mm and greater.

.1 Acceptable products: Foamglas, Extol, Buckaroos/model 2550FS.

.2 Insulation thickness: as indicated in table in PART 3.

.5 The Departmental Representative may, at any moment, inform the General Contractor, Plumbing/Heating Contractor or Insulation Contractor of deficiencies concerning locations where insulation has been crushed. If this is the case, the Plumbing/Heating Contractor and Insulation Contractor will be obliged to re-do work to the satisfaction of the Departmental Representative.

.6 Removable, pre-fabricated insulation

.1 Application: at expansion joints, valves, primary flow measuring elements, flanges and unions at equipment piping connections for equipment served by steam pressure valve bodies and steam condensate water traps.

3.4 PIPING INSULATION SCHEDULES

.1 Unless otherwise specified, insulation of pipes includes valves, valve bonnets, filters and strainers, flanges and fittings, elbows, T's, etc.

.2 Thickness of insulation as listed in the following table.

.1 Do not insulate exposed run-outs to plumbing fixtures, chrome plated piping, valves, or fittings.

Piping/Service	Temp. °C	TIAC Code	Pipe Sizes (DN) and Insulation Thickness (mm)				
			up to 25	from 32 to 50	from 65 to 100	from 125 to 150	200 and greater
Hot potable water supply and recirculation	indoor	A-1	25	25	38	38	38
	outdoor	A-1	65	65	75	90	90
Cold potable water supply		A-3	25	25	25	25	25
Supply water to humidifier between the domestic water system and the humidifier		A-3	25	25	25	25	25
Sanitary vents in ceiling space and up to 5 m inside the thermal envelope (vapour-barrier)		C-2	25	25	25	25	25
Refrigerant, hot gas, suction, liquid inside, concealed	Higher than 5	A-3 ou A-6	25	25	25	25	25
Refrigerant, hot gas, suction, liquid inside, concealed	Lower than 5	A-3 ou A-6	25	38	38	38	38
Refrigerant, hot gas, suction, liquid inside exposed and located outside.	Higher than 5	A-3 ou A-6	25	25	25	25	25
Refrigerant, hot gas, suction, liquid inside exposed and	Lower than 5	A-3 ou A-6	25	38	38	38	38

Piping/Service	Temp. °C	TIAC Code	Pipe Sizes (DN) and Insulation Thickness (mm)				
			up to 25	from 32 to 50	from 65 to 100	from 125 to 150	200 and greater
located outside.							

.3 Finishes

.1 Exposed indoor piping: PVC jacket.

.2 Exposed piping in mechanical rooms: PVC jacket.

.3 Concealed indoor piping: canvas or PVC on fittings, elbows and valves.

.4 Latex Enamel Finish

.1 Insulation bearing the code ACIT A-6.

.2 Acceptable product : Armaflex WB coverage 10 m^2/L, Armstrong, Rubatex.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for piping, valves and fittings for gas fired equipment.

1.2 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.2 American Society for Testing and Materials International (ASTM)

.3 Canadian Standards Association (CSA International)

.4 Canadian Standards Association (CSA)/Canadian Gas Association (CGA)

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

.2 Indicate on manufacturer's catalogue literature following: valves.

.3 Submit WHMIS MSDS. Indicate VOC's for adhesive and solvents during application and curing.

.2 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.1 GAS NETWORK

	CALCULATION		SERVICE	HYDROSTATIC TESTING	GROUP
PRESSURE kPa	up to		100 (WP)	1,5 WP	M-81 (See note (2))
TEMP. °C MAX				AMBIENT	
PIPING AND FITTING STANDARDS			Natural gaz/propane (above ground)		

	DIAMETER		SPECIFICATION	DESCRIPTION	ASTM MATERIALS AND STANDARDS
	FROM	TO			
PIPE	DN 15	DN 50	Cal. 40	Continuous weld, threaded ends	Black steel A.53, grade A or B, CSA B-63
	DN 65	DN 100	Cal. 40	Continus weld, bevelled ends joint to électricity	
	DN 125	DN 250	Cal. 40	Vent (see note (3))	
ASSEMBLY	DN 15 DN 65	DN 50 DN 250		Screw-in Butt weld	
FITTINGS	DN 15 DN 65	DN 50 DN 250	150 lb Cal. 40	Screw-in Seamless, bevelled ends	Malleable iron A.197 Steel A.234
FLANGES	DN 15 DN 65	DN 50 DN 250	150 lb 150 lb	Screw-in Collar and a) 1,5 mm raised face (1/16 in) or b) Surface for cast iron flanges	Forged steel A.181 grade 1
UNIONS	DN 15	DN 50	300 lb	Screw-in	Malleable iron A.197
BOLTS	Heavy duty bolts and nut, semi-finish				Steel A.307
PACKING (1)	Thickness: 1,5 mm (1/16 in)				Neoprene

VALVES	DIAMETER		SPECIFICATION (*)	DESCRIPTION
	FROM	TO		
GATE				None
GLOBE				None
BALL	DN 15	DN 50	150 lb (UL and « CGA »)	Milwaukee, fig. BB2-100-LD, Jenkins 201JLD, Toyo 5044ALH, Kitz 68-A-LL, MAS B3LL, Neo 3380
PLUG	DN 15 DN 65	DN 50 DN 250	175 lb w.o.g.	Rockwell-Nordstrom, fig. 142, cast iron; Dezurik; Homestead, Resun R-1430 Rockwell-Nordstrom, fig. 143, cast iron; Dezurik; Homestead, Resun R-1431 Alternative : Kitz 150SCTBZM-N (steel ball valve CGA approved)
STRAINER				

NOTES :

(*) Indicated class is minimum.
(1) Natural rubber fittings are not permitted.
(2) According to installation code G40, edition Quebec for piped gas.
(3) All vents to the exterior will be 304 s. An insect screen of ss 40 mesh located in PVC connection must be installed at each end of vents.

GENERAL NOTE : Install drain valves or sediment valves where required.

2.2 FLEXIBLE PIPING

.1 The contractor must obtain the approval of the engineer to install flexible piping unless this type of pipe is specifically required by the plans.

.2 All hoses and fittings must be designed for an operating pressure of 2400 kPa (350 psig). They must meet either the CAN1-8.1 standard, the CAN1-8.3 standard, and must be approved by the authority for electricity and gas.

2.3 VALVES

.1 Lubricated valves, code compliant and UL approved and CGA

.2 Ball valve compliant to UL and CGA

.3 The manual valve located in a by-pass to the stop valve upon gas leak detection will be lockable c/w padlock, and special lockable key.

2.4 IDENTIFICATION

.1 Identification of the gas piping will comply with Section 23 05 53.01 – Identifying networks and mechanical appliances.

.2 The contractor must paint all piping. See details in section 3.2.2.

2.5 SUPPORTS

.1 Suspensions, supports and bracing parts must be manufactured conform to ANSI B31.1 and MSS-SP58.

.2 Hangers and supports should be attached on top of the structural members. If there is no structural member or the anchor sleeves are not in the right place, supply and install any additional structural parts needed.

.3 Materials and products in according with Section 01 47 15 – Sustainable Requirements: Construction.

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 PIPING

.1 Install in accordance with Section CAN/CSA B149.1, CAN/CSA B149.2.

.2 Paint all natural gas and propane lines with 2 coats of yellow antirust paint.

.3 Install drip points:

.1 At low points in piping system.

.2 At connections to equipment.

3.3 VALVES

.1 Install valves with stems upright or horizontal unless otherwise approved by Departmental Representative.

.2 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

.3 Install pressure regulators at eat fixture, to be able to adjust the supply pressure, and at other indicated locations.

3.4 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Test system in accordance with CAN/CSA B149.1 and CAN/CSA B149.2 and requirements of authorities having jurisdiction.

.2 Manufacturer's Field Services:

.1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract.

.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 Obtain reports within 3 days of review and submit immediately to Departmental Representative.

3.5 ADJUSTING

.1 Purging: purge after pressure test in accordance with CAN/CSA B149.2 and CAN/CSA B149.1.

.2 Pre-Start-Up Inspections:

.1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.

.2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.6 CLEANING

.1 Cleaning: in accordance with Section CAN/CSA B149.1 and CAN/CSA B149.2, supplemented as specified.

.2 Perform cleaning operations as specified by manufacturer.

.3 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 SUMMARY

.1 Section content

.1 This section specifies materials, equipment and related installation methods for refrigerant copper tubing and fittings.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B16.22-01, Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings.

.2 ASME B16.24-91(R1998), Cast Copper Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.

.3 ASME B16.26-88, Cast Copper Alloy Fittings for Flared Copper Tubes.

.4 ASME B31.5-01, Refrigeration Piping and Heat Transfer Components.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A307-04, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.2 ASTM B280-03, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.3 CSA Group

.1 CSA B52-05(R2009), B52 Package, Mechanical Refrigeration Code.

.4 Environment Canada (EC)

.5 EPS 1/RA/1-[96], Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

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

.1 Material safety data sheets (MSDS).

1.3 SUBMITTALS

.1 Product data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for refrigerant piping, fittings and equipment.

1.4 MANUFACTURER'S COMPETENCE

.1 Installation work is to be performed by certified refrigeration technicians and mechanics.

.2 Refrigeration installations must be in compliance with Document EPS 1/RA/1.

1.5 WARRANTY

.1 The Contractor certifies by the present that refrigeration lines are guaranteed against leaks and that compressors are sealtight and are guaranteed against all operating defects in accordance with the general requirements.

PART 2 PRODUCTS

2.1 TUBING AND FITTINGS

.1 Processed for refrigeration installations, seamless, dehydrated and sealed, hard copper type ACR.

.2 Tubing to be in compliance with ANSI/ASME B31.5 and ASTM B280 and Document EPS 1/RA/1.

.3 Fittings:

.1 Valves in compliance with ANSI/ASME B16.26 and ANSI/ASME B16.29.

.2 Large radius bends.

.3 Forged copper and forged brass valves, solder-end connection. Flared joint fittings may be used on soft annealed copper tubes.

.4 Materials used for brazing must meet ANSI/AWS A5.8; SIL-FOS-15 brazing for copper tubing assembled using copper fittings; silver solder for brass fittings, 170 MPa; 95-5 for connections to equipment or accessories.

.5 Flexible connectors: nominal diameter up to 10 mm must be made of soft coiled copper tubing; connectors with diameter greater than 10 mm must be made of bronze flexible pipe, seamless, bronze-wire-reinforced protective jacket. When installed in an area prone to freezing, connectors must be protected using a factory sealed neoprene membrane.

.6 Refrigerant piping must be identified as per specifications.

2.2 PIPE SLEEVES

.1 Hard copper or steel, sized to provide 6 mm clearance between sleeve and un-insulated pipe or between sleeve and insulation.

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 data sheets.

3.2 GENERAL

.1 Install in accordance with CSA B52 and ASME B31.5 and Document EPS 1/RA/1.

.2 Seal all of the openings according to the requirement of this section and that of the architectural section.

3.3 BRAZING PROCEDURES

.1 Bleed inert gas into pipe during brazing.

.2 Remove valve internal parts, solenoid valve coils, sight glass.

.3 Do not apply heat near expansion valve and sensitive elements.

3.4 PIPING INSTALLATION

.1 General:

.1 Soft annealed copper tubing: bend without crimping or constriction. Hard drawn copper tubing: do not bend. Minimize use of fittings.

.2 Hot gases piping

.1 Hot gas lines in a downward slope in the range of 1: 240 in the direction of flow so as to prevent any return of oil during compressor operation.

.2 Provide and install traps at the bottom of all risers of over 2400 mm high and 7600 mm in intervals.

.3 Provide deep bucket steam traps, inverted, and install at the top of risers.

3.5 PRESSURE AND LEAK TESTING

.1 Close valves on factory charged equipment and other equipment not designed for test pressures.

.2 Leak test to CSA B52 before evacuation to 2 MPa and 1 MPa on high and low sides respectively.

.3 Test procedure: build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

3.6 FIELD QUALITY CONTROL

.1 Site tests/inspection:

.1 Close service valves on factory charged equipment.

.2 Ambient temperatures to be at least 13°C for at least 12 hours before and during dehydration and all work herein.

.3 Use copper lines of largest practical size to reduce evacuation time.

.4 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5 Pa absolute and filled with dehydrated oil.

.5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.

.6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:

.1 twice to 14 Pa absolute and hold for four (4) hours;

.2 break vacuum with refrigerant to 14 kPa;

.3 final to 5 Pa absolute and hold for at least 12 hours;

.4 isolate pump from system, record vacuum and time readings until stabilization of vacuum;

.5 submit test results.

.7 Charging:

.1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.

.2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.

.3 Re-purge charging line if refrigerant container is changed during charging process.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section contents

.1 This section specifies low and high pressure ducts, materials, accessories and related installation methods.

.2 Related sections

.1 23 05 29 – Hangers and Supports for Piping and HVAC Equipment.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM A480/A480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.2 ASTM A635/A635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.

.3 ASTM A653/A653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM A653/A653M-04a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process. (Metric).

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

.1 Material safety data sheets (MSDS).

.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.

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, 1997.

.2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.

1.3 SUBMITTALS

.1 Product data: submit material safety data sheets in accordance with Workplace Hazardous Materials Information System (WHMIS) for the items listed below.

.1 sealants;

.2 tape;

.3 pre-fabricated trademark fittings;

.4 fabrication details in accordance with SMACNA for each type of duct, dimensions and pressure classification, including:

.1 sheet metal thicknesses;

.2 seam and joint construction;

.3 types of reinforcement;

.4 hangers and supports;

.5 connection details;

.6 branch connection details;

.7 references to articles and figures used for design and fabrication of ducts.

PART 2 PRODUCTS

2.1 SEALANT

.1 Sealant: water-based duct sealer, fire retardant, oil resistant, service temperature -7°C to 93°C.

.1 Acceptable products: Duro Dyne WB-S2, Foster, Hardcast Carlisle.

2.2 JOINT AND SEAM TAPE

.1 Joint and seam tape: polyvinyl treated open-weave fiberglass tape, 50 mm wide.

.1 Acceptable products: Duro Dyne FT-2, Flexmaster, Foster, Hardcast Carlisle.

2.3 ALUMINUM TAPE

.1 Aluminum tape: self-adhesive reinforced, 75 mm wide.

.1 Acceptable products: 3M, Impérial, Cantech.

2.4 GASKET MATERIAL

.1 Gasket material

.1 Acceptable products: Tremco, 3M, Hardcast Carlisle.

2.5 HANGERS AND SUPPORTS FOR AIR DUCTS

.1 Hangers and supports: to Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

2.6 FIRESTOP SYSTEM

.1 Retaining angles must be installed around ducts (fire damper and/or fire/smoke damper), on either side of a fire separation.

.2 Ducts must not be distorted by firestop systems or the installation thereof.

2.7 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual and the article entitled "Seal Classification" of the present section.

2.8 SEAL CLASSIFICATION

.1 Classification for air ducts is determined as follows:

Seal Class	Seal Requirements	Static Pressure Class
A	Longitudinal seams, transverse joints and connections and penetrations through duct walls made airtight with sealant, tape or combination thereof.	Above 750 Pa (3")
B	Longitudinal seams, transverse joints and connections and penetrations through duct walls made airtight with sealant, tape or combination thereof.	500 Pa (2") to 750 Pa (3")
C	Transverse joints and connections and penetrations through duct walls: made airtight with gasket and aluminum tape according to duct type (round or square). Longitudinal seams unsealed.	Max. 500 Pa (2")

2.9 DUCTS AND FITTINGS (LOW PRESSURE TO 500 PA)

.1 Rectangular and round ducts (longitudinal joint type): flexible steel to create slip seams, as per ASTM A653/A653M, Z90 designation zinc.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Seams: compliant.

.4 Radiused elbows:

.1 rectangular ducts: standard radius with centreline radius 1.5 times width of duct;

.2 round ducts: smooth radius five piece; centreline radius 1.5 times width of duct.

.5 Mitred elbows – rectangular

.1 to 400 mm: with single thickness turning vanes;

.2 over 400 mm: with double thickness turning vanes.

.6 Branches

.1 Rectangular main and branch: with centreline radius 1.5 times width of duct.

.2 Round main and branch: enter main duct at 45 degrees with conical connection.

.3 Provide volume control damper in branch duct near connection to main duct.

.4 Main duct branches: with splitter damper.

.7 Transitions

.1 Diverging: 20 degrees maximum included angle.

.2 Converging: 30 degrees maximum included angle.

PART 3 EXECUTION

3.1 GENERAL

.1 Do work in accordance with SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.3 Support risers in accordance with SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Firestopping material must not distort duct network or the installation thereof.

3.2 HVAC CLEANLINESS STANDARDS

.1 Specific requirements before delivery of material

.1 The Contractor is responsible for taking all measures necessary to protect duct networks from dust and other debris that may soil the interior and exterior of ducts and accessories.

.2 Before their shipment to the site, completely clean and degrease the inside of ducts and accessories for all HVAC networks.

.3 Porous surfaces must be free from dust and debris and undergo a visual inspection.

.4 Clean system components and accessories before they are shipped to the site.

.5 All HVAC networks ducts and accessories must be delivered to the site with their openings sealed.

.2 Specific requirements for installation of material

.1 The Ventilation Contractor must take all preventive measures necessary to ensure that the interior of new ventilation equipment, components and ducts are free of dust and oil after their on-site installation.

.2 Sealed coverings will be removed only when a duct section is installed. Any duct or accessory delivered to the site that the Departmental Representative believes does not respect the requirements of this section will immediately be identified as needing to be removed from the site by the Contractor.

.3 While ducts are being installed, the sealed covering at duct ends will be left in place by the Contractor until the next seam must be done.

.4 All diffusers and return grilles must be protected with a sealed covering after their installation.

.5 Any activity the Departmental Representative believes will generate dust and/or or dirt and/or contaminants that may undermine the quality of the project environment must be performed outside of the building perimeter.

3.3 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one (1) coat of sealant to manufacturer's recommendations.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies materials and installation for air duct accessories including flexible connections, access doors, vanes and collars.

.2 Related sections

.1 23 33 14 – Dampers – Balancing.

1.2 REFERENCES

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

.1 Material safety data sheets (MSDS).

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2005.

1.3 SUBMITTALS

.1 Data sheets

.1 Submit required data sheets and specifications and manufacturer's documentation for the following:

.1 flexible connections;

.2 duct access doors;

.3 turning vanes;

.4 instrument test ports.

.2 If required, submit WHMIS MSDS and comply with this system. Indicate VOC's for adhesive and solvents during application and curing.

PART 2 PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with SMACNA – HVAC Duct Construction Standards

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame 0.6 mm thick with fabric clenched by means of double locked seams.

.2 Flexible Material:

.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at -40°C to 90°C, density of 1,017 kg/m².

2.3 ACCESS DOORS IN DUCTS

.1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.4 Hardware:

.1 Up to 300 x 300 mm: two sash locks complete with safety chain.
.2 301 to 450 mm: four sash locks complete with safety chain.
.3 451 to 1000 mm: piano hinge and minimum two sash locks.
.4 Doors over 1,000 mm: piano hinge and two handles operable from both sides.
.5 Hold open devices.
.6 300 x 300 mm glass viewing panels.

2.4 TURNING VANES

.1 Factory or shop fabricated double thickness with trailing edge to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

2.6 SPIN-IN COLLARS

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to corresponding round duct standards.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 INSTALLATION

.1 Flexible connections:

.1 Install in following locations:

.1 inlets and outlets to supply air units and fans.

.2 inlets and outlets of exhaust and return air fans.

.3 as indicated.

.2 Length of connection: 150 mm.

.3 Minimum distance between metal parts when system in operation: 75 mm.

.4 Install in accordance with recommendations of SMACNA.

.5 When the system is running:

.1 ducting on sides of flexible connection to be in alignment;

.2 ensure slack material in flexible connection.

.2 Access doors and viewing panels:

.1 Size:

.1 635 mm x 432 mm for person size entry;

.2 203 mm x 127 mm for servicing entry;

.3 305 mm x 152 mm for viewing.

.4 as indicated.

.2 Locations:

.1 fire and smoke dampers;

.2 control dampers;

.3 devices requiring periodical maintenance;

.4 required by code;

.5 reheat coils;

.6 Variable volume boxes (when a reheat coils is to be install after variable volume boxes, 2 access doors will be require. One for de reheat coil and one for de variable volume boxe);

.7 elsewhere as indicated;

.8 an access door must be installed on each air intake and/or air exhaust plenum.

.3 Instrument test ports:

.1 General:

.1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 Locate to permit easy manipulation of instruments.

.3 Install insulation port extensions as required.

.4 Locations:

.1 for air flow readings:

.1 ducted inlets to roof and wall exhausters.

.2 inlets and outlets of other fan systems.

.3 main and sub-main ducts.

.4 and as indicated.

.2 for temperature readings:

.1 at outside air intakes.

.2 in mixed air applications in locations as approved.

.3 at inlet and outlet of coils.

.4 downstream of junctions of two converging air streams of different temperatures.

.5 and as indicated.

.4 Turning vanes:

.1 Install in accordance with recommendations of SMACNA and as indicated.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies balancing dampers for ventilation and air conditioning installations.

.2 Related sections

.1 23 33 00 – Air Duct Accessories.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA)

.1 SMACNA, HVAC Duct Construction Standards, Metal and Flexible-2005.

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

.1 Material safety data sheets (MSDS).

1.3 SUBMITTALS

.1 Product data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish and limitations.

.1 If necessary, submit two (2) copies of material safety data sheets as per Workplace Hazardous Materials Information System (WHMIS), which must comply with this system.

.2 Product data sheets must include:

.1 blades;

.2 operating leverage;

.3 interlocking.

PART 2 PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SPLITTER DAMPERS

.1 Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.

.2 Single thickness construction.

.3 Control rod with locking device and position indicator.

.4 Rod configuration to prevent end from entering duct.

.5 Pivot: piano hinge.

.6 Folded leading edge.

2.3 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height 250 mm or as indicated.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Inside and outside nylon end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

.3 Maximum blade height: 100 mm.

.4 Bearings: pin in bronze bushings self-lubricating nylon.

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 Dampers: vibration free.

.6 Ensure damper operators are observable and accessible.

.7 Corrections and adjustments conducted by Departmental Representative.

3.3 TESTING

.1 Testing must take place over a minimum period to demonstrate that the system operates as specified.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies dampers for ventilation and air conditioning installations.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A653/A653M-04a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

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

.1 Material safety data sheets (MSDS).

1.3 SUBMITTALS

.1 Product data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Product data sheets must include:

.1 performance characteristics.

.2 Closeout submittals

.1 Submit operation and maintenance data for incorporation into manual.

PART 2 PRODUCTS

2.1 MULTI-LEAF DAMPERS

.1 Opposed and/or parallel blade type as indicated.

.2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded aluminum frame.

.3 Pressure fit self-lubricated bronze bearings.

.4 Linkage: brass pivots and plated steel brackets, complete with plated steel control rod.

.5 Performance:

.1 Leakage: in closed position less than 34.4 L/s/m^2 of rated air flow at 100 Pa differential across damper.

.2 Pressure drop: at full open position less than 40 Pa differential across damper at 7.5 m/s.

.3 Except for dampers mentioned in article 2.1.1, the product of acceptance for all dampers must be Series 1500 from Tamco or approved equivalent.

.6 Insulated aluminum dampers:

.1 Frames: insulated with extruded polystyrene foam with RSI 0.88.

.2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane foam, RSI 0.88.

.3 All dampers installed on a fresh air duct or exhaust air duct (except when building is not heated) must be insulated.

.4 Acceptable product: Series 9000 BF from Tamco or approved equivalent.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.

.3 Seal multiple damper modules with silicon sealant.

.4 Install access door adjacent to each damper. See Section 23 33 00 – Air Duct Accessories.

.5 Ensure dampers are observable and accessible.

3.3 TESTING

.1 Testing must take place over a minimum period to demonstrate that the system operates as specified.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies fire and smoke dampers.

1.2 REFERENCES

.1 American National Standards Institute/National Fire Protection Association (ANSI/NFPA)

.1 ANSI/NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

.2 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S112-10, Standard Test Method of Fire Test of Fire Damper Assemblies.

.2 CAN/ULC-S112.2-07, Standard Method of Fire Test of Ceiling Fire Stop Flap Assemblies.

.3 ULC-S505-1974, Standard for Fusible Links for Fire Protection Service.

1.3 SUBMITTALS

.1 Product data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for fire and smoke dampers and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Product data must indicate the following:

.1 fire dampers;

.2 smoke dampers;

.3 fire stop flaps;

.4 operators;

.5 fusible links;

.6 design details of break-away joints.

PART 2 PRODUCTS

2.1 FIRE DAMPERS

.1 Fire dampers: arrangement Type B, listed and bear label of ULC, to meet requirements of Fire Commissioner of Canada (FCC) and ANSI/NFPA 90A. Fire damper assemblies fire tested in accordance with CAN4/ULC-S112.

.2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.

.1 Fire dampers: 1-1/2 hour fire rated unless otherwise indicated.

.2 Fire dampers: automatic operating type with dynamic rating suitable for maximum air velocity and pressure differential to which they will be subjected.

.3 Top hinged: offset guillotine type; sized to maintain full duct cross section as indicated.

.4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.

.5 40 mm x 40 mm x 3 mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.

.6 Equip fire dampers with steel sleeve or frame installed without disrupting ductwork or impairing damper operation or air duct passage.

.7 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.

.8 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.

.9 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition of floor slab depth or thickness.

.10 Unless otherwise indicated, the installation details given in SMACNA Install Fire Damp HVAC and in manufacturer's instructions for fire dampers shall be followed.

2.2 FIRE AND SMOKE DAMPERS

.1 Smoke Dampers: to be ULC or UL listed and labelled. Fire and smoke dampers must be conform to requirements of Fire Commissioner of Canada (FCC) and NFPA 90A. Fire damper assemblies fire tested in accordance with CAN/ULC-S112

.2 Normally open smoke/seal (S/D-SSSD): folding blade type, closing when actuated by means of electro thermal link from remote alarm signalling device. Blade edge seals of flexible stainless steel to provide required constant sealing pressure. Provide stainless steel negator springs with locking devices to ensure positive closure for units mounted horizontally in vertical ducts.

.3 Electro thermal link (S/D-ETL): dual responsive fusible link which melts when subjected to local heat of 74degrees C and from external electrical impulse of low power and short duration; ULC or UL listed and labelled.

2.3 SMOKE DAMPERS

.1 Smoke Dampers: to be ULC or UL listed and labelled.

.2 Normally open smoke/seal (S/D-SSSD): folding blade type, closing when actuated by means of electro thermal link from remote alarm signalling device, division 26. Blade edge seals of flexible stainless steel to provide required constant sealing pressure. Provide stainless steel negator springs with locking devices to ensure positive closure for units mounted horizontally in vertical ducts.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 INSTALLATION AND INSPECTION

.1 Install in accordance with ANSI/NFPA 90A and in accordance with conditions of ULC listing.

.2 Maintain integrity of fire separation.

.3 After completion and prior to concealment, obtain approvals of complete installation from authority having jurisdiction.

.4 Install access door adjacent to each damper. See Section 23 33 00 – Air Duct Accessories.

.5 Coordinate with installer of fire stopping.

.6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.

.7 Install break-away joints of approved design on each side of fire separation.

3.3 COMMISSIONING

.1 Do all activities, all tasks and provide all required documents for commissioning the equipment and systems required for early delivery and the final commissioning, according to the requirements of this specification and commissioning sections.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section includes domestic and commercial grade supply air linear slot diffusers and return air linear diffusers.

1.2 SUBMITTALS

.1 Product data

.1 Submit manufacturer's instructions, printed product literature and data sheets for products and include product characteristics, performance criteria and limitations.

.2 Data sheets to indicate following:

.1 capacity;

.2 throw and terminal velocity;

.3 noise criteria;

.4 pressure drop;

.5 neck velocity.

PART 2 PRODUCTS

2.1 GENERAL

.1 Products whose characteristics meet the requirements on drawings for: capacity, pressure drop, throw and terminal velocity, noise criteria and neck velocity.

2.2 GRILLES AND DIFFUSERS

.1 Housing

.1 Housing of standard welded steel with visible joints, polished and perfectly sealed.

.2 Housing of extruded aluminum with mechanical fasteners and seals perfectly tight angles.

.3 Seal around the entire periphery..

.4 Mounting frame – coated for the housing as directed.

.5 Attaching devices are hidden

.2 Manual and hidden manoeuvering devices for volumetric registers, as indicated.

.3 Standard colour, unless otherwise indicated.

.4 See table on drawings for details.

.5 Acceptable products: Nailor, Titus, Price, Krueger.

2.3 MANUFACTURED PRODUCTS

.1 Diffusers, registers and grilles provided must be of same type and from the same manufacturer.

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 data sheets.

3.2 INSTALLATION OF GRILLES AND DIFFUSERS

.1 Install grilles, registers and diffusers in accordance with manufacturer's instructions.

.2 Where attachment elements are visible, use round-head screws and sink them into countersunk holes.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section contents

.1 Louvres, air intakes and other vents integrated to the mechanical systems, and devices for strengthening and bracing used to ensure the vents, air intakes and goose-necks resistance required for wind loads.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/ National Fire Protection Association (NFPA)

.1 ANSI/NFPA 96-04, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.2 National Fire Protection Association (NFPA)

.1 NFPA 96-[11], Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.4 Society of Automotive Engineers (SAE)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for louvers, intakes and vents and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Indicate following:

.1 Pressure drop.

.2 Face area.

.3 Free area.

PART 2 PRODUCTS

2.1 FIXED LOUVRES - ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: stormproof pattern with centre watershed in blade], reinforcing bosses and maximum blade length of 1500mm.

.4 Frame, head, sill and jamb: 100 mm deep one piece extruded aluminum, minimum 3mm thick with approved caulking slot, integral to unit.

.5 Mullions: at 1500 mm maximum centres.

.6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.7 Screen: 12 mm intake mesh, 1.6mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.8 Finish: factory applied enamel. Colour: to architect's approval.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with requirements, with manufacturer's written data, including product technical bulletins, instructions for handling, storage and installation of the products, and technical data sheets.

3.2 INSTALLATION

.1 In accordance with manufacturer's and SMACNA recommendations.

.2 Reinforce and brace as indicated.

.3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This section specifies the following:

.1 materials, accessories and installation for engine silencer, breeching, chimneys and stacks;

.2 double pipe chimneys and breeching for oil-fired appliances;

.3 special double pipe exhaust ducts for venting categories II, III and IV appliances.

1.2 REFERENCES

.1 NFPA: in compliance with NFPA 211 – Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.

.2 Underwriters' Laboratories (UL): in compliance with applicable section "UL Safety Standards"; provide UL listed products bearing UL certification label.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): in compliance with SMACNA Low Pressure Duct Standards for Fabricated Breeching and Smoke Pipe.

.4 AWS: in compliance with AWS Structural Welding Code for welder's qualifications, welding details, and workmanship standards.

.5 ASHRAE: in compliance with ASHRAE Equipment Handbook for Chimney, Gas Vent, and Fireplace Systems, material requirements and design criteria.

1.3 SUBMITTALS

.1 Product Data: submit product data including materials, dimensions, weights and accessories.

.2 Shop Drawings: submit a shop drawing of the layout, plans and elevations, including clearances, assembly, brackets and installation instructions

.3 Shop drawings must include the following:

.1 methods of sealing sections;

.2 methods of expansion;

.3 details of thimbles;

.4 bases/foundations;

.5 supports and anchors;

.6 guy details;

.7 rain caps;

.8 roof caps;

1.4 QUALITY ASSURANCE

.1 Certificates: submit a complete engineering report certifying that chimneys meet seismic design demands and wind loads.

1.5 MATERIALS OR PRODUCTS ACCEPTABLE

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

PART 2 PRODUCTS

2.1 DOUBLE PIPE CHIMNEYS AND BREECHING

.1 Positive pressure stainless steel chimneys and breeching. To UL1738 (for gas fixtures, catagorie II, III, and IV)

.2 The prefabricated product will be in compliance with NFPA211. This duct system shall be designed and installed to be gas tight. It is to be UL tested and listed in compliance with UL103 and ULC-S604-M91 to withstand up to 15" w.c. positive pressure and must only bear the UL certification label. This duct system shall be designed to compensate for all flue gas induced thermal expansions. Clearances to combustible materials shall be as per installation instructions.

.3 The joint assembly shall be a male/female slip-type jointing with flange to flange and V-band assembly.

.4 The single walled product shall be 24 Ga (0.6070 mm) SS 304 to UL 1738.. The materials and construction of the modular sections and accessories shall be as specified by the terms of the product's UL Listing.

.5 Acceptable products : Cheminée Lining.E inc. modèle HEP or approved equivalent

2.2 ACCESSORIES

.1 Hangers and supports: in accordance with SMACNA recommendations and as indicated.

.2 Seismic Hangers.

.3 Vented caps.

.4 Support accessories.

.5 Expansion sleeves with heat-resistant caulking, held in place as indicated.

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 data sheets.

3.2 INSTALLATION – GENERAL

.1 Follow manufacturer's and SMACNA installation recommendations for shop fabricated components.

.2 Suspend breeching at 1.5 m centres and at each joint.

.3 Support chimneys at bottom, roof and intermediate levels as indicated.

.4 Install thimbles where penetrating roof, floor, ceiling and where breeching enters masonry chimney. Pack annular space with heat-resistant caulking.

.5 Install flashings on chimneys penetrating roofs, as indicated.

.6 Install rain caps and cleanouts, as indicated.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section content

.1 This section specifies duct heaters, materials, equipment and related installation methods.

1.2 RERERENCES

.1 Canadian Standards Association (CSA)/CSA International.

.1 CSA C22.2 No.46-M1988 (R2011), Electric Air-Heaters.

1.3 SUBMITTALS

.1 Product data must include:

.1 element support details;
.2 heater: total kW rating, voltage, phase;
.3 number of stages;
.4 rating of stage: rating, voltage, phase;
.5 heater element watt/density and maximum sheath temperature;
.6 maximum discharge temperature;
.7 dimensions;
.8 unit support;
.9 operating limitations;
.10 clearance from combustible materials;
.11 internal components wiring diagrams;
.12 minimum operating airflow;
.13 minimum and maximum airflow pressure drop.

PART 2 PRODUCTS

2.1 HEATING COILS

.1 Heating coils for in-duct installation, flange type or insert type as indicated

.2 Heating Elements

.1 Components of helical coils in nichrome resistance wire.
.2 Protective grating on both sides of heating elements.

.3 Stages

.1 Heating coils at various stages of heating, with balanced current demand for each stage.
.2 Heating coils designed so that heat is uniformly distributed throughout the air stream at each heating stage.
.3 Specifications: as per drawings.

.4 Control / regulation devices

.1 Factory prewired control / control devices mounted in a housing, comprising the following:

.1 Disconnector without fuse

.2 Magnetic contactors;

.3 Control Transformer;

.4 Manual and automatic thermal protection

.5 Flow switch (PD switch) or electronic protection control for high temperature.

.6 An SCR type controller (modulating 0-10 volts)

.2 If the control/regulating devices are integrated into the heating coils, mount the contactors so as to minimize the transmission of switching noise in the air ducts.

.5 Electrical Characteristics

.1 Nominal specifications for heating coils

.1 Power: according to specifications

.2 Fixed and modulating stages: according to plans

.3 Voltage: according to specifications

.4 Number of phases: according to drawings

.6 Acceptable products: Thermolec, Neptronic, PM Wright.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install coil in place. Refer to the manufacturer's installation manual for on-site handling instructions

.2 Install required access doors for maintenance and inspection and coordinate positioning with other subcontractors for use.

.3 Ensure seal between connecting ducts and coils.

.4 Anchor all coil installations in an earthquake-resistant manner to the architectural structure and coordinate the design and installation of seismic elements to ensure access to coils and associated equipment and components provided and installed by other subcontractors.

.5 Remove all shipping ties.

.6 Coordinate the positioning of anchors, provided and installed by the general contractor, above the coils to permit replacement, see structural and architectural plans in reference.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section contents:

.1 Materials, components and installation methods associated with air-to-air energy recovery systems

.2 Related requirements

.1 23 33 00 – Air Duct Accessories.

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 84-1991, Method of Testing Air-to-Air Heat/Energy Exchangers (ANSI approved).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for energy recovery equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

PART 2 PRODUCTS

2.1 GENERAL

.1 Comply with ASHRAE 84.

.2 The devices must be certified to UL 1812 and C22.2 no. 113

.3 Ventilation unit with core for sensitive energy recovery.

.4 The unit shall be one-piece and consist of the following elements:

.1 A sensitive energy recovery core;

.2 A supply fan;

.3 An exhaust fan;

.4 MERV 8 filters upstream of the heat wheel in the two air circuits covered with dirty filter contacts integrated for two (2) filtration sections;

.5 A single wall cabinet for indoor installation;

.6 Temperature sensors, electrical components and controls microprocessor for autonomous operation.

.5 The unit must be delivered completely assembled at the factory, with probes and internal controls, ready for connection once on-site.

2.2 Ae-1 Unit

.1 Recovery Core

.1 The heat transfer section shall consist of a core installed in a frame with sealed joints.

.2 The core must allow the transfer of sensitive heat from the exhaust air to the fresh air against the current.

.3 No contamination between the intake air circuit and the exhaust air circuit will be tolerated.

.4 One or more condensation basins with drainage fittings for condensate draining should be provided in the section of the recovery core.

.5 The recovery core must be easily removable to facilitate maintenance.

.6 The core must be sliding and can be pulled out from the outside of the unit.

.7 Energy recovery performance must be issued in accordance with AHRI-1060 standard and be certified AHRI.

.8 The recovery core must meet the requirements of NFPA 90A standard for flame spread and smoke ratings.

.2 Case

.1 The case must be a single-wall construction of 22-gauge galvanized c/w 25 mm of wool fiberglass internal insulation.

.2 The floor must be insulated with 25 mm of wool fiberglass and protected under the unit by a 22 gauge galvanized G90 steel sheet.

.3 The outer wall must be made of galvanized steel 22 gauge pre-painted with a polyurethane paint and silicone resist 150 smears (return) methyl ethyl ketone with (MEK) when tested according to ASTM D5402 standard.

.4 The case shall have no screws penetrating from the outside to the inside of cabinet and through the internal insulation.

.5 Gaskets of access panels must be of top quality soft neoprene.

.6 All exterior joints must be sealed and blocked using a bead of waterproof elastomeric polyurethane caulking.

.7 Peripheral base shall be provided with lifting and suspension lugs.

.8 Hinged access doors will be equipped with high-quality full-rotation opening handles with integrated lock.

.3 Fans

.1 The supply and exhaust fans will be plenum type with blades inclined to the back.

.2 The fans should be statically and dynamically balanced at the factory.

.3 Fan performance must be certified to the standard 210 AMCA.

.4 Assembly of fans to be on rubber vibration isolators.

.5 Fan bearings are sealed and permanently lubricated.

.4 Motors

.1 The motors must be of PSC or equivalent.

.2 Efficiency: EPAC

.3 The drive between the motors and fans will be direct.

.4 3-speed motors (High/medium/low speed)

.5 Filters

.1 Each air stream must be equipped with replaceable-type pleated MERV 8 filters MERV 8, 2 inches thick.

.2 These filters should be installed upstream of recovery core in each air circuit.

.3 Performance of filters must be tested according to the ASHRAE 52.2 and be ULC class 2 approved.

.4 The supply system filters must be of a MERV-8 efficiency.

.5 The exhaust system filters must be of a MERV-8 efficiency.

.6 Vibration isolator

.1 Spring-type vibration isolators Vibra-Sil SR2 for suspension from the ceiling.

.7 Electrical supply and control

.1 The unit must have a single point of electrical connection with included cable and connector plug.

.2 The supply voltage is 120 V/1/60.

.3 Transformer 24 VAC/20 VA and low voltage terminals.

.4 Integrated magnetic starters for engines.

.5 Electronic Calibration airflows with final adjustment potentiometer airflow for each fan.

.6 Internal control unit microprocessor.

.7 Stop contact departure and general alarm unit.

.8 The electrical data must be:

.1 FLA: 5,5 A.

.8 Ventilation performance

.1 Air supply flow 165 l/s (350 CFM)

.2 Air exhaust flow: 165 l/s (350 CFM)

.3 External static pressures (supply): 188 pa (0,75 po H2O)

.4 External static pressures (exhaust): 188 pa (0,75 po H2O)

.9 Operating conditions

.1 Summer:

.1 Exterior

.1 Dry bulb (DB): (84°F)

.2 Wet bulb (WB): (73°F)

.2 Interior

.1 Dry bulb (DB): (75°F)

.2 Wet bulb (WB): (63°F)

.2 Winter:

.1 Exterior

.1 Dry bulb (DB): (23°F)

.2 Wet bulb (WB): (15°F)

.2 Interior

.1 Dry bulb (DB): (70°F)

.2 Wet bulb (WB): (58°F)

.10 Defrosting

.1 Defrost by preheating fresh air (external electrical coil unit). No defrosting sequence and downtime of the outside air supply will be permitted.

.11 Recovery efficiency

.1 Winter

.1 Sensitive: 52,4 %

.2 Summer

.1 Sensitive : 62,5 %

.12 Acceptable Products: Aldes model H650A-Fi, Venmar or approved equivalent.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with requirements, with manufacturer's written data, including product technical bulletins, instructions for handling, storage and installation of the products, and technical data sheets.

3.2 INSTALLATION

.1 Install in accordance with manufacturers recommendations.

.2 Support independently of adjacent ductwork with flexible connections.

.3 Install access doors in accordance with Section 23 33 00- Air Duct Accessories for access to coils and dampers.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section contents

.1 This section treats the equipment, materials and installation methods for the incremental electrical heating/cooling equipment, as well as related accessories.

1.2 REFERENCES

.1 Health Canada - Information system on Hazardous Materials (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for incremental heating and cooling units and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Include information as follows:

.1 Replacement data for motor element, thermostat and switch.

.2 Mounting methods.

.3 kW rating.

.4 Cabinet material thicknesses.

.5 Dimensions

.6 finish

.7 Cabinet surface temperature.

.8 Thermostat, transformer, controls where integral.

.3 Submit WHMIS MSDS in accordance with Hazardous Materials. Indicate VOC's for adhesive and solvents during application and curing.

.2 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.3 Certificates: submit certificates signed by manufacturer certifying that the products, materials and equipment comply with specifications for their physical characteristics and performance criteria.

.4 Manufacturer's Field Reports:

.5 Submit manufacturer's field reports specified.

.6 Close-out Submittals: Operation and Maintenance Data: submit operation and maintenance data for incremental heating and cooling units for incorporation into manual.

1.4 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

PART 2 PRODUCTS

2.1 HEATING/COOLING UNITS

.1 Supply and install an air conditioning/heating unit (air-source heat pump) to separate elements of a cooling capacity of 36,000 BTU/h in total, using an external condenser and an internal evaporator connected by the copper refrigeration piping provided with welded connections.

.2 Outdoor unit must contain the total amount of Freon R-410A system. If the load is incomplete due to the installation distance, the freon charge must be completed on-site according to the manufacturer's requirements.

.3 The outdoor unit must be equipped with a quiet rotary compressor equipped with service valves and a charging valve, having an additional manufacturer's guarantee of seven (7) years.

.4 Condenser coils and evaporator must be constructed of aluminum fins mechanically bonded to copper seamless tubes.

.5 The unit must bear the ARI certification symbol and must be CSA approved.

.6 Control/regulation devices

- .1 The unit will be controlled using a wall control (wired).

.7 Air filters: washable and easily removable.

.8 Electrical characteristics:

- .1 Voltage : 208 -1-60 Hz
- .2 Max fuse Size : 30 A
- .3 MCA : 23,3 A

.9 Efficiency:

- .1 SEER : 15,5
- .2 EER (cooling): 2,5 kW/kW
- .3 COP (heating): 2,94 kW/kW
- .4 HSPF (heating): 9,0 Btu/hW

.10 Noise levels:

- .1 Exterior unit (condensor): 55 dB (A)
- .2 Interior unit (evaporator): 50 dB (A)

.11 Specified product:

- .1 Exterior module (condensor) : Fujitsu model AOU36RLXB
- .2 Interior module (evaporator) : Fujitsu model ASU36RLXB
- .3 Interior mural controler (cable) : Fujitsu model UTY RVNUM

.12 Acceptable products: Fujitsu, Mitsubishi, or approved equivalent.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: conform to manufacturer's written requirements, recommendations and specifications, including product technical bulletins, instructions for handling, storage and installation, and technical data sheets.

3.2 INSTALLATION

.1 Install in accordance with manufacturer's written instructions.

.2 Make power and control connections.

.3 Ensure positive contact between condenser frame and exterior louvre to prevent cross- ventilation of supply and discharge air.

.4 For the outdoor unit, when installed on the wall, the contractor must respect the distances recommended by the manufacturer and also according to the requirements of the owner. In addition, the appliance is installed at a reasonable height to facilitate maintenance.

3.3 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

- .1 Set controls and operate each unit.
- .2 Take readings and record:
  - .1 Current.
  - .2 Air velocity at discharge.
  - .3 Discharge air temperature.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section contents

.1 This section treats the commercial convectors (baseboard heaters), their characteristics, control and adjustment such as the thermostats/relays and their installation methods.

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No.46-M1988 (R2006), Electric Radiators.

.2 Underwriters' Laboratories (UL)

.1 UL 1042-2009, Standard for Electric Baseboard Heating Equipment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for convectors and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's Instructions: provide to indicate special handling criteria, installation sequence, and cleaning procedures

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 convectors for incorporation into manual.

PART 2 PRODUCTS

2.1 BASEBOARD CONVECTORS

.1 Heaters: to standard CSA C22.2 No.46 with connection box both ends.

.1 Element through-type fitted with aluminum convector vanes and resistor wire enclosed in mineral insulation in copper sheath.

.2 Element: locked to cabinet and supported at additional points throughout length to allow for linear expansion without cracking sound.

.3 Cabinet: to CSA C22.2 No.46, pre-drilled back for securing to wall. Integral air diffusion reflector with wireway at bottom.

.1 Bottom front inlet/ sloping front top outlet.

.2 Panel: steel 18 calibre for the housing and 16 calibre for the heating vanes.

.3 Finish: phosphatized and finished with powder coated finish, white.

.4 Blank cabinet sections and inside corners complete with wireway in sections including splice plates, to match heater cabinets in respects for continuous baseboard effect as indicated.

2.2 CONTROLS

.1 Wall mounted thermostats: type electronic or low voltage.

.1 Thermostat type 1 with the following characteristics:

.1 Power: 3475W at 208 volts.

.2 One-time programming

.3 Display in Celsius or Fahrenheit.

.4 White colored plastic housing.

.5 Digital display that simultaneously displays the ambient temperature and the temperature setpoint

.6 Temperature range from 3 to 30 ° C (37 to 86 ° F)

.2 Low voltage thermostat type 2 with the following characteristics:

.1 Operating voltage: 24V, 0.5A

.2 Operate baseboards relay (4 relays maximum thermostat)

.3 Display in Celsius or Fahrenheit

.4 White colored plastic housing.

.5 Programming for Lowering of night temperature.

.6 Temperature range from 3 to 30 ° C (37 to 86 ° F)

.7 Backlit display

.2 Integral thermostats 2 pole to control load as indicated.

.3 Relays without transformers to regulate the power of the fixtures according to indications.

.1 Pulsed signal (PWM) all or nothing (ON/OFF) to 24Vac, 3-32Vdc signal

.2 Installation in the junction box of the baseboard

.3 For use with type 2 thermostat

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 convectors installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install baseboard convector heaters, blank sections and controls.

.2 When wireway is used, remove knock-outs and insert insulating bushing between units.

.3 Install grounding wire to maintain ground integrity between heating, blank, and auxiliary sections.

.4 Install thermostats in locations indicated.

.5 Make power and control connections.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Ensure heaters and controls operate correctly.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by commercial convectors installation.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Contents of this section

.1 This section treats the electric unit heaters, their voltage, power, thermostats and characteristics as well as their installation methods.

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No.46-M1988(R2006), Electric Air-Heaters.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA 250-[08], Enclosures for Electrical Equipment (1000 V Maximum).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for unit heaters and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's Instructions: provide to indicate special handling criteria, installation sequence, and cleaning procedures.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for unit heaters for incorporation into manual.

PART 2 PRODUCTS

2.1 UNIT HEATERS

.1 Unit heater: to CSA C22.2 No.46, horizontal discharge complete with adjustable louvers finished to match cabinet with various finishes to match surface of wall.

.2 Fan motor: permanently lubricated ball bearing totally enclosed.

.1 Built-in fan motor thermal overload protection.

.3 Heating element of nickel –chrome alloy

.4 Cabinet: steel, 20 calibre for housing and 18 caliber for grille.

.1 Phosphatized and finished with epoxy-polyester powder.

2.2 CONTROLS

.1 Built in thermostat and support controls.

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 unit heaters installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install thermostats on surfaces.

.2 Make power and control connections.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Test cut-out protection when air movement is obstructed.

.3 Test fan delay switch to assure dissipation of heat after element shut down.

.4 Ensure heaters and controls operate correctly.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.1 Leave Work area clean at end of each day.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by unit heaters installation.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Contents

.1 Infrared heating radiators sealed combustion circuit (suction cup), condensation, condensing, forced draft, natural draft, connected and not connected to an exhaust duct, high-intensity, low intensity, powered natural gas or propane gas.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/CSA Group

.1 ANSI Z83.19a/CSA 2.35a-2011, Gas-Fired High-Intensity Infrared Heaters.

.2 Canadian Gas Association(CGA)

.1 CSA B149.1-05, Natural Gas and Propane Installation Code.

.3 CSA Group

.1 CSA C22.1-02, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

.4 Health Canada / Information System Hazardous Materials (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for radiant heating units and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop Drawings:

.1 Devices, their power and related piping and connections.

.2 Dimensions, construction details of internal and external parts, the details of the proposed support, the recommended installation instructions, as well as dimensions and location of the holes for the mounting bolts.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Submit manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for radiant heating units for incorporation into manual.

1.5 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

PART 2 PRODUCTS

2.1 GENERAL

.1 Provide CSA approved, packaged factory assembled components consisting of heat exchangers, burners, controls, air filters, vacuum generators, reflectors, fans, 2-step and control gas valves.

2.2 Low Intensity Infrared Radiant Heater

.1 Source of heating energy: Propane

.2 Heat output in 2 heating steps (high heat, low heat):

- .1 Step 1 - 9.23 kW (31 500 Btu/h)
- .2 Step 2 – 14.65 kW (50 000 Btu/h total).

.3 Dimensions

- .1 Length: 282 mm (111")
- .2 Width: 470 mm (18, 5")
- .3 Height: 133,35 mm (5,5")
- .4 Length of U-tube: 4571 mm (180")

.4 Pressures

- .1 Pressure at burner: 10'' W.C.
- .2 Supply pressure: min. 11" W.C., max. 14" W.C.

.5 Electrical supply:

- .1 120 V, 1 phase, 60 Hz.
- .2 2.6 A.

.6 Ignition: direct spark

.7 Connections:

- .1 Air admission: 100mm (4")
- .2 Evacuation of combustion gases: 100mm (4")

.8 Options and accessoires:

- .1 2-step Gas Valve and 3-position control selector ((Low heat, Stop, High heat).
- .2 Protective guard to the burner and the control box
- .3 Protective guard to the heat emitter (U-tube).
- .4 Brackets and adjustable suspension cables.
- .5 Pressure regulator.
- .6 Evacuation wall cap approved by the manufacturer.

.9 Acceptable products: Space Ray Cold Blocker CB 50, or approved equivalent.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with requirements, with manufacturer's written data, including product technical bulletins, instructions for handling, storage and installation of the products, and technical data sheets.

3.2 INSTALLATION

.1 Install infrared radiant system in accordance with CSA B149.1, as recommended by manufacturer and as indicated.

.2 Provide grading of radiant pipe as required.

.3 Make provision for pipe movement caused by normal operation and expansion.

.4 Maintain required clearances from combustibles.

.5 Follow manufacturer's detailed installation, testing, operation and maintenance instructions.

.6 Install thermostats where indicated. Supply heat shields where recommended by manufacturer.

.7 Test radiant system as recommended by manufacturer and required by authorities having jurisdiction. Air test piping for leaks. Check burner safety controls.

.8 Arrange equipment, including burners, vacuum generators, to facilitate removal without dismantling pipe, reflectors, or associated apparatus.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Contents

.1 Materials, equipment and installation methods associated with steam injection humidifiers and related accessories.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for humidifiersand include product characteristics, performance criteria, physical size, finish and limitations.

.1 Submit shop drawings to indicate

.1 project layout,

.2 dimensions

.3 accesories included and exclusded

1.3 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials required

.2 Furnish list of individual manufacturer's recommended spare parts for equipment, addresses of suppliers, list of specialized tools necessary for adjusting, repairing or replacing, for inclusion into operating manual.

1.4 ACCEPTABLE MATERIALS OR PRODUCTS

.1 When materials or products are prescribed by their trademark, consult the instructions to tenderers in order to know the procedure concerning the request for approval of materials or substitutes.

PART 2 PRODUCTS

2.1 HUMIDIFIERS – STEAM INJECTION

Humidifier shall be a packaged steam injection type humidifier or multiple tube dispersion assembly ready for insertion into the duct.

.1 HumidiPack CF includes a vertical pipe-within-a-pipe fabricated separator/header and multiple dispersion tube design of all stainless steel construction.

.2 Active dispersion tubes are pre-heated with an internal pipe carrying steam to the far end of the dispersion tube. Steam is then allowed to travel thru an oversized dispersion tube allowing maximum separation of steam from condensate prior to discharge through a series of dispersion nozzles that extend into the center of the tube.

.3 Each active tube is fitted with a series of plastic nozzles, which extend into the center of the tube. The nozzles are sized and spaced to accept steam from the separator/header and provide a dry and uniform discharge of steam.

.4 During periods of no demand, the entire tube bank assembly will be cold, providing no additional heat transferred into the active air flow.

.5 Complete dispersion panel assembly must be all welded construction. O-rings or slip fit couplings are not acceptable as O-rings add another level of required annual maintenance.

.6 Each Humidifier segment is designed for simplified duct mounting including stacking of header/separator/dispersion tube segments when necessary.

.7 Humidifier includes a steam supply control valve utilizing a parabolic plug design offering immediate response and precise modulation of flow throughout the ¾" valve stroke. The control valve is protected by a steam supply strainer and inverted bucket drip trap.

.8 Two float type drip trap will be used to drain the separator/header.

.9 All connected piping is to be on one side of the duct.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with requirements, with manufacturer's written data, including product technical bulletins, instructions for handling, storage and installation of the products, and information from technical sheets.

3.2 INSTALLATION

.1 Install in accordance with manufacturers instructions.

.2 Humidifier and evaporator media to be new and clean when project is accepted

.3 Install humidistat as indicated in accessible location.

.4 Water service overflow drain: as indicated on the drawings.

.5 Install access doors or panels in adjacent ducting.

.6 When installing in ducting, provide waterproof duct up and downstream in accordance with Section 23 31 13.01 – Metal Ducts – Low Pressure to 500 Pa

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 Methods and procedures for start-up, verification and commissioning for building Energy Monitoring and Control System (EMCS) and includes:

.1 Start-up testing and verification of systems.

.2 Check-out demonstration of proper operation of components.

.3 On-site operational tests.

.2 Related Sections

.1 01 91 31 – General Commissioning (Cx) Requirements.

1.2 DEFINITIONS

.1 AEL (Average Effectiveness Level): ratio between total test period less any system downtime accumulated within that period and test period.

.2 Downtime: results whenever EMCS is unable to fulfill required functions due to malfunction of equipment defined under responsibility of EMCS Contractor. Downtime is measured by duration, in time, between time that Contractor is notified of failure and time system is restored to proper operating condition. Downtime not to include following:

.1 Outage of main power supply in excess of back-up power sources, provided that:

.1 Automatic initiation of back-up was accomplished.

.2 Automatic shut-down and re-start of components were as specified.

.2 Failure of communications link, provided that:

.1 Controller automatically and correctly operated in stand-alone mode.

.2 Failure was not due to failure of any specified EMCS equipment.

.3 Functional failure resulting from individual sensor inputs or output devices, provided that:

.1 System recorded said fault.

.2 Equipment defaulted to fail-safe mode.

.3 AEL of total of all input sensors and output devices is at least 99% during test period.

1.3 DESIGN REQUIREMENTS

.1 Confirm with Departmental Representative that design criteria and design intents are still applicable.

.2 Commissioning personnel to be fully aware of and qualified to interpret design criteria and design intents.

1.4 SUBMITTALS

.1 Final report: submit report to Departmental Representative.

.1 Include measurements, final settings and certified test results.

.2 Bear signature of commissioning technician and supervisor.

.3 Report format to be approved by Departmental Representative before commissioning is started.

.4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to Departmental Representative.

.5 Recommend additional changes and/or useful modifications to improve room conditions or energy consumption.

.6 Provide information with regard to system performance in the form of graphics. Information within the graphics must contain trend points for each control loop.

1.5 CLOSEOUT SUBMITTALS

.1 Provide documentation, O&M Manuals and training materials of O&M personnel for review by Departmental Representative before interim acceptance.

1.6 COMMISSIONING

.1 Inform and obtain approval from Departmental Representative in writing at least seven (7) days prior to commissioning or each test. Indicate:

.1 Location and part of system to be tested or commissioned.

.2 Testing/commissioning procedures and anticipated results.

.3 Names of testing/commissioning personnel.

.2 Correct deficiencies, re-test in presence of Departmental Representative until satisfactory performance is obtained.

.3 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of contract.

.4 Load system with project software.

.5 Perform tests as required.

1.7 COMPLETION OF COMMISSIONING

.1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by Departmental Representative.

1.8 ISSUANCE OF FINAL CERTIFICATE OF COMPLETION

.1 Final Certificate of Completion will not be issued until receipt of written approval indicating successful completion of specified commissioning activities including receipt of commissioning documentation.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Provide sufficient instrumentation to verify and commission the installed system. Provide two-way radios.

.2 Instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.

.3 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than two (2) months prior to tests.

.4 Locations to be approved, readily accessible and readable.

.5 Application: to conform to normal industry standards.

PART 3 EXECUTION

3.1 PROCEDURES

.1 Test each system independently and then in unison with other related systems.

.2 Commission integrated systems.

.3 Debug system software.

.4 Optimize operation and performance of systems by fine-tuning PID values and modifying CDL's as required.

.5 Test full scale emergency evacuation and life safety procedures including operation and integrity of smoke management systems under normal and emergency power conditions as applicable.

.6 Test weather-sensitive systems twice: first at near winter design conditions and secondly under near summer design conditions.

.7 All existing control equipment that will be reused such as valves, damper motors, etc., must be verified and adjusted. If there are problems with existing equipment, the Contractor must notify the Departmental Representative.

3.2 FIELD QUALITY CONTROL

.1 Pre-installation testing

.1 General: consists of field tests of equipment just prior to installation.

.2 Testing may be on site or at Contractor's premises as approved by Departmental Representative.

.3 Configure major components to be tested in same architecture as designed system. Main components to be tested include the room control station and two (2) building controllers (BC's) including the MCU, LCU's and TCU'S of the EMCS.

.4 Equip each building controller with sensor and controlled device of each type (AI, AO, DI, DO).

.5 Additional instruments to include:

.1 DP transmitters.

.2 VAV supply duct SP transmitters.

.3 DP switches used for dirty filter indication and fan status.

.6 After setting, test zero and span in 10% increments through entire range while both increasing and decreasing pressure.

.7 Departmental Representative to mark instruments' tracking within 0.5% in both directions as "approved for installation".

.8 Transmitters above 1% error will be rejected.

.9 DP switches to open and close within 2% of set point.

.2 Completion testing

.1 General: test after installation of each part of system and after completion of mechanical and electrical hook-ups to verify correct installation and functioning.

.2 Include following activities:

.1 Test and calibrate field hardware including stand-alone capability of each controller.

.2 Verify each A-to-D convertor.

.3 Test and calibrate each AI using calibrated digital instruments.

.4 Test each DI to ensure proper settings and switching contacts.

.5 Test each DO to ensure proper operation and lag time.

.6 Test each AO to ensure proper operation of controlled devices. Verify tight closure and signals.

.7 Test operating software.

.8 Test application software and Contractor to provide samples of communication input procedures and all commands.

.9 Verify each CDL including energy optimization programs.

.10 Debug software.

.11 Blow out flow measuring and static pressure stations with high pressure air.

.3 Provide point verification list in table format including point identifier, point identifier expansion, point type and address, low and high limits and engineering units. Provide space on this list for the technician responsible for commissioning This document will be used in final start-up testing.

.4 Final start-up testing: upon satisfactory completion of tests, perform point-by-point test of entire system and provide:

.1 Two-technical personnel capable of re-calibrating field hardware and modifying software.

.2 Detailed daily schedule showing items to be tested and personnel available.

.3 Commissioning to commence during final start-up testing.

.4 O&M personnel to assist in commissioning procedures as part of training.

.5 Commissioning to be supervised by qualified supervisory personnel.

.6 Commission systems considered as life safety systems before affected parts of the facility are occupied.

.7 Operate systems as long as necessary to commission entire project.

.8 Monitor progress and keep detailed records of activities and results.

.5 Final operational testing: to demonstrate that EMCS functions in accordance with contract requirements.

.1 Prior to beginning of 30-day test demonstrate that operating parameters (set points, alarm limits, operating control software, sequences of operation, trends, graphics and CDL's) have

been implemented to ensure proper operation and operator notification in event of off-normal operation.

.1 Repetitive alarm conditions to be resolved to minimize reporting of nuisance conditions.

.2 Test to last at least 30 consecutive 24-hour days.

.3 Tests to include:

.1 Demonstration of correct operation of monitored and controlled points.

.2 Operation and capabilities of sequences, reports, special control algorithms, diagnostics, software.

.4 System will be accepted when:

.1 EMCS equipment operates to meet overall performance requirements. Downtime as defined in this section must not exceed allowable time calculated for this site.

.2 if the conditions of the contract have been fulfilled.

.5 In event of failure to attain specified AEL during test period, extend test period on day-to-day basis until specified AEL is attained for test period.

.6 Correct defects when they occur and before resuming tests.

.6 Departmental Representative to verify reported results.

3.3 REPORT

.1 Provide a commissioning report including all information necessary to verify operations. Each item must be signed and dated by the technician responsible for commissioning. The report must include, without being limited to, the following:

.1 I/O testing table.

.2 Verification of PID control loops.

.3 Verification of operating sequences.

.4 Provision of trend graphs and tables for each control loop for a period of seven (7) consecutive days.

.5 Each control point must be recorded as a trend from the beginning of commissioning and available for consultation.

.6 Air flow table for each sensor versus balancing reports.

.2 Tests must be recorded with test reports consisting of results measurements and observations. Recording of test procedures and results must be kept in a separate document that will be submitted to the Departmental Representative at the end of work.

.3 Complete the following forms available in the appendix in order to document the various tests:

.1 Digital Outputs Testing – Controllers (Appendix A).

.2 Digital Inputs Testing – Controllers (Appendix B).

.3 Room Parameter Control Loops Testing (Appendix C).

.4 System Parameter Control Loop Testing (Appendix D).

.5 Instrument Test Record (Appendix E).

.6 Operating Sequences Testing (Appendix F).

.7 Deviation Report (Appendix G).

.8 Record of Deviation Reports (Appendix H).

.4 Lists of I/O and sequence verification, appended to the present section, are examples of verification reports without being restricted to such.

.5 These tests are not restrictive in nature and represent an example only of the minimum requirements. Approval of content and format will be required by the Departmental Representative.

.6 A copy of these appendix files will be available upon request by the Contractor.

3.4 ADJUSTING

.1 Final adjusting: upon completion of commissioning as reviewed by Departmental Representative, set and lock devices in final position and permanently mark settings.

3.5 DEMONSTRATION

.1 Demonstrate to Departmental Representative operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs.

END OF SECTION

Panel ID: _____ Verified by: _____ Date: _____

DIGITAL OUTPUTS TESTING – CONTROLLERS										
Description			Test Setting – Output				Commissioning			Initials/ Date
Address	Point Name	Type of point: AO, DO	0% signal or stop	50% Signal	100% signal or activated	Accepted? (Yes/No)	Installation complete? (Yes/No)	Programming and adjustments of PID loops complete? (Yes/No)	Graphics complete and verified? (Yes/No)	

Panel ID: _____ Verified by: _____ Date: _____

DIGITAL INPUTS TESTING – CONTROLLERS										
Description			Test Setting – Output				Commissioning			Initials/ Date
Address	Point Name	Type of point: AI, DI	Analog system reading	Actual analog reading	Tolerance to specifications	Accepted? (Yes/No)	Installation complete? (Yes/No)	Alarms entirely configured? (Yes/No)	Graphics complete and verified? (Yes/No)	

Panel ID: _____ Verified by: _____ Date: _____

ROOM PARAMETER CONTROL LOOPS TESTING						
Room No.	**Control Loops**	**Applicable? (Yes/No)**	**Loop stable? (Yes/No)**	**Report attached? (Yes/No)**	**Accepted? (Yes/No)**	**Initials/Date**
	Differential pressure					
	Return or ambient temperature					
	Humidity					
	Supply flow					
	Return or exhaust flow					
	Differential pressure					
	Return or ambient temperature					
	Humidity					
	Supply flow					
	Return or exhaust flow					
	Differential pressure					
	Return or ambient temperature					
	Humidity					
	Supply flow					
	Return or exhaust flow					

Panel ID: _____ Verified by: _____ Date: _____

SYSTEM PARAMETERS CONTROL LOOP TESTING					
System	**Control Loops**	**Loop stable? (Yes/No)**	**Report appended? (Yes/No)**	**Accepted? (Yes/No)**	**Initials/Date**
Ventilation and heating system	Mixing temperature				
	Supply temperature				
	Pre-heating temperature				
	Exhaust recovery temperature				
	Return and supply humidity				
	Supply or return static pressure				
	Supply or return flow				
	Speed or other, as required				

INSTRUMENT TEST RECORD							
Instrument No.	Test No.	Model No.	Serial No.	Photocopy of certificate appended? (Yes/No)	Date of last calibration	Calibration due date	Initials/ Date

Panel ID: _____ Verified by: _____ Date: _____

OPERATING SEQUENCES TESTING					
Action	**Anticipated Results**	**Observed Results**	**Accepted? (Yes/Non)**	**Initials/Date**	**Remarques**
Reduce or increase set point for pressure, temperature, humidity, flow or other.	Control signal for damper, valve or VFD shall reduce or increase according to control loop activity.	Note signal setting and variable measured before and after variation.			
Simulate a controller breakdown.	Valves, dampers and signals must return to their position and their normal setting.	Note or generate reports on signal settings and variables measured before and after variation.			
Simulate a defect in a temperature sensor, pressure sensor, flow sensor or other, as required.	Valves, dampers and signals must return to their position and their normal setting.	Note or generate reports on signal settings and variables measured before and after variation.			
Simulate the following: power failure, return to normal power, emergency mode, unoccupied mode, winter mode, summer mode, or any another mode deemed critical.	The systems must start in sequence as per preprogrammed time delays. As per mode, the systems will be activated to react and respond to operating requirements.	Note or generate reports on actual time delays for systems to start up and operating sequences in emergency mode.			
Simulate low and high limits for temperature and pressure.	The system must stop and dampers, motors and valves will be controlled by the EMCS.	Note or generate reports on actual time delays for systems to start up and operating sequences in protection mode.			
Proceed with system start-up.	All alarms will be deactivated for a 15-minute period (adjustable).	Note or generate reports on alarms during deactivation.			

DEVIATION REPORT

Panel ID: _____ Verified by: _____ Date: _____

Description of problem
Surname, name: _____ **Signature:** _____ **Date:** _____
Impact
Surname, name: _____ **Signature:** _____ **Date:** _____
Recommended solution
Surname, name: _____ **Signature:** _____ **Date:** _____
Solution implemented
Surname, name: _____ **Signature:** _____ **Date:** _____
Incident closure: Complete (yes/no) _____ If no, see Incident Report no.: _____
Surname, name: _____ **Signature:** _____ **Date:** _____
Approved by:
Surname, name: _____ **Signature:** _____ **Date:** _____

RECORD OF DEVIATION REPORTS

Report No.	Start Date	End Date	Follow-up Date	Comments

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 Requirements and procedures for training program, instructors and training materials, for building Energy Monitoring and Control System (EMCS).

1.2 DEFINITIONS

.1 CDL – Control Description Logic.

1.3 SUBMITTALS

.1 Submit training proposal complete with hour-by-hour schedule including brief overview of content of each segment to the Departmental Representative 30 days prior to anticipated date of beginning of training.

.1 List name of trainer and type of visual and audio aids to be used.

.2 Show coordinated interface with other EMCS mechanical and electrical training programs.

.2 Submit reports within one (1) week after completion of Phase 1 and Phase 2 training program that training has been satisfactorily completed.

1.4 QUALITY ASSURANCE

.1 Provide competent instructors thoroughly familiar with aspects of EMCS installed as part of the present contract.

.2 The Departmental Representative reserves the right to approve instructors.

1.5 INSTRUCTIONS

.1 Provide instruction to designated personnel in adjustment, operation, maintenance and pertinent safety requirements of EMCS installed.

.2 Training to be project-specific.

1.6 TIME FOR TRAINING

.1 Number of days of instruction to be as specified in this section (1 day = 8 hours including two 15-minute breaks and excluding lunch time).

.2 Training courses shall take place during normal working hours before acceptance and handover of systems and facilities and before substantial achievement of work.

1.7 TRAINING MATERIALS

.1 Provide equipment, visual and audio aids, and materials for classroom training.

.2 Supply manual for each trainee, describing in detail data included in each training program.

.1 Review contents of manual in detail to explain aspects of operation and maintenance (O&M).

1.8 TRAINING PROGRAM

.1 1- day program to begin before 30-day test period at time mutually agreeable to the Departmental Representative.

.1 Train O&M personnel in functional operations and procedures to be employed for system operation.

.2 Supplement with on-the-job training during 30-day test period.

.3 Include overview of system architecture, communications, operation of computer and peripherals and report generation.

.4 Include detailed training on operator interface functions for control of mechanical systems, CDL's for each system and elementary preventive maintenance.

.5 General equipment layout, troubleshooting and preventive maintenance of EMCS components, maintenance and calibration of sensors and controls.

.6 Training must cover control logic, control loop programming, point configuration, alarm deactivation, trend point generation, trend graphic generation, data archiving, etc.

.7 Graphic page generation, point integration system drawings, mapping points integration, etc.

1.9 ADDITIONAL TRAINING

.1 List courses offered by name, duration and approximate cost per person per week. Note courses recommended for training supervisory personnel.

1.10 MONITORING OF TRAINING

.1 The Departmental Representative will monitor training program and may modify schedule and content.

PART 2 PRODUCTS

.1 N/A.

PART 3 EXECUTION

.1 N/A.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 General requirements for Division 25 – Building Energy Monitoring and Control System (EMCS).

.2 Related sections

.1 Division 26 – Electricity.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/The Instrumentation, Systems and Automation Society (ISA).

.1 ANSI/ISA 5.5-1985, Graphic Symbols for Process Displays.

.2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE).

.1 ANSI/IEEE 260.1-1993, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.1 ASHRAE STD 135-R2001, BACNET – Data Communication Protocol for Building Automation and Control Network.

.4 Canadian Standards Association (CSA International).

.1 CAN/CSA-Z234.1-89 (C1995), Canadian Metric Practice Guide.

.5 Consumer Electronics Association (CEA).

.1 CEA-709.1-B-2002, Control Network Protocol Specification.

.6 Department of Justice Canada (Jus).

.1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

.2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.7 Electrical and Electronic Manufacturers Association (EEMAC).

.1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

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

.1 Material Safety Data Sheets (MSDS).

.9 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.10 Quebec Construction Code (*Code de construction du Québec*)

.1 Chapter I – Buildings and the National Building Code Canada 2005.

.11 Quebec Construction Code (*Code de construction du Québec*)

.1 Chapter V – Electricity 2010 (C22.10-10).

1.3 ACRONYMS AND ABBREVIATIONS

.1 Acronyms used in EMCS:

.1 AC – Applications Controller.
.2 AEL – Average Effectiveness Level.
.3 AI – Analog Input.
.4 AIT – Agreement on International Trade.
.5 AO – Analog Output.
.6 BACnet - Building Automation and Control Network as developed by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers).
.7 CA – Circuit Analyser.
.8 CAD – Computer Aided Design.
.9 CDL – Control Description Logic.
.10 CMS - Centralized Management System.
.11 COSV – Change of State or Value.
.12 CPU – Central Processing Unit.
.13 CS – Control schematics.
.14 DI – Digital Input.
.15 DO – Digital Output.
.16 ECU – Equipment Control Unit.
.17 EMCS – Energy Monitoring and Control System.
.18 HVAC – Heating, Ventilation, Air Conditioning.
.19 IDE – Interface Device Equipment.
.20 I/O - Input/Output.
.21 ISA – Industry Standard Architecture.
.22 LAN – Local Area Network.
.23 LCU – Local Control Unit.
.24 LonWorks – Trademark open communication protocol developed by ECHELON.
.25 MCU – Master Control Unit.
.26 Modbus – Trademark communication protocol developed by Modicom.
.27 NAFTA – North American Free Trade Agreement.
.28 NC – Normally Closed.
.29 NO – Normally Open.
.30 OPC – Trademark open communication protocol mainly used in industrial automation, developed by OPC Foundation.
.31 OS – Operating System.
.32 OWS – Operator Work Station.

.33 O&M – Operation and Maintenance.

.34 PC – Personal Computer.

.35 PCMCIA – Personal Computer Micro-Card Interface Adapter.

.36 PID – Proportional, Integral and Derivative.

.37 RAM – Random Access Memory.

.38 ROM – Read Only Memory.

.39 TCU – Terminal Control Unit.

.40 UPS – Uninterruptible Power Supply.

.41 USB – Universal Serial Bus.

.42 VAV - Variable Air Volume.

1.4 DEFINITIONS

.1 Point: may be logical or physical.

.1 Logical points: values calculated by system such as totals, counts, derived corrections and may include, but not limited to result of and statements in CDL's.

.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 with related equipment (stop, start) and valve or damper actuators.

.2 Point name: composed of two parts, point identifier and point expansion.

.1 Point identifier: comprised of three descriptors, "area" descriptor, "system" descriptor and "point" descriptor, for which database to provide 25-character field for each 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 or logical point description. For point identifier "area", "system" and "point" will be shortforms or acronyms. Database must provide 25-character field for each point identifier.

.2 Point expansion : comprised of three (3) fields, one for each descriptor. Expanded form of shortform or acronym used in "area", "system" and "point" descriptors is placed into appropriate point expansion field. Database must provide 32-character field for each point expansion.

.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 DI (digital input).

.4 DO (digital output).

.5 Pulse signals.

.4 Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5.

.1 Printouts: to ANSI/IEEE 260.1.

.2 Refer also to Section 25 05 54 – EMCS: Identification.

1.5 RESPONSIBILITY

.1 The sections of Division 25 fall under the responsibility of a single subcontractor called the Controls Subcontractor.

.2 The Controls Subcontractor must become familiar with overall mechanical and electrical drawings, specifically (but not limited to) for locating equipment that he must connect (ex.: starters, chillers, etc.) as well as location of his own equipment (sensors, valves, actuators, etc.).

.3 The Controls Subcontractor is responsible for all control strategies and must anticipate future expansion of system capacity. If control components must be added or if modifications with regard to operating sequences are necessary for optimum performance, the Contractor must do so at his own costs.

.4 The Controls Subcontractor must examine the site to determine what is involved in work execution and quality.

.5 Provide an experienced project manager with regular site presence and responsible for the direct supervision of the design, coordination, installation start-up and commissioning of the building management system.

.6 Provide local and experienced manpower in sufficient quantity to carry out the work.

.7 Provide overall services of local branches to coordinate all services and warranties. Keep essential change parts or use a local provisioning source.

.8 Remain responsible at all times for all activities identified in the Contractor's construction and commissioning schedule and commit to respecting the dates outlined in the provisional and final work acceptance.

1.6 SCOPE OF WORK

.1 This list is not restrictive in nature and does not relieve the Subcontractor of his responsibility to provide all material, equipment and manpower in order to execute his contract. In fact, this list does not remove any portion of work load as defined in other sections.

.2 The existing building management system of the Donnacona Establishment of Correctional Servicies Canada (CSC) is the Honeywell brand distributed by "Honneywell inc."

.3 Supply and installation of a complete operating system and building management system, which integrates digital control and equipment supervision which is composed of a station (server), and operator work stations on personal computers with colour graphic display. The control system must meet the specifications of this section in order to ensure compatibility with hardware and existing software. If a control system manages specific aspects of these specifications, the Controls Contractor must obtain approval from the Contracting Autority within five (5) days prior to tender date.

.4 Control contractor should reuse existing controllers and where applicable add expansion cards or provide complete controllers to meet the operation of systems. The existing centralized management system Honeywell (EBI) brand is retained. Provide the necessary licenses to rapidly growing points for works cited in this document.

.5 Work includes manpower, supply and installation of hardware, programming, warranty, start-up, tooling and all other items necessary for complete and meticulous control work in order for the systems to be complete and operational as described in the present section and as illustrated on drawings.

.6 Control drawings are qualitative in nature, i.e., they only describe type of components (electrical connection, pneumatic conduit, AO, AI, DO, DI, etc.) and do not indicate the number of components necessary. The Contractor must refer to overall mechanical and electrical sections and control sequences in Section 25 90 01 – EMCS – Site Requirements, Applications and Systems Sequences of Operation to determine what is required and comply with such.

.7 Provide, install, program and configure all software, cards and/or interfaces required for complete and functional installation of the EMCS thus ensuring autonomy for system users. It must be possible to program dynamic graphics in HTML format on the central management system and add and implement new digital controllers on the network without the need for components or technical support from the EMCS building management manufacturer or distributor. Provide programming software to access configuration parameter and controllers' programming as well as the possibility of programming new control points, algorithms and new control loops.

.8 Provide assistance to the Balancing Contractor in adjusting air systems, hydronic systems and terminal equipment.

.9 For sectors not retrofitted in the present work, the removal and reinstallation of ceilings, cutting and patching of ceilings and walls damaged by works and cleaning of premises will fall under the responsibility of the present contractor.

.10 Provide and install all control equipment not indicated on drawings or in specifications but necessary for system operating.

.11 Unless otherwise indicated, control devices must be from a single manufacturer.

.12 Verify and adjust the control systems every three (3) months for the first year following the date of installation acceptance. Submit a written report on the operation status or on adjustments performed.

.13 For software licences subject to a specific number of physical or virtual points, plan for at least 15% spare points upon the date of provisional acceptance of the completed project.

.14 Program an HTML dynamic graphic for each electro-mechanical system. Program a dynamic graphic per room indicating (as required) room number, position and ID for terminal unit, temperature sensor, heating element and lighting status and lighting control of required elements. Program architecture penetration (plan view) for floors or floor section providing access to each room dynamic graphic. Summary tables providing overall control room information are prohibited.

.15 Conduct all start-up, verification and basic and enhanced commissioning tests in compliance with Section 25 01 11 – EMCS – Start-up, Verification and Commissioning. Provide for collaboration during the commissioning process.

.16 Provide electrical interlock accessories such as, but not limited to, the following equipment:

.1 Humidifier: differential pressure switch, humidistat, drain cooler, temperature switch (high or low limit), steam valves, control valves, valve solenoids (water inlet or drainage, etc.), etc.

.17 Anticipate time for additional programming and commissioning to optimize operating sequences and equipment functioning to the entire satisfaction of the Departmental Representative. No additional amounts will be accepted for modification to programming.

1.7 SYSTEM DESCRIPTION

.1 Refer to CDL schematics for system architecture.

.2 Work covered by sections referred to above consists of fully operational EMCS, including, but not limited to, following:

.1 Unless otherwise indicated, provide, install and connect equipment and other components, including the following, without limited to such;

.1 Server, OWS and computer.

.2 Interface software, management software, programming software, dynamic graphic generation software, and data communications equipment necessary to effect EMCS data transmission system including gateways.

.3 MCU, LCU and required TCU/ECU.

.4 Field control devices including, but not limited to, sensors, actuators, valves, humidity and pressure transmitters, end-of-line switches, frost and differential pressure detection.

.5 Control panels (main, auxiliary and interface).

.6 All conduits and wiring connecting system components.

.7 Electrical and pneumatic modifications.

.8 Identification of components, etc.

.9 Complete O&M manuals, on-site training for operators, programmers and maintenance personnel.

.10 Acceptance tests, technical support during commissioning, full documentation.

.11 Interface wiring coordination of equipment supplied by others.

1.8 DESIGN REQUIREMENTS

.1 Design and provide conduit and wiring linking elements of system.

.2 Supply sufficient programmable controllers of types to meet project requirements. Quantity and points contents as reviewed by Departmental Representative prior to installation.

.3 Location of controllers as reviewed by Departmental Representative prior to installation.

.4 Provide utility power and emergency power to EMCS as indicated.

.5 Metric references: in accordance with CAN/CSA Z234.1.

.6 Language operating requirements

.1 Provide French operator selectable access codes.

.2 Use non-linguistic symbols for displays on graphic terminals wherever possible. Other information to be in French.

.3 Operating system executive: provide primary hardware-to-software interface with associated documentation to be in French.

.4 System manager software: include in French system definition point database, additions, deletions or modifications, control loop statements, use of high level programming languages, report generator utility and other OS utilities used for maintaining optimal operating efficiency.

.5 Include, in French:

.1 Input and output commands and messages from operator-initiated functions, field related changes, alarms as defined in CDL's or assigned limits (i.e. commands relating to day-to-day operating functions and not related to system modifications, additions, or logic re-definements).

.2 Graphic "display" functions, point commands to turn systems on or off, manually override automatic control of specified hardware points. To be in French at specified OWS and to be able to operate one terminal in English and second in French. Point name expansions in both languages.

.3 Reporting function such as trend log, trend graphics, alarm report logs, energy report logs, maintenance generated logs.

1.9 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 25 05 02 – EMCS: Shop Drawings, Product Data and Review Process.

.2 Submit for review:

.1 Equipment list and systems manufacturers within 48 hours after award of contract.

.2 List existing field control devices to be re-used included in tender along with unit price.

.3 Quality control:

.1 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.

.2 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.

.3 Submit proof of compliance to specified standards with shop drawings and product data in accordance with Section 25 05 02 – EMCS: Shop Drawings, Product Data and Review Process. Label or listing of specified organization is acceptable evidence.

.4 In lieu of such evidence, submit certificate from testing organization, approved by Departmental Representative, certifying that item was tested in accordance with their test methods and that item conforms to their standard/code.

.5 For materials whose compliance is not regulated by organization using its own listing or label as proof of compliance, furnish certificate stating that material complies with applicable referenced standard or specification.

.6 Permits and fees: in accordance with general conditions of contract.

.7 Submit certificate of acceptance from authority having jurisdiction.

.8 Existing devices intended for re-use: submit test report.

1.10 CONTROLS SUBCONTRACTOR QUALIFICATIONS

.1 Automated controls work must be executed by an specialized automated controls firm and as per the requirements of the Electrical Examiners Bureau. Contractors who do not fabricate the components that they propose must submit a letter from the manufacturer indicating that they are authorized distributors or certified installers.

.2 The system shall be designed, programmed, installed and commissioned by technicians, mechanics and skilled electricians, normally employed by the firm. The firm must have at least ten (10) years experience in the design and installation of regulation systems "DDC". It will also be manufacturer or distributor of the product offered for a minimum of ten (10) consecutive years.

.3 Have a service desk staffed by trained personnel capable of providing instruction and routine maintenance on EMCS.

.4 Provide record of successful previous installations showing experience with similar EMCS installations.

.5 Have access to local supplies of essential parts and provide ten (10) year guarantee of availability of spare parts after obsolescence.

.6 Ensure qualified supervisory personnel continuously direct and monitor work and attend site meetings.

.7 The control contractor authorised for Honeywell product installation is the contractor "Honeywell".

1.11 EXISTING CONTROL EQUIPMENT

.1 Utilize existing control wiring and piping as indicated.

.2 Re-use field control devices that are usable in their original configuration provided that they conform to applicable codes, standards and requirements.

.1 Do not modify original design of existing devices without written permission from Departmental Representative.

.2 Provide for new, properly designed devices where re-usability of components is uncertain.

.3 Inspect and test existing devices intended for re-use within 30 days of award of contract, and prior to installation of new devices.

.1 Furnish test report within 40 days of award of contract listing each component to be re-used and indicating whether it is in good order or requires repair.

.2 Failure to produce test report will constitute acceptance of existing devices by Controls Subcontractor.

.4 Non-functioning items:

.1 Provide with report specification sheets or written functional requirements to support findings.

.2 Departmental Representative will repair or replace existing items judged defective yet deemed necessary for EMCS.

.5 Submit written request for permission to disconnect controls and to obtain equipment downtime before proceeding with work.

.6 Assume responsibility for controls to be incorporated into EMCS after written receipt of approval.

.1 Subcontractor is responsible for items repaired or replaced.

.2 Subcontractor is responsible for repair costs due to negligence or abuse of equipment.

.3 Responsibility of Subcontractor for existing devices terminates upon final acceptance of EMCS.

.7 Remove existing controls not re-used or not required. Place in approved storage for disposition as directed.

PART 2 PRODUCTS

2.1 REQUIRED QUALITY

.1 Honeywell, as the existing.

2.2 ADAPTORS

.1 Provide adaptors between metric and imperial components.

PART 3 EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS

.1 Installation: to manufacturer's recommendations.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 Methods and procedures for shop drawing submittals, preliminary and detailed review process include review meetings for the building Energy Monitoring and Control System (EMCS).

1.2 PRELIMINARY DESIGN REVIEW

.1 Preliminary Design Review: to contain the following information on the Controls Subcontractor and systems.

.1 Location of local office.
.2 Description (qualifications) and location of installing and servicing technical staff.
.3 Location and qualifications of programming design and programming support staff.
.4 List of spare parts.
.5 Location of spare parts stock.
.6 Names of subcontractors and key site-specific personnel.
.7 Sketch of site-specific system architecture.
.8 Specification sheets for each item including memory provided, programming language, speed and type of data transmission.
.9 Descriptive brochures.
.10 Sample CDL and graphics (systems schematics).
.11 Response time for each type of command and report.
.12 Item-by-item statement of compliance.
.13 Proof of demonstrated ability of system to communicate utilizing BACnet protocol.

1.3 SUBMITTALS

.1 Submit the following documents for review by the Departmental Representative.

.2 Shop drawings to consist of one (1) soft copy of design documents, shop drawings, product data and software as per master specifications or general requirements.

.3 Hard copy to be a completely indexed and coordinated package to ensure compliance with contract requirements and arranged in same sequence as specifications and cross-referenced to specification section and paragraph number.

.4 Soft copy to be structured using menu format for easy loading and retrieval on OWS.

1.4 SHOP DRAWING REVIEW

.1 Submit preliminary shop drawings within 30 working days of award of contract and prior to installation work, and include following:

.1 Specification sheets for each item. To include manufacturer's descriptive literature, manufacturer's installation recommendations, specifications, drawings, diagrams, performance and characteristic curves, catalogue cuts, manufacturer's name, trade name, catalogue or model number, nameplate data, size, layout, dimensions, capacity, and any other data to establish compliance.

.2 Detailed system architecture showing all points associated with each controller including signal levels, pressures where new EMCS ties into existing control equipment.

.3 Spare point capacity of each controller by number and type.

.4 Controller locations.

.5 Auxiliary control cabinet locations.

.6 Single-line diagrams showing cable routings, conduit sizes, spare conduit capacity between control centre, field controllers and systems being controlled.

.7 Valves: complete schedule listing including the following information: designation, service, type of equipment/network controlled, manufacturer, model, point ID, design flow rate, valve pressure drop, equipment pressure drop, required Cv, valve size, pipe size, spring range, pilot range, required torque and actual torque.

.8 Dampers: sketches showing module assembly, interconnecting hardware, operator locations, operator spring range, pilot range, required torque and actual torque.

.9 Flow measuring stations: complete schedule listing designation, service, point ID, manufacturer, model, size, velocity at design flow rate, manufacturer, model and range of velocity transmitter.

.10 Compressor schematic and sizing data.

.11 Wiring diagrams.

.12 Piping diagrams and hook-ups.

.13 Interface wiring diagrams showing termination connections and signal levels for equipment to be supplied by others.

.14 Shop drawings for each input/output point (sensors, transmitters) showing information associated with each particular point including:

- .1 Sensing element type and location.
- .2 Transmitter type and range.
- .3 Associated field wiring schematics, schedules and terminations.
- .4 Pneumatic schematics and schedules.
- .5 Complete point name lists.
- .6 Set points, curves or graphs and high and low alarm limits (three (3) types: "critical", "cautionary" and "maintenance") and signal range.
- .7 Software and programming details associated with each point.
- .8 Manufacturer's recommended installation instructions and procedures.
- .9 Input and output signal levels or pressures where new system ties into existing control equipment.

.15 CDL schematics, narrative description, CDL's fully showing and describing automatic and manual procedure required to achieve proper operation of project, including under complete failure of EMCS.

.16 Graphic system schematic displays of air and water systems with point identifiers and textual description of system, and typical floor plans as specified.

.17 Complete system CDL's including companion English language explanations on same sheet but with

different font and italics. CDL's to contain specified energy optimization programs.

.18 Listing of and example of specified reports.

.19 Listing of time of day schedules.

.20 Mark up to-scale construction drawing to detail control room showing location of equipment and operator work space.

.21 Type and size of memory with statement of spare memory capacity.

.22 Full description of software programs provided.

.23 Sample of "Operating Instructions Manual" to be used for training purposes.

.24 Outline of proposed start-up and verification procedures.

.25 Complete control valve table.

1.5 QUALITY ASSURANCE

.1 Preliminary Design Review Meeting: convene meeting within 45 working days of award of contract to:

.1 undertake functional review of preliminary design documents and resolve inconsistencies;

.2 resolve conflicts between contract document requirements and actual items (e.g.: points list inconsistencies);

.3 review interface requirements of materials supplied by others;

.4 review "Sequence of Operation".

.2 Subcontractor's factory trained programmer to attend meeting.

.3 The Departmental Representative retains the right to revise sequence or subsequent CDL prior to software finalization without additional costs.

PART 2 PRODUCTS

.1 N/A.

PART 3 EXECUTION

.1 N/A.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 Requirements and procedures for final control diagrams and operation and maintenance (O&M) manual for building Energy Monitoring and Control System (EMCS) work.

1.2 SUBMITTALS

.1 Documents and samples must be submitted to Departmental Representative for approval prior to final work completion.

.2 Submit record documents, as-built drawings and O&M Manual to Departmental Representative in French.

.3 Provide soft copies and hard copies in hard-back, 50 mm 3-ring, D-ring binders.

.1 Binders to be 2/3 maximum full.
.2 Provide index to full volume in each binder.
.3 Identify contents of each manual on cover and spine.
.4 Provide table of contents in each manual.
.5 Assemble each manual to conform to table of contents with tab sheets placed before instructions covering subject.

1.3 AS-BUILT DRAWINGS

.1 Provide one (1) copy of detailed shop drawings generated for verification by Departmental Representative:

.1 Changes to contract documents as well as addenda and contract extras.
.2 Changes to interface wiring.
.3 Routing of conduit, wiring and control air lines associated with controls.
.4 Locations of obscure devices.
.5 Listing of alarm messages.
.6 Panel/circuit breaker number for sources of normal/emergency power.
.7 Names, addresses, telephone numbers of each subcontractor having installed equipment, local representative for each item of equipment, each system.
.8 Test procedures and reports: provide records of start-up procedures, test procedures, checkout tests and final commissioning reports.
.9 Basic system design and full documentation on system configuration.

.2 Submit red line drawings issued for construction prior to final review by the Departmental Representative.

1.4 O&M MANUALS

.1 Custom design O&M Manuals (both hard and soft copy) to contain material pertinent to this project only and to provide full and complete coverage of subjects referred to in this section.

.2 Provide one (1) complete set of O&M Manuals (both hard and soft copy) prior to final approval of work for verification by Departmental Representative. Once the manual has been approved by Departmental Representative, provide two (2) complete sets of hard and soft copies to General Contractor for distribution to Departmental Representative.

.3 Include complete coverage in concise language, readily understood by operating personnel using common terminology of functional and operational requirements of system. Do not presume knowledge of computers, electronics or in-depth control theory.

.4 Functional description to include:

- .1 Functional description.
- .2 Design philosophy.
- .3 Specific functions of design philosophy and system.
- .4 Full details of data communications, including data types and formats, data processing and disposition data link components, interfaces and operator tests or self-test of data link integrity.
- .5 Explicit description of hardware and software functions, interfaces and requirements for components in functions and operating modes.
- .6 Description of person-machine interactions required to supplement system description, known or established constraints on system operation, operating procedures currently implemented or planned for implementation in automatic mode.

.5 System operation to include:

- .1 Complete step-by-step procedures for operation of system including required actions at each OWS.
- .2 Operation of computer peripherals, input and output formats.
- .3 Emergency, alarm and failure recovery.
- .4 Step-by-step instructions for start-up, back-up equipment operation, execution of systems functions and operating modes, including key strokes for each command so that operator need only refer to these pages for keystroke entries required to call up display or to input command.

.6 Software to include:

- .1 Documentation of theory, design, interface requirements, functions, including test and verification procedures.
- .2 Detailed descriptions of program requirements and capabilities.
- .3 Data necessary to permit modification, relocation, reprogramming and to permit new and existing software modules to respond to changing system functional requirements without disrupting normal operation.
- .4 Software modules, fully annotated source code listings, error-free object code files ready for loading via peripheral device.

.5 Complete program cross reference plus linking requirements, data exchange requirements, necessary subroutine lists, data file requirements, other information necessary for proper loading, integration, interfacing and program execution.

.6 Software for each controller and single section referencing controller common parameters and functions.

.7 Maintenance: document maintenance procedures including inspection, periodic preventive maintenance, fault diagnosis, repair or replacement of defective components, including calibration, maintenance, repair of sensors, transmitters, transducers, controller and interface firmware, plus diagnostics and repair/replacement of system hardware.

.1 Provide a list of change parts.

.8 System configuration document:

.1 Provisions and procedures for planning, implementing and recording hardware and software modifications required during operating lifetime of system.

.2 Information to ensure coordination of hardware and software changes, data link or message format/content changes, sensor or control changes in event that system modifications are required.

.9 Programmer control panel documentation: provide where panels are independently interfaced with BECC, including interfacing schematics, signal identification, timing diagrams, fully commented source listing of applicable driver/handler.

PART 2 PRODUCTS

.1 N/A.

PART 3 EXECUTION

.1 N/A.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 Requirements and procedures for identification of devices, sensors, wiring, tubing, conduit and equipment for building Energy Monitoring and Control System (EMCS) work and nameplates, materials, colours and lettering sizes.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1, The Canadian Electrical Code, Part I, Safety Standard for Electrical Installations.

1.3 SYSTEM DESCRIPTION

.1 Language operating requirements: provide identification for control items in French.

1.4 SUBMITTALS

.1 Submit to Departmental Representative for approval samples of nameplates, identification tags and list of proposed wording.

PART 2 PRODUCTS

2.1 NAMEPLATES FOR PANELS

.1 Identify by plastic laminate, 3 mm thick melamine, melamine black finish, white core, square corners, lettering accurately aligned and engraved into core.

.2 Sizes: 50 x 125 mm minimum.

.3 Lettering: minimum 7 mm high, black.

.4 Inscriptions: machine engraved to identify function.

2.2 NAMEPLATES FOR FIELD DEVICES

.1 Identify by plastic encased cards attached by plastic tie or chain.

.2 Sizes: 50 x 100 mm minimum.

.3 Lettering: minimum 5 mm high produced from laser printer in black.

.4 Data to include: point name, designation and address of mesure point address, as well as all other pertinent information.

.5 Companion cabinet: identify interior components using plastic enclosed cards with point name and point address.

2.3 NAMEPLATES FOR ROOM SENSORS

.1 Identify by stick-on labels using point identifier.

.2 Location: sensor facade.

.3 Letter size: to suit, clearly legible.

.4 Anticipate nameplates for room sensors such as, but not limited to, room temperature sensors, room humidity sensors, room pressure sensors, room CO_2 level, etc.

2.4 WARNING SIGNS

.1 Equipment including motors, starters under remote automatic control: supply and install orange coloured signs warning of automatic starting under control of EMCS.

.2 Sign to read: "*Attention – Commande automatique à distance*".

2.5 IDENTIFICATION OF WIRING

.1 Supply and install numbered tape markings on wiring at panels, junction boxes, splitters, cabinets and outlet boxes.

.2 Colour coding: to CSA C22.1. Use colour coded wiring in communication cables, matched throughout system.

.3 Power wiring: identify circuit breaker panel/circuit breaker number inside each EMCS panel

2.6 IDENTIFICATION OF CONDUITS

.1 EMCS conduits to be orange.

.2 Pre-paint box covers and conduit fittings.

.3 Marking: paint or tape, orange, 25 mm wide.

PART 3 EXECUTION

3.1 NAMEPLATES AND LABELS

.1 Ensure that manufacturer's nameplates, CSA labels and identification nameplates are visible and legible at all times.

3.2 EXISTING PANELS

.1 Correct existing legends to reflect changes made during work

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 Requirements and procedures for warranty and activities during warranty period and service contracts for building Energy Monitoring and Control System (EMCS).

1.2 REFERENCES

.1 Canada Labour Code (R.S., c. L-2)/Part I – Industrial Relations.

.2 Canadian Standards Association (CSA)

.1 CSA Z204 – Guidelines for Managing Indoor Air Quality in Buildings.

1.3 WARRANTY

.1 For a period of one (1) year from the date of final work acceptance:

.1 Guarantee operation and maintenance of control system including replacement of defective items.

.2 Guarantee the system and all components (control devices, instrumentation and others) against any deviations or deterioration to maintain a top notch operating installation that meets all contract requirements.

.3 Guarantee the control system against all defects, omissions, malfunctions or hidden defects in operating or equipment, including fabrication, installation and programming defects.

.4 Immediately rectify defects, omissions or malfunctions that may be observed in the above-mentioned work, strictly and faithfully in compliance with the contract (stipulated terms, agreements and conditions) to ensure proper operating and expected performance. In case of repairs, provide all means necessary to maintain and ensure similar performance to that of system design.

1.4 SUMBITTALS

.1 Submit detailed preventative maintenance schedule for system components.

.2 Submit detailed inspection reports.

.3 Submit dated, maintenance task lists and include the following sensor and output point details, as proof of system verification:

.1 Point name and location.

.2 Device type and range.

.3 Measured value.

.4 System displayed value.

.5 Calibration details.

.6 Indication if adjustment required.

.7 Other action taken or recommended.

.4 Submit network analysis report showing results with detailed recommendations to correct problems found.

.5 Records and logs

.1 Maintain records and logs of each maintenance task on site.

.2 Organize cumulative records for each major component and for entire EMCS chronologically.

.3 Submit records after inspection indicating that planned and systematic maintenance have been accomplished.

.6 Revise and submit documentation and commissioning reports to reflect changes, adjustments and modifications to EMCS made during warranty period.

PART 2 PRODUCTS

.1 N/A.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform as minimum (3) three minor inspections and one (1) major inspection (more often if required by manufacturer) per year. Provide detailed written report of each inspection.

.2 Perform inspections during regular working hours, 0800 to 1630 h, Monday through Friday, excluding statutory holidays.

.3 Following inspections are minimum requirements and should not be interpreted to mean satisfactory performance:

.1 Perform calibrations using test equipment having traceable, certifiable accuracy at minimum 50% greater than accuracy of system displaying or logging value.

.2 Check and calibrate random sample of field input/output devices in accordance with Canada Labour Code – Part I and CSA Z204.

.3 Provide dated maintenance task lists as proof of execution of complete system verification.

.4 Minor inspections to include, but not limited to:

.1 Perform visual and operational checks to BC's, peripheral equipment, interface equipment and other panels.

.2 Check equipment cooling fans as required and filter replacement.

.3 Visually check for mechanical faults, air leaks and proper pressure settings on pneumatic components.

.4 Review system performance with Operations Supervisor to discuss suggested or required changes.

.5 Major inspections to include, but not limited to:

.1 Minor inspection.

.2 Clean OWS peripheral equipment, BC's, interface and other panels, micro-processor interior and exterior surfaces.

.3 Check signal, voltage and system isolation of BC's, peripherals, interfaces and other panels.

.4 Verify calibration/accuracy of each input and output device and recalibrate or replace as required.

.5 Provide mechanical adjustments and necessary maintenance on printers.

.6 Run system software diagnostics as required.

.7 Install software and firmware enhancements to ensure components are operating at most current revision for maximum capability and reliability.

.1 Perform network analysis and provide report as described in Submittal article.

.6 Rectify deficiencies revealed by maintenance inspections and environmental checks.

.7 Continue system debugging and optimization.

.8 Testing/verification of occupancy and seasonal-sensitive systems to take place during four (4) consecutive seasons after facility has been accepted, taken over and fully occupied.

.1 Test weather-sensitive systems twice: first at near winter design conditions and secondly under near summer design conditions.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for building automation controllers including:

.1 Master Control Unit (MCU).

.2 Local Control Unit (LCU).

.3 Equipment Control Unit (ECU).

.4 Terminal Control Unit (TCU).

1.2 CONTROLLERS DESCRIPTION

.1 General: Network of controllers comprising of MCU('s), LCU('s), ECU('s) or TCU('s) to be provided as indicated in System Architecture Diagram to support building systems and associated sequence(s) of operations as detailed in these specifications.

.1 Provide sufficient controllers to meet intents and requirements of this section.

.2 Controller quantity, and point contents to be approved by Engineer at time of preliminary design review.

.2 Controllers: stand-alone intelligent Control Units.

.1 Incorporate programmable microprocessor, non-volatile program memory, RAM, power supplies, as required to perform specified functions.

.2 Incorporate communication interface ports for communication to LANs to exchange information with other Controllers.

.3 Capable of interfacing with operator interface device.

.4 Execute its logic and control using primary inputs and outputs connected directly to its onboard input/output field terminations or slave devices, and without need to interact with other controller. Secondary input used for reset such as outdoor air temperature may be located in other Controller(s).

.1 Secondary input used for reset such as outdoor air temperature may be located in other Controller(s).

.3 Interface to include provisions for connection to Ethernet network socket

.1 Transmission must be via network quality lines and IP address.

.2 A network jack may be associated with one or more controllers.

1.3 DESIGN REQUIREMENTS

.1 To include:

.1 Scanning of AI and DI connected inputs for detection of change of value and processing detection of alarm conditions.

.2 Perform On-Off digital control of connected points, including resulting required states generated through programmable logic output.

.3 Perform Analog control using programmable logic, (including PID) with adjustable dead bands and deviation alarms.

.4 Control of systems as described in sequence of operations.

.5 Execution of optimization routines as listed in this section.

.2 Total spare capacity for MCUs and LCUs: at least 10% of each point type distributed throughout the MCUs and LCUs.

.3 Field Termination and Interface Devices:

.1 To: CSA C22.2 No.205.

.2 Electronically interface sensors and control devices to processor unit.

.3 Include, but not be limited to, following:

.1 Programmed firmware or logic circuits to meet functional and technical requirements.

.2 Power supplies for operation of logics devices and associated field equipment.

.3 Lockable wall cabinet.

.4 Required communications equipment and wiring (if remote units).

.5 Leave controlled system in "fail-safe" mode in event of loss of communication with, or failure of, processor unit.

.6 Input Output interface to accept as minimum AI, AO, DI, DO functions as specified.

.7 Wiring terminations: use conveniently located screw type or spade lug terminals.

.4 AI interface equipment to:

.1 Provide for following input signal types and ranges:

.1 4 – 20 mA;

.2 0 – 10 V DC;

.3 Resistive temperature sensor or thermistor;

.2 Have common mode signal rejection greater than 60dB to 60Hz.

.3 Where required, dropping resistors to be certified precision devices which complement accuracy of sensor and transmitter range specified.

.5 AO interface equipment:

.1 Provide for following output signal types and ranges:

.1 4 – 20 mA.

.2 0 – 10 V DC.

.6 DI interface equipment:

.1 Able to reliably detect contact change of sensed field contact and transmit condition to controller.

.2 Accept pulsed inputs up to 2kHz.

.7 DO interface equipment:

.1 Respond to controller processor output, switch respective outputs. Each DO hardware to be capable of switching up to 0.5 amps at 24V AC.

.2 Switch up to 5amps at 240 V AC using optional interface relay.

.4 Controllers and associated hardware and software: operate in conditions of 0 degrees C to 44 degrees C and 20 % to 90 % non-condensing RH.

.5 Controllers (MCU, LCU): mount in wall mounted cabinet with hinged, keyed-alike locked door.

.1 Provide for conduit entrance from top, bottom or sides of panel.

.2 ECUs and TCUs to be mounted in equipment enclosures or separate enclosures.

.3 Mounting details as approved by the Engineer for ceiling mounting.

.6 Cabinets to provide protection from water dripping from above, while allowing sufficient airflow to prevent internal overheating.

.7 Provide surge and low voltage protection for interconnecting wiring connections.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data sheets for each product item proposed for this project.

1.5 MAINTENANCE

.1 Provide manufacturers recommended maintenance procedures for insertion in maintenance manual.

PART 2 PRODUCTS

2.1 MASTER CONTROL UNIT (MCU)

.1 General: primary function of MCU is to provide co-ordination and supervision of subordinate devices in execution of optimization routines such as demand limiting or enthalpy control.

.2 Include high speed communication LAN Port for Peer to Peer communications with OWS(s) and other MCU level devices.

.1 MCU must support BACnet.

.2 MCU must support "BTL" (BACnet Testing in Laboratories) approved by ASHRAE.

.3 MCU local I/O capacity as follows:

.1 MCU I/O points as allocated in I/O Summary Table.

.2 LCUs may be added to support system functions.

.4 Central Processing Unit (CPU).

.1 Processor to consist of minimum 32 bit microprocessor capable of supporting software to meet specified requirements.

.2 CPU idle time to be more than 30% when system configured to maximum input and output with worst case program use.

.3 Minimum addressable memory to be at manufacturer's discretion but to support at least performance and technical specifications to include but not limited to:

.1 Non-volatile EEPROM to contain operating system, executive, application, sub-routine, other configurations definition software. Tape media not acceptable.

.2 Battery backed (72 hour minimum capacity) RAM (to reduce the need to reload operating data in event of power failure) to contain CDLs, application parameters, operating data or software that is required to be modifiable from operational standpoint such as schedules, setpoints, alarm limits, PID constants and CDL and hence

modifiable on-line through operator panel or remote operator's interface. RAM to be downline loadable from OWS.

.4 Include uninterruptible clock accurate to plus or minus 5 secs/month, capable of deriving year/month/day/hour/minute/second, with rechargeable batteries for minimum 72 hour operation in event of power failure.

.5 Local Operator Terminal (OT): Provide OT for each MCU.

.1 Mount access/display panel in MCU or in suitable enclosure beside MCU.

.2 Support operator's terminal for local command entry, instantaneous and historical data display, programs, additions and modifications.

.3 Display simultaneously minimum of 16 point identifiers to allow operator to view single screen dynamic displays depicting entire mechanical systems. Point identifiers to be in French.

.4 Functions to include, but not be limited to, the following:

.1 Start and stop points.

.2 Modify setpoints.

.3 Modify PID loop parameters.

.4 Override PID control.

.5 Change time/date.

.6 Add/modify/start/stop weekly scheduling.

.7 Add/modify setpoint weekly scheduling.

.8 Enter temporary override schedules.

.9 Define holiday schedules.

.10 View analog limits.

.11 Enter/modify analog warning limits.

.12 Enter/modify analog alarm limits.

.13 Enter/modify analog differentials.

.5 Provide access to real and calculated points in controller to which it is connected or to other controller in network. This capability not to be restricted to subset of predefined "global points" but to provide totally open exchange of data between OT and other controller in network.

.6 Operator access to OTs: same as OWS user password and password changes to automatically be downloaded to controllers on network.

.7 Provide prompting to eliminate need for user to remember command format or point names. Prompting to be consistent with user's password clearance and types of points displayed to eliminate possibility of operator error.

.8 Identity of real or calculated points to be consistent with network devices. Use same point identifier as at OWS's for access of points at OT to eliminate cross-reference or look-up tables.

2.2 LOCAL CONTROL UNIT (LCU)

.1 Provide multiple control functions for typical built-up and package HVAC systems, hydronic systems and electrical systems.

.2 Minimum of 16 I/O points of which minimum be 4 AOs, 4 AIs, 4 DIs, 4 DOs.

.3 Points integral to one Building System to be resident on only one controller.

.4 The UCL shall have an RS-485 local area network port for peer-to-peer communications with other MCU/LCU/ECU/TCU devices.

.1 The MCU must be able to support the BACnet protocol.

.2 The MCU shall be certified "BTL" ("BACnet Testing in Laboratories") approved by the ASHRAE organization.

.5 Microprocessor capable of supporting necessary software and hardware to meet specified requirements as listed in previous MCU article with following additions:

.1 Include minimum 2 interface ports for connection of local computer terminal.

.2 Design so that shorts, opens or grounds on input or output will not interfere with other input or output signals.

.3 Physically separate line voltage (70V and over) circuits from DC logic circuits to permit maintenance on either circuit with minimum hazards to technician and equipment.

.4 Include power supplies for operation of LCU and associated field equipment.

.5 In event of loss of communications with, or failure of, MCU, LCU to continue to perform control. Controllers that use defaults or fail to open or close positions not acceptable.

.6 Provide conveniently located screw type or spade lug terminals for field wiring.

2.3 TERMINAL/EQUIPMENT CONTROL UNIT (TCU/ECU)

.1 Microprocessor capable of supporting necessary software and hardware to meet TCU/ECU functional specifications.

.2 Controller to communicate directly with EMCS through EMCS LAN and provide access from EMCS OWS for setting occupied and unoccupied space temperature setpoints, flow setpoints, and associated alarm values, permit reading of sensor values, field control values (% open) and transmit alarm conditions to EMCS OWS.

.3 The UCL shall have an RS-485 local area network port for peer-to-peer communications with other MCU/LCU/TCU devices.

.1 The TCU/ECU must be able to support the BACnet protocol.

.2 The TCU/ECU shall be certified "BTL" ("BACnet Testing in Laboratories") approved by the ASHRAE organization.

.4 VAV Terminal Controller.

.1 Microprocessor based controller with integral flow transducer, including software routines to execute PID algorithms, calculate airflow for integral flow transducer and measure temperatures as per I/O Summary required inputs.

.2 Controller to operate independent of network in case of communication failure.

.3 Controller to include damper actuator and terminations for input and output sensors and devices.

2.4 SOFTWARE

.1 General.

.1 Include as minimum: operating system executive, communications, application programs, operator interface, and systems sequence of operation - CDL's.

.2 Include "firmware" or instructions which are programmed into ROM, EPROM, EEPROM or other non-volatile memory.

.3 Include initial programming of Controllers, for entire system.

.2 Program and data storage.

.1 Store executive programs and site configuration data in ROM, EEPROM or other non-volatile memory.

.2 Maintain CDL and operating data including setpoints, operating constants, alarm limits in battery-backed RAM or EEPROM for display and modification by operator.

.3 Programming languages.

.1 Program Control Description Logic software (CDL) using graphical or high level, general control language.

.2 Structure software in modular fashion to permit simple restructuring of program modules if future software additions or modifications are required.

.4 Operator Terminal interface.

.1 Operating and control functions include:

.1 Multi-level password access protection to allow user/manager to limit workstation control.

.2 Alarm management: processing and messages.

.3 Operator commands.

.4 Reports.

.5 Displays.

.6 Point identification.

.5 Pseudo or calculated points.

.1 Software to provide access to value or status in controller or other networked controller in order to define and calculate pseudo point. When current pseudo point value is derived, normal alarm checks must be performed or value used to totalize.

.2 Inputs and outputs for process: include data from controllers to permit development of network-wide control strategies. Processes also to permit operator to use results of one process as input to number of other processes (e.g. cascading).

.6 Control Description Logic (CDL):

.1 Capable of generating on-line project-specific CDLs which are software based, programmed into RAM or EEPROM and backed up to OWS. Owner must have access to these algorithms for modification or to be able to create new ones and to integrate these into CDLs on BC(s) from OWS.

.2 Write CDL in high level language that allows algorithms and interlocking programs to be written simply and clearly. Use parameters entered into system (e.g. setpoints) to determine operation of algorithm. Operator to be able to alter operating parameters on-line from OWS and BC(s) to tune control loops.

.3 Perform changes to CDL on-line.

.4 Control logic to have access to values or status of points available to controller including global or common values, allowing cascading or inter-locking control.

.5 Energy optimization routines including enthalpy control, supply temperature reset, to be LCU or MCU resident functions and form part of CDL.

.6 MCU to be able to perform following pre-tested control algorithms:

.1 Two position control.

.2 Proportional Integral and Derivative (PID) control.

.7 Control software to provide ability to define time between successive starts for each piece of equipment to reduce cycling of motors.

.8 Provide protection against excessive electrical-demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.

.9 Power Fail Restart: upon detection of power failure system to verify availability of Emergency Power as determined by emergency power transfer switches and analyse controlled equipment to determine its appropriate status under Emergency power conditions and start or stop equipment as defined by I/O Summary. Upon resumption of normal power as determined by emergency power transfer switches, MCU to analyse status of controlled equipment, compare with normal occupancy scheduling, turn equipment on or off as necessary to resume normal operation.

.7 Event and Alarm management: use management by exception concept for Alarm Reporting. This is system wide requirement. This approach will insure that only principal alarms are reported to OWS. Events which occur as direct result of primary event to be suppressed by system and only events which fail to occur to be reported. Such event sequence to be identified in I/O Summary and sequence of operation. Examples of above are, operational temperature alarms limits which are exceeded when main air handler is stopped, or General Fire condition shuts air handlers down, only Fire alarm status shall be reported. Exception is, when air handler which is supposed to stop or start fails to do so under event condition.

.8 Energy management programs: include specific summarizing reports, with date stamp indicating sensor details which activated and or terminated feature.

.1 MCU in coordination with subordinate LCU, TCU, ECU to provide for the following energy management routines:

.1 Time of day scheduling.

.2 Calendar based scheduling.

.3 Statutory Holiday scheduling.

.4 Temporary schedule overrides.

.5 Optimal start stop.

.6 Night setback control.

.7 Enthalpy (economizer) switchover.

.8 Peak demand limiting.

.9 Temperature compensated load rolling.

.10 Fan speed/flow rate control.

.11 Cold deck reset.

.12 Hot deck reset.

.13 Hot water reset.

.14 Chilled water reset.

.15 Condenser water reset.

.16 Chiller sequencing.

.17 Night purge.

.2 Programs to be executed automatically without need for operator intervention and be flexible enough to allow customization.

.3 Apply programs to equipment and systems.

.9 Function/Event Totalization: features to provide predefined reports which show daily, weekly, and monthly accumulating totals and which include high rate (time stamped) and low rate (time stamped) and accumulation to date for month.

.1 MCUs to accumulate and store automatically run-time for binary input and output points.

.2 MCU to automatically sample, calculate and store consumption totals on daily, weekly or monthly basis for user-selected analog or binary pulse input-type points.

.3 MCU to automatically count events (number of times pump is cycled off and on) daily, weekly or monthly basis.

.4 Totalization routine to have sampling resolution of 1 min or less for analog inputs.

.5 Totalization to provide calculations and storage of accumulations up to 99,999.9 units (eg. kWH, litres, tonnes, etc.).

.6 Store event totalization records with minimum of 9,999,999 events before reset.

.7 User to be able to define warning limit and generate user-specified messages when limit reached.

2.5 LEVELS OF ADDRESS

.1 Upon operator's request, EMCS to present status of any single 'point', 'system' or point group, entire 'area', or entire network on printer or OWS as selected by operator.

.1 Display analog values digitally to one (1) place of decimals with negative sign as required.

.2 Update displayed analog values and status when new values received.

.3 Flag points in alarm by blinking, reverse video, different colour, bracketed or other means to differentiate from points not in alarm.

.4 Updates to be change-of-value (COV)-driven or if polled not exceeding 2 second intervals.

PART 3 EXECUTION

3.1 LOCATION

.1 Location of Controllers to be approved by Departmental Representative.

3.2 INSTALLATION

.1 Install Controllers in secure locking enclosures with lockable hinge. The enclosure must be NEMA 1.

.2 Install ECU and TCU controllers in secure electrical enclosures with hinged door.

.3 Provide necessary power from local 120V branch circuit panel for equipment.

.4 Install tamper locks on breakers of circuit breaker panel.

.5 Connect MCU and LCU to uninterruptible power supply (UPS).

.6 Use uninterruptible Power Supply (UPS) and emergency power when equipment must operate in emergency and co-ordinating mode.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 Control devices integral to the building Energy Monitoring and Control System (EMCS).

1.2 SUBMITTALS

.1 Pre-installation tests.

.1 Submit samples performed at random from equipment shipped for testing before installation. Replace devices not meeting specified performance and accuracy.

.2 Manufacturer's instructions:

.1 Submit manufacturer's installation instructions for specified equipment and devices.

1.3 EXISTING CONDITIONS

.1 Cutting, adjusting and patching: to replace existing devices.

.2 Repair surfaces damaged during execution of work.

.3 Turn over to Departmental Representative existing materials removed.

PART 2 PRODUCTS

2.1 GENERAL

.1 Control devices of each category to be of same type and manufacturer.

.2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, heat resistant assembly.

.3 Operating conditions: 0–32°C with 10–90% RH (non-condensing), unless otherwise specified.

.4 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.5 Transmitters and sensors to be unaffected by external transmitters including walkie-talkies.

.6 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

.7 Outdoor installations: use weatherproof construction in NEMA 4 enclosures.

.8 Devices installed in user occupied space not to exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

.9 Range: including temperature, humidity and pressure.

2.2 TEMPERATURE SENSORS

.1 General: to be resistance or thermocouple type to following requirements:

.1 Thermocouples: limit to temperature range of 100°C and over.

.2 RTD's: 100 or 1,000 ohm at 0°C (±0.2 ohms) platinum element with strain minimizing construction, three (3) integral anchored leadwires. Coefficient of resistivity: 0.00385 ohms/ohm degrees C or integral thermistor sensing element 10,000 ohms at 24°C or 20 000 ohms NTC.

.1 Accuracy ±0.2°C over range.

.2 Stability 0.02°C drift per year.

.3 Operating range to include control device's entire conditions.

.3 Sensing element: hermetically sealed.

.4 Stem and tip construction: copper or type 304 stainless steel.

.5 Time constant response: less than three (3) seconds to temperature change of 10°C.

.2 Room temperature sensors

.1 Temperature sensing and display wall module.

.1 LCD display to show space temperature and temperature setpoint.

.2 Buttons for occupant selection of temperature setpoint and occupied/unoccupied mode.

.3 Jack connection for plugging in laptop personal computer for access to zone bus.

.4 Platinum or thermistor sensor element

.5 White lid.

.6 Separate mounting base for ease of installation.

.2 Blind room temperature sensors

.1 Digital room sensor without display or manual adjustment.

.2 Wall mounting type with slotted cover and protective device as indicated.

.3 Platinum or thermistor sensor element.

.4 White lid.

.5 Separate mounting base for easy installation.

.3 Tamper-proof Room Temperature Sensors

.1 Digital sensor mounted on standard stainless steel electrical plate for flush mounting.

.2 Tamper-proof screws.

.3 For mounting on electrical box one (1) group.

.4 Platinum or thermistor sensor element.

.5 Where indicated by Departmental Representative.

.6 Obtain authorization from departmental representative prior to use

.3 Air Duct Temperature Sensors

.1 Rigid sensors for duct installation

.1 For return and less than 1 m ducts and ducts without power source.

.2 Stainless steel rod with single point sensor at end of rod.

.3 General purpose duct type: suitable for insertion into ducts at various orientations, with an insertion length long enough so that the sensor element is as close as possible to the center of the conduit.

.4 Platinum or thermistor type sensor elements depending on the application.

.5 Mounting Hardware for easy Installation on ventilation duct

.2 Averaging Sensors for in-duct installation

.1 Averaging duct type: incorporates numerous sensors inside assembly which are averaged to provide one reading. Minimum insertion length 7300 mm. Bend probe at field installation time to 100 mm radius at point along probe without degradation of performance

.2 Use probes at least 1000 mm in length per square meter of duct section. Use multiple probes when the length of a single probe does not meet previous requirements. Connect probes individually. Individual data will be used to calculate the global mean for temperature control purposes.

.3 Platinum or thermistor sensor element.

.4 Mounting hardware for easy installation inside ventilation duct.

.4 Liquid well temperature sensors

.1 Stainless steel stem with single-point sensor tip and return spring.

.2 Designed to detect fluids within piping or tank.

.3 Stem with ½" dia. fitting and NEMA 1 electrical enclosure.

.4 Platinum or thermistor sensor according to application.

.5 Thermometric well

.1 With ½" DN fitting and minimum immersion depth of 100 mm.

.2 Stainless steel grade 304 or 316 according to type of fluid.

.3 Well designed for return spring.

.4 Heat transfer agent compatible with sensor material.

.5 Use brass well for copper piping. Obtain Departmental Representative's authorization before installation.

.5 Outdoor air temperature sensors

.1 Outside air type: complete with probe length 100 - 150 mm long,

.2 Non-corroding shield to minimize solar and wind effects

.3 Threaded fitting for mating to 13 mm conduit,

.4 Weatherproof construction in NEMA 4 enclosure

.5 Platinum or thermistor sensor.

.6 Specialized Sensors

.1 Sunlight Sensors

.1 Probes for measuring solar radiation, as indicated

.2 Black/white type thermopile pyranometer producing a proportional signal of the order of 0-50 mV with a converter for generating 4 -20 mA signals.

2.3 TEMPERATURE TRANSMITTERS

.1 Requirements:

.1 Input circuit: to accept 3-lead, 100 or 1,000 ohm at 0°C, platinum resistance detector type sensors.

.2 Power supply: 24 VDC or 24VAC. Power supply effect less than 0.01°C per volt change.

.3 Output signal: 4–20 mA into 500 ohm maximum load.

.4 Input and output short circuit and open circuit protection.

.5 Output variation: less than 0.2% of full scale for supply voltage variation of ±10%.

.6 Combined non-linearity, repeatability, hysteresis effects: not to exceed ±0.5% of full scale output.

.7 Maximum current to 100 or 1,000 ohm RTD sensor: not to exceed 25 mA.

.8 Integral zero and span adjustments.

.9 Temperature effects: not to exceed ±1.0% of full scale/50°C.

.10 Long term output drift: not to exceed 0.25% of full scale/six (6) months.

.11 Transmitter ranges: select narrowest range to suit application from following:

.1 -50°C to +50°C, ±0.5°C.

.2 0 to 100°C, ±0.5°C.

.3 0 to 50°C, ±0.25°C.

.4 0 to 25°C, ±0.1°C.

.5 10 to 35°C, ±0.25°C.

.6 According to the application.

2.4 HUMIDITY SENSORS

.1 Room and Duct Requirements:

.1 Range: 5- 90% RH minimum.

.2 Operating temperature range: 0-60 degrees C.

.3 Absolute accuracy: plus or minus 2 %].

.4 Maximum sensor non-linearity: plus or minus 2% RH with defined curves.

.5 Room sensors: locate in air stream near RA grille as indicated.

.6 White lid.

.2 Outdoor Humidity Requirements

.1 Range: 5-90% RH minimum.

.2 Operating temperature range: 0 -60 degrees C.

.3 Absolute accuracy: plus or minus 2%.

.4 Mechanical protection in stainless steel with built-in shield allowing installation in air streams flowing at a maximum speed of 10 m / s.

.5 Maximum linearity error of relative humidity in the order of ± 2% with respect to the base curves.

.3 Duct mounted humidity sensors: located so that sensing element is in air flow in duct

.1 Temperature coefficient: plus or minus 0.03%RH/ degrees C over 0 to 50 degrees C.

.2 Must be unaffected by condensation or 100% saturation.

.3 Protected from wind and sun by anti-corrosion hood.

.4 With screw connection for 13 mm electrical conduit.

.5 With waterproof NEMA 12 type electrical box.

.6 No routine maintenance or calibration is required.

2.5 HUMIDITY TRANSMITTERS

.1 Requirements:

.1 Input signal: from RH sensor.

.2 Output signal: 4- 20mA onto 500 ohm maximum load.

.3 Input and output short circuit and open circuit protection.

.4 Output variations: not to exceed 0.2% of full scale output for supply voltage variations of plus or minus 10%.

.5 Output linearity error: plus or minus 1.0% maximum of full scale output.

.6 Integral zero and span adjustment.

.7 Temperature effect: plus or minus 1.0 % full scale/ 12months.

.8 Long term output drift: not to exceed 0.25% of full scale output/ 12months.

2.6 DIFFERENTIAL PRESSURE TRANSMITTERS

.1 Requirements

.1 Internal materials: suitable for continuous contact with industrial standard instrument air, compressed air, water, steam, as applicable.

.2 Output signal: 4 – 20 mA into 500ohm maximum load.

.3 Output variations: less than 0.2% full scale for supply voltage variations of plus or minus 10%.

.4 Combined non-linearity, repeatability, and hysteresis effects: not to exceed plus or minus 0.5% of full scale output over entire range.

.5 Integral zero and span adjustment.

.6 Temperature effects: not to exceed plus or minus 1.5% full scale/ 50degrees C.

.7 Over-pressure input protection to at least twice rated input pressure.

.8 Output short circuit and open circuit protection.

.9 Unit to have 12.5 mm N.P.T. conduit connection. Enclosure to be integral part of unit.

.10 In the case of liquid differential type measurement, provide a stainless steel manifold block with a minimum of three (3) needle type valves mounted directly on the instrument

.11 Manual switches with four pre-programmed ranges available.

2.7 STATIC PRESSURE SENSORS

.1 Requirements:

.1 Multipoint element with self-averaging manifold.

.1 Maximum pressure loss: 160 Pa at 10m/s. (Air stream manifold).

.2 Accuracy: plus or minus 1 % of actual duct static pressure.

2.8 STATIC PRESSURE TRANSMITTERS

.1 Requirements

.1 Output signal: 4- 20mA linear into 500ohm maximum load.

.2 Calibrated span: not to exceed 150% of duct static pressure at maximum flow.

.3 Accuracy: 0.4% of span.

.4 Repeatability: within 0.5% of output.

.5 Linearity: within 1.5% of span.

.6 Deadband or hysteresis: 0.1% of span.

.7 External exposed zero and span adjustment.

.8 Unit to have 12.5 mm N.P.T. conduit connection, and integrated enclosure.

.9 Manual switches with four (4) pre-set ranges available.

2.9 VELOCITY PRESSURE SENSORS

.1 Requirements:

.1 Multipoint static and total pressure sensing element with self-averaging manifold with integral air equalizer and straightener section.

.2 Maximum pressure loss: 37 Pa at 1000 m/s.

.3 Accuracy: plus or minus 1% of actual duct velocity.

2.10 VELOCITY PRESSURE TRANSMITTERS

.1 Requirements

.1 Output signal: 4- 20mA linear into 500ohm maximum load.

.2 Calibrated span: not to exceed 125% of duct velocity pressure at maximum flow.

.3 Accuracy: 0.4% of span.

.4 Repeatability: within 0.1% of output.

.5 Linearity: within 0.5% of span.

.6 Deadband or hysteresis: 0.1% of span.

.7 External exposed zero and span adjustment.

.8 Unit to have 12.5 mm N.P.T. conduit connection. Enclosure to be integral part of unit.

.9 Manual switches with four (4) pre-set ranges available

2.11 PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES

.1 Requirements:

.1 Internal materials: suitable for continuous contact with compressed air, water, steam, etc., as applicable.

.2 Adjustable setpoint and differential.

.3 Switch: snap action type, rated at 24 V DC120V, 15 amps AC.

.4 Switch assembly: to operate automatically and reset automatically when conditions return to normal. Over-pressure input protection to at least twice rated input pressure.

.5 Accuracy: within 2% repetitive switching.

.6 Provide switches with isolation valve and snubber, where code allows, between sensor and pressure source.

.7 Switches on steam and high temperature hot water service: provide pigtail syphon

2.12 THERMOSTATS

.1 Requirements

.1 Automatic operation and reset.

.2 Adjustable set point and differential.

.3 Accuracy of ± 1°C. Snap-action contacts for rated voltages of 120 V, 15 A in AC or 24 V AC as required; bidirectional unipolar type for power cables and connections to the EMS.

.4 Types of thermostats by function or location

.1 Room thermostats: to be mounted to the wall on a standard electrical box, with protective cover.

.2 Thermostats to be installed in air ducts: insertion length 460 mm.

.3 Thermostats to be mounted in a thermowell: stainless steel well with compression fitting of nominal diameter DN ¾; plunging length of 100 mm.

.4 Thermostats for detecting low temperatures: Continuous duct element, 6000 mm long, capable of detecting the coldest temperature in any 30 mm length.

.5 Wall Thermostats: Retained using a stainless steel collar and helical threaded screws.

2.13 FREEZE PROTECTION THERMOSTATS – AIR DUCT

.1 Low temperature thermostat, very sensitive to contact point temperature.

.1 Sensor with continuous capillary element for in-duct installation. Sensors with bulb are to be avoided.

.2 Sensor with a minimum length of 6000 mm, capable of detecting the coldest temperature in any section of 30 mm in length.

.1 Use sensors at least 1000 mm in length per square meter of duct section. Use multiple thermostats when the length of a single sensor does not meet previous requirements. Electrically connect the thermostats in series.

.3 Scale of -5 to 15°C (20 to 60°F).

.4 Adjustable set point and differential.

.5 DPDT output contact, automatic reset. Use a series contact to stop the fan and a contact to activate the EMS alarm.

.6 Snap contacts for rated voltages of 120 V, 15 A AC or 24 V DC as required; bidirectional unipolar type for power cables and connections to the EMS

.7 Accuracy of ± 1°C.

2.14 DIFFERENTIAL PRESSURE SWITCH – AIR

.1 Switch with diaphragm to operate unipolar contact with two (2) directions, movement of diaphragm limited by stainless steel calibration spring adjustable on site. The movement of the diaphragm operates the contact by means of a direct-acting mechanism.

.2 The range of detector operations per application may not be more than three (3) times the pressure to be measured.

.3 SPDT contact, 20 A, 125 to 277 Vac.

.4 All mounting and connection accessories must be supplied.

2.15 POSITION SWITCHES (MICROCONTACT)

.1 Switch indicating the open or closed position of the dampers.

.2 Adjustable lever.

.3 DPDT contact.

.4 Contact rating: 10 A (resistive).

.5 Operating voltage: 12 V ac/dc to 250 V ac/dc.

.6 Threaded fitting ½" nominal diameter NPT.

2.16 FLOAT SWITCHES

.1 Requirements

.1 Liquid level switches, sealed in waterproof and shockproof housing.

.2 Switches with float, flexible cord, a weight and housing which can be immersed in measured liquid.

.3 Contacts open at idle/closed at idle with rated current of 15 A at a voltage of 120 V ac. Contacts with ratings equal to or less than 10 A/250 V ac must be approved by CSA.

2.17 PRESENCE DETECTOR

.1 Requirements

.1 For wall or ceiling installation as indicated

.2 Infrared, low voltage type

.3 Adjustable detection sensitivity

.4 Included with ceiling or wall mount depending on application

.2 Acceptable products

.1 Leviton, Hubbel, Paradox.

2.18 SOLENOID CONTROL AIR VALVES

.1 Coil: 120V AC or 24V DC, as indicated.

.2 Capacity: to pass a minimum of 0.15 l/s air at 140 kPa differential.

2.19 ELECTROMECHANICAL RELAYS

.1 Requirements:

.1 Double voltage, DPDT, plug-in type with termination base.
.2 Coils: rated for 120V AC or 24V DC. Other voltage: provide transformer.
.3 Contacts: rated at 5 amps at 120 V AC.
.4 Relay to have visual status indication.
.5 Override button.

2.20 TIMER RELAYS

.1 Requirements

.1 With time range adjustable between 0 and 10 min.
.2 Operating voltage between 24 and 600 Vac depending on the application.
.3 Configurable delay action between run time and shutdown time.
.4 Operation indicator light.

2.21 SOLD STATE RELAYS

.1 General:

.1 Relays to be socket or rail mounted.
.2 Relays to have LED Indicator
.3 Input and output Barrier Strips to accept 14 to 28 AWG wire.
.4 Operating temperature range to be -20 degrees C to 70 degrees C.
.5 Relays to be CSA Certified.
.6 Input/output Isolation Voltage to be 4000 VAC at 25 degrees C for 1 second maximum duration.
.7 Operational frequency range, 45 to 65 HZ.

.2 Input:

.1 Control voltage, 3 to 32 VDC.
.2 Drop out voltage, 1.2 VDC.
.3 Maximum input current to match AO (Analog Output) board.

.3 Output.

.1 AC or DC Output Model to suit application.

2.22 ELECTRONIC RELAYS (TRIAC)

.1 Requirements

.1 Proportional control signal
  .1 24 Vac.
  .2 4 to 32 Vdc.
  .3 4-20 mA.
.2 Indicator light to confirm relay activation

.3 Quick installation on standard 4 "x 4" electrical box.

.4 Provided with terminal blocks for low voltage.

.5 Pole: single-phase or three-phase. The use of a single-phase relay on a three-phase circuit is prohibited.

.6 Power Capacity by Application

.1 15 to 50 A resistive.

.2 120 to 600 Vac.

.3 Single-phase or three-phase.

.7 With heat dispersion block.

2.23 CURRENT TRANSDUCERS (ANALOG CURRENT RELAY)

.1 Requirements:

.1 Purpose: combined sensor/transducer to measure line current and produce proportional signal in one of following ranges:

.1 4–20 mA DC.

.2 0–10 volts DC.

.2 Frequency insensitive from 10–80 hz.

.3 Accuracy to 0.5% full scale.

.4 Zero and span adjustments. Field adjustable range to suit motor applications.

.5 Adjustable mounting bracket to allow for secure/safe mounting inside MCC.

.6 Manual selectors for three (3) pre-programmed ranges.

.7 LED indicator lights.

2.24 CURRENT RELAY (DIGITAL)

.1 Requirements

.1 Devices for detecting the load current and converting it into a digital signal via a dry contact.

.2 Integrated sensitivity adjustment device.

.3 Integrated status indicator (LED) to indicate the open/closed state of the dry contact.

.4 Split core for easy mounting.

.5 Induced sensor power.

.6 Relay contacts: capable of handling 0.5amps at 30 VAC / DC Output to be NO solid state.

.7 Suitable for single or 3 phase monitoring. For 3-Phase applications: provide for discrimination between phases

.8 Adjustable brackets for safe and rigid mounting inside MCC.

2.25 INTEGRATED CURRENT RELAYS AND RELAYS

.1 Requirements

.1 Devices for sensing the load current and converting it into a digital signal, combined with a control relay, for reducing the number of components within the starter boxes.

.2 Integrated sensitivity adjustment device, adjustable from 1 to 135 A.

.3 Integrated status indicator (LED) to indicate the open/closed status of the current detector.

.4 Integrated control relay N.O., rated at 5 A resistive (3 A inductive) at 30 VDC, 240 Vac.

.5 Adjustable brackets for safe and rigid mounting inside MCC.

2.26 ELECTRONIC DAMPER ACTUATORS

.1 Requirements

.1 Actuators shall be of sufficient size and quantity to control dampers against maximum pressures or dynamic closure pressures. The actuator torque shall be calculated at 30% of the theoretical required power according to the higher of either the maximum pressure or the dynamic closing pressure.

.2 Actuators shall be fitted with return springs which, in the event of a power failure, shall automatically return the dampers to the safe, normally open or normally closed position, depending on the application.

.3 Actuator with electronic overload protection or a series of digital rotation sensors to prevent damage during rotation. The limit switches to deactivate the actuator at the end of rotation and the magnetic clutches are not acceptable.

.4 Connection of actuators must be provided with a terminal cover to meet NEMA 2.standards.

.5 Open/closed actuator capable of receiving a voltage command.

.1 24 VDC or VAC.

.2 120 VAC.

.6 Modulating valve actuator capable of receiving control signals:

.1 0 to 10 VDC.

.2 2 to 10 VDC.

.3 0 to 20 mA.

.4 4 to 20 mA.

.7 All 24 V AC/DC actuators must be operated with class 2 cabling.

.8 Maximum consumption of 10 VA in AC or 8 W in DC for 24 Vac at 120 Vac.

.9 External manual override device on all actuators to facilitate installation and allow manual positioning when the actuator is not energized. Spring return actuators greater than 7 Nm (60 psi) must be equipped with a manual lever for this purpose.

.10 All actuators must be certified by the Underwriters Laboratories (UL), standard 60730-1A / -2-14 and 2043 and certified by the Canadian Standard Association (CSA), standard E60730-1: 02. They must also meet the safety standards recognized by the industry.

.11 Minimum cycle of 60,000 complete actions at nominal torque for each actuator.

.12 With a five (5) year warranty inscribed on the actuator motor:

.1 Two (2) years unconditional.

.2 Three (3) years unconditional.

2.27 PANELS

.1 Wall mounted enamelled steel cabinets with hinged and key-locked front door.

.2 Multiple panels as indicated to handle requirements with additional space to accommodate 25% additional capacity without adding additional cabinets.

.3 Panels to be lockable with same key.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

.2 Install field control devices in accordance with manufacturers' recommended methods, procedures and instructions.

.3 Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, controllers, relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in cases when dissimilar metals make contact.

.4 Support field-mounted panels, transmitters and sensors on pipe stands or channel brackets.

.5 Fire stopping: provide space for fire stopping. Maintain fire rating integrity.

3.2 TEMPERATURE AND HUMIDITY SENSORS

.1 Stabilize to ensure minimum field adjustments or calibrations.

.2 Readily accessible and adaptable to each type of application to allow for quick and easy replacement and servicing without special tools or skills.

.3 Outdoor installation:

- .1 Protect from solar radiation and wind effects by non-corroding shields.
- .2 Install in NEMA 4 enclosures.

.4 Duct installations:

- .1 Do not mount in dead air space.
- .2 Locate within sensor vibration and velocity limits.
- .3 Securely mount extended surface sensor used to sense average temperature.
- .4 Thermally isolate elements from brackets and supports to respond to air temperature only.
- .5 Support sensor element separately from coils or filter racks.

.5 Averaging duct type temperature sensors.

- .1 Install averaging element horizontally across the ductwork starting 300 mm from top of ductwork. Each additional horizontal run to be no more than 300 mm from one above it. Continue until complete cross-sectional area of ductwork is covered. Use multiple sensors where single sensor does not meet required coverage.
- .2 Wire multiple sensors in series for low temperature protection applications.
- .3 Wire multiple sensors separately for temperature measurement.
- .4 Use software averaging algorithm to derive overall average for control purposes.

.6 Thermowells: install for piping installations.

- .1 Locate well in elbow where pipe diameter is less than well insertion length.
- .2 Thermowell to restrict flow by less than 30%.

.3 Use thermal conducting paste inside wells.

3.3 PANELS

.1 Arrange for conduit and tubing entry from top, bottom or either side.

.2 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.

.3 Identify wiring and conduit clearly.

3.4 MAGNEHELIC PRESSURE INDICATORS

.1 Install adjacent to fan system static pressure sensor and duct system velocity pressure sensor.

.2 Locations: as indicated on drawings.

.3 Install isolation valve and snubber on sensors between sensor and pressure source where code allows.

.1 Protect sensing elements on steam and high temperature hot water service with pigtail syphon between valve and sensor.

3.5 I/P TRANSDUCERS

.1 Install air pressure gauge on outlet.

3.6 AIR PRESSURE GAUGES

.1 Install pressure gauges on pneumatic devices, I/P, pilot positioners, motor operators, switches, relays, valves, damper operators and valve actuators.

.2 Install pressure gauge on output of auxiliary cabinet pneumatic devices.

3.7 IDENTIFICATION

.1 Suitably identify field devices.

3.8 AIR FLOW MEASURING STATIONS

.1 Protect air flow measuring assembly until cleaning of ducts is completed.

3.9 TESTING AND COMMISSIONING

.1 Calibrate and test field devices for accuracy and performance.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes

.1 General requirements for the installation of electrical wiring with regard to Energy Management Control System (EMCS).

1.2 QUALIFICATIONS OF PERSONELLE

.1 Systems and related controls to be installed by qualified workers with permits issued by the Province of Quebec.

.2 Qualified factory trained supervisory personnel to continuously direct and monitor all work and attend all site meetings.

1.3 EXISTING CONDITIONS

.1 Repair surfaces damaged during execution of work.

.2 Turn over to Departmental Representative existing materials removed from work not identified for re-use. If Departmental Representative does not which to keep said materials, remove from site as per environmental regulations in effect.

1.4 REFERENCES

.1 All temporary and permanent installations shall comply with the Canadian Electrical Code and the Bureau of Electrical Examiners (*Bureau des examinateurs électriciens*).

.2 All components shall be CSA approved or UL listed, when applicable.

PART 2 PRODUCTS

2.1 WIRING

.1 Unless otherwise indicated, ductless FT4 conductors are permitted only in suspended ceilings and gypsum walls. In suspended ceilings, wiring must be secured every three (3) metres and must follow the building's architectural lines.

.2 In ceiling spaces, low voltage wiring must be grouped and secured to the structure with brackets and not nylon Tiewraps attached to conduits whether electric, plumbing or ventilation.

.3 Unless otherwise indicated, all conductors will be installed in EMT conditions in mechanical utility rooms or other exposed locations as well as inside ventilation units. In addition, all wiring in concrete block walls or other inaccessible locations, as well as conductors 120 V and greater must be installed in EMT conduits. Conduits will be 13 mm minimum.

.4 Flexible conduits will be used for transitions between control components and EMT conduits when wiring is to be within conduits. Flexible conduits will not exceed 500 mm. In humid locations, conduits and hardware to comply with the type of application.

.5 Wiring must be in compliance with the requirements of Division 26.

.6 70 V and higher: use copper conductors with cross-linked thermosetting polyethylene material, RW90, 600 V nominal, at least 12AWG for 120V supply and at least 14AWG for motor control centres, colour code as per CSA 22.1.

.7 Less than 70 V: use copper conductors, FT4 type. The wire must be certified and orange in colour. Select minimum type and gauge as per the following requirements:

.1 Control wiring (for connecting starters or interlocking): #16AWG, stranded.

.2 Output signal wiring (relays, actuators, etc.): #18AWG, stranded.

.3 Input signal wiring (sensors, transmitters, etc.): #18AWG, stranded.

.4 Intelligent room temperature sensor wiring: #20AWG, stranded.

.5 Variable speed wiring: #18AWG, stranded and shielded.

.6 Communication wiring: #20AWG, stranded and shielded.

If cable size is not respected, provide manufacturer's documentation and have Departmental Representative approve cable size before installation.

.8 Wiring must be continuous from their electrical source up to connected point. Pressure-type connectors will not be accepted for wires.

2.2 CONDUIT SYSTEM

.1 For mechanical utility rooms and in other exposed locations, plan for conduit system to connect field instrumentation to EMCS. Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems. Maximum conduit fills not to exceed 40%. Design drawings do not show conduit layout.

.2 As per requirements of Electrical Division 26.

.3 Electrical metallic tubing to CSA C22.3 83. Flexible and liquid tight flexible metal conduit to CSA C22.2 No. 56. Rigid steel threaded conduit to CSA C22.2 No. 45.

.4 Fittings for rigid conduits:

.1 Couplings and fittings: threaded type steel.

.2 Double locknuts and insulated bushings: use on sheet metal boxes.

.3 Use factory "ells" where 90 degree bends required for 25 mm and larger conduits.

.5 Fittings for thin wall conduits:

.1 Connectors and couplings: steel, set screw type.

.6 50 mm dia. and smaller: steel straps, one (1) hole. Larger than 50 mm dia.: steel straps, two (2) holes.

.7 Identify conduits using orange coloured tape at all transitions and every three (3) metres. Tape identification is not necessary when orange conduits are used.

2.3 PULL AND/OUTLET BOXES

.1 Junction and pull boxes: welded steel.

.1 Surface mounting cast FS: screw-on flat covers.

.2 Flush mounting: covers with 25 mm minimum extension all round.

.2 Cabinets: sheet steel, for surface mounting, with hinged door, latch lock, two (2) keys, complete with perforated metal mounting backboard. Panels to be keyed alike for similar functions and or entire contract as approved.

.3 Outlet boxes: 100 mm minimum, square.

.4 Conduit boxes, fittings:

.1 Bushings and connectors: with nylon insulated throats.

.2 With push pennies to prevent entry of foreign materials.

.5 Junction and pull boxes are painted orange.

PART 3 EXECUTION

3.1 GENERAL

.1 Install equipment and components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

.2 Provide and install required electrical wiring and conduits to connect the various components of the centralized control system in compliance with the requirements of the Quebec Electrical Code and the Bureau of Electrical Examiners.

.3 Identify tubing and/or wiring at each end, connection, piece of equipment, etc., with a wire marker such as model from Thomas & Betts or equivalent.

.4 Tubing and wiring must following building lines and be securely fastened to equipment. Do not insulate.

.5 Conform to manufacturer's recommendations for storage, handling and installation.

.6 Check factory connections and joints. Tighten where necessary to ensure continuity.

.7 Install electrical equipment between 1,000 and 2,000 mm above finished floor wherever possible and adjacent to related equipment.

.8 Protect exposed live equipment such as panels, mains, outlet wiring during construction for personnel safety.

.9 Install complete, permanent and continuous grounding system for equipment including conductors, connectors and accessories.

3.2 WIRING

.1 Install multiple wiring in ducts simultaneously. Do not pull spliced wiring inside conduits or ducts.

.2 Use CSA certified lubricants of type compatible with insulation to reduce pulling tension.

.3 Tests: use only qualified personnel. Demonstrate the following:

.1 circuits are continuous, free from shorts, unspecified grounds;

.2 resistance to ground of all circuits is greater than 50 Megohms.

.4 Remove insulation carefully from ends of conductors and install to manufacturer's recommendations. Accommodate all strands in lugs. Where insulation is stripped in excess, neatly tape so that only lug remains exposed.

.5 Install all strands of conductor in lugs of components. Strip insulation only to extent necessary for installation.

.6 Wiring in main junction boxes and pull boxes to terminate on terminal blocks only, clearly and permanently identified. Junctions or splices not permitted for sensing or control signal covering wiring.

3.3 CONDUIT SYSTEM

.1 Install conduits and sleeves prior to pouring of concrete.

.2 Install conduits parallel or perpendicular to building lines to conserve headroom and to minimize interference.

.3 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Obtain approval from Departmental Representative before starting such work.

.4 Locate conduits at least 150 mm from parallel steam or hot water pipes and at least 50 mm at crossovers.

.5 Bend conduit so that diameter is reduced by less than 1/10th original diameter.

.6 Field thread on rigid conduit to be of sufficient length to draw conduits up tight.

.7 Limit conduit length between pull boxes to less than 30 m.

.8 Use conduit outlet boxes for conduit up to 32 mm diameter and pull boxes for larger sizes.

.9 Fastenings and supports for conduits, cables and equipment:

.1 Provide metal brackets, frames, hangers, clamps and related types of support structures as indicated and as required to support cable and conduit runs.

.2 Provide adequate support for raceways and cables, sloped vertically to equipment.

.3 Use supports or equipment installed by other trades for conduit, cable and raceway supports only after written approval from Departmental Representative.

.10 Install polypropylene fish cord in empty conduits for future use.

.11 Where conduits become blocked, remove and replace blocked sections.

.12 Pass conduits through structural members only after receipt of Departmental Representative's written approval.

.13 Group conduits wherever possible on suspended or surface channels.

.14 Install bonding conductor for 120 volt and above in conduit.

.15 Holes through exterior wall and roofs: flash and make weatherproof.

.16 Make necessary arrangements for cutting of chases, drilling holes and other structural work required to install electrical conduits, cable, pull boxes, outlet boxes.

.17 Install cables, conduits and fittings which are to be embedded or plastered over, neatly and closely to building structure to minimize furring.

3.4 PULL AND OUTLET BOXES

.1 Install in inconspicuous but accessible locations.

.2 Support boxes independently of connecting conduits.

.3 Fill boxes with paper or foam to prevent entry of construction material.

.4 Provide correct size of openings. Reducing washers not permitted.

.5 Mark location of pull boxes on record drawings.

.6 Identify AC power junction boxes, by panel and circuit breaker.

END OF SECTION

PART 1 GENERAL

1.1 NOT USED

PART 2 SEQUENCING

2.1 GENERAL

.1 The starts/stops and occupied/unoccupied periods for zones and systems must be programmed from the EMCS according to building schedule. Each zone and/or system must be able to be programmed individually or as a group, seeing that the schedules are not necessarily the same for all parts of the building.

.2 Provide and install an analog type current transformer within each magnetic starter, fan, an analogue type current transformer. Connect transformers to EMCS to provide current reading and proof of equipment operation. Operating status for each piece of equipment is indicated on the related graphics. If a piece of equipment does not operate or if an overload is detected by a motor, an alarm is sent to the EMCS and the back-up equipment shall start (if applicable).

.3 All systems and their components, unless otherwise indicated, are controlled by DDC via the EMCS. Unless otherwise indicated, all thermostats, valves and actuators will be electronic type. All set points must be able to be re-adjusted from the EMCS.

.4 Outside temperature is read via the Text sensor whose value is displayed on the graphics of all supply systems.

.5 Operating sequences for fans in automatic mode are dependent on their selector switches of their magnetic starter in “automatic” position.

.6 Install and connect the adjustable humidity upper limit and a flow switch. The control contractor will install these components and make electrical interlock with the necessary command of the humidifier to prevent it from functioning when humidity in the duct is measured 80%, or the fan is not operating.

.7 The supply systems with outside air will be provided with a freeze protection (electric thermostat DPDT), with adjustable delay relay, which will stop the entire system, when the temperature at the fan inlet of supply is 4 ° C or less. The protections will be the automatic reset type. Bypass this protection for three (3) minutes to start up systems. The stop control of a ventilation unit on low temperature limit shall be direct electrical frost thermostat magnetic starter of the blower unit, and not from the DDC system. An alarm of low freeze limit in the feed is transmitted to the centralization. The fresh air flaps and evacuation must close completely by electric interlock.

.8 The controls contractor is responsible for the power supply to 120 V for all necessary monitoring equipment, and this, from the panels of emergency electrical distribution (if available, otherwise, the normal). Provide required circuit breakers if no free circuit breaker is available.

.9 Each filter bank shall be equipped with an analog differential pressure transmitter, combined with local digital display and display at the centralization. An alarm will be transmitted to the centralization when the setpoint is reached.

.10 The different measured ambient static pressures have the exterior static pressure as reference. The Automatic Controls Contractor is responsible for 120V power supply for all control equipment from the emergency distribution panels. Provide required breakers if there are no available breakers.

.11 All control points for a particular system must reside in the same circuit analyser (CA). Allow for a minimum of 10% spare points in each controller (see specifications).

.12 Control connections between the following equipment fall under the responsibility of Division 26 – Electricity.

.1 Between magnetic starters and thermistors for motors equipped with such.

.2 Between fire alarm system and starters.

All other connections, unless otherwise indicated, fall under the responsibility of the Controls Subcontractor.

.13 In addition to the specified indications, the following alarms will be transmitted to the EMCS:

.1 Low or high supply temperature alarm: 3°C deviation (or greater) from the set point.

.2 Alarm for high or low static supply pressure: a difference of 75°Pa at the point of measurement for a delay of more than 2 consecutive minutes.

.3 Motor abnormal current intensity via the current transformers in the magnetic starters.

.14 Operating programming and feedback from the systems' control components must be optimized based on temperature, flow and pressure balancing within ten (10) minutes of a system being started up.

.15 Further to a general power failure, the systems are restarted sequentially.

PART 3 NARRATIVE SEQUENCES

3.1 AE-1 VENTILATION SYSTEMS

.1 General

.1 The EA-1 system is a latent and recoverable, 100% fresh air, air exchanger installed in the mechanical room of the training building. It will supply fresh air to the occupied premises and ensures the evacuation of stale air from the various parts of the building

.2 An electrical pre-heating coil SE-1 is provided to preheat the outside air before entering the air exchanger.

.3 An electrical post-heating coil SE-2 is provided at the air supply outlet of the exchanger to maintain a constant supply temperature according to the season.

.4 The AE-1 system operates on schedule and on the basis of presence detection.

.5 A humidifier is provided for humidifying the system.

.2 System OFF (inoccupied)

.1 Supply and exhaust fans are off.

.2 The flaps are in their normal position (closed).

.3 Heating coils are off.

.4 Humidifier is off.

.3 System ON (occupied)

.1 Upon START confirmation by the schedule a start command is transmitted to the starters. The supply and exhaust fans are started. Upon confirmation of fan operation, the following operating sequence can be operated.

.2 When the fans are started, the fresh air and exhaust flaps open 100%.

.3 Supply Temperatures Control Loop

.1 The TC-1 supply temperature sensor and controller modulate the heating coil SE-1 to maintain its set point at a minimum temperature of -5° C (23°F) during cold periods to prevent freezing of the recovery core.

.2 The TC-2 supply temperature sensor and controller modulate the heating coil SE-2 to maintain its set point at a minimum temperature of 20°C during cold periods.

.4 Room Humidity Control Loop

.1 The room humidity transmitter and controller modulate the humidifier to meet its setpoint that is readjusted to the outside temperature.

EXTERIOR TEMPÉRATURE	ROOM HUMIDITY PERCENTAGE
-20°C (adjustable)	25 % (adjustable)
-10°C (adjustable)	30 % (adjustable)

.1 Motion Detection Loop in Occupied Period

.1 During occupied periods, upon motion detection via one of the detectors, the AE-1 system and its components are allowed to operate for a period of 60 minutes (adjustable). The controller via a logic counter reactivates the counter for a new period of 60 minutes at each presence detection via a motion detector. Without presence detection for a period of more than 60 minutes, the controller will shut down the AE-1 system and its components.

.2 Motion Detection Loop in Unoccupied Period

.1 In unoccupied periods, upon motion detection via one of the sensors, the AE-1 system and its components are permitted to operate for a period of 60 minutes (adjustable). The controller via a logic counter reactivates the counter for a new period of 60 minutes at each presence detection via a motion detector. Without presence detection for a period of more than 60 minutes, the controller will shut down the AE-1 system and its components.

.3 Protection

.1 The high limit switch stops the humidifier if the humidity level exceeds 85% in the supply conduit via the humidifier's internal control. Provide wiring and connection. Connect the two switches in series with the humidifier to the normally closed contact.

.2 The differential pressure switch stops the humidifier if there is no flow rate detected in the supply conduit via the humidifier's internal control. Provide wiring and connection. Connect the two switches in series with the humidifier to the normally closed contact.

.3 Low limit switch (LL) stops the unit upon detection of frost in the supply conduit. The flaps close completely by electric interlocking on gel detection. See general notes for resetting.

.4 If the humidity transmitter is faulty, the control loop associated with this transmitter is canceled.

.4 Alarms and Supervision

.1 Alarm of unwanted shutdown of each fan (control versus status).

.2 Alarm of temperature ±3°C of the set point.

.3 Alarm of supply temperature below 10°C.

.4 Alarm of frost (see general).

.5 Alarm of return humidity ±10% of set point (winter only).

.6 Monitoring the pressure on dial filters and centralization filters.

.7 Running time of each equipment.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 01 33 00 – Submittal Procedures.

.2 01 35 29.06 – Healthy and Safety Requirements.

.3 01 45 00 – Quality Control.

.4 01 61 00 – Common Products Requirements.

.5 01 74 11 – Cleaning.

.6 01 74 21 – Construction/Demolition Waste Management and Disposal.

.7 01 78 00 – Closeout Submittals.

1.2 REFERENCES

.1 Definitions:

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

.2 Reference Standards:

.1 CSA Group

.1 CSA C22.1-15 Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

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

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

1.3 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 equipment and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit for review single line electrical diagrams under plexiglass and locate as indicated.

.4 Shop drawings:

.1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.

.2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.4 Submit one (1) copy of drawings and product data sheets in electronic format (pdf) to Departmental Representative.

.5 If changes are required, notify Departmental Representative of these changes before they are made.

.5 Certificates:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment or material is not available, submit such equipment or material] to authority having jurisdiction for special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit, upon completion of Work, load balance report as described in PART 3 – LOAD BALANCE.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.6 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within three (3) days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 – FIELD QUALITY CONTROL.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for generator and automatic vehicle barriers for incorporation into manual.

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

1.6 PARASEISMIC INSTALLATION

.1 The electrical subcontrator will be responsible for the conformity of earthquake protection systems for the installation for lumianires and transformers. To this end, the electrical subcontractor must provide for the inspection of a professional to obtain a certificate that will confirm that the installation of these equipments meets the requirements of the building code.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates for control items in English and French.

.4 Use one nameplate for each language.

2.2 MATERIALS AND EQUIPMENT

.1 Provide material and equipment] in accordance with Section 01 61 00 – Common Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction 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 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction and the Departmental Representative.

.2 Porcelain enamel signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

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

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: plastic lamicoid 3 mm, melamine, black face, white core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.

.2 Sizes as follows:

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

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 The nameplates for disconnects, starters and contactors must indicate the controlled device, voltage, the switch number, or starter switch and the power panel with the number or the channels used.

.7 Nameplates for disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Junction boxes and pull boxes will be painted all around according to the color code when located in an unfinished space or in a ceiling space. The lid of the box will be marked with a permanent marker. Identify on the cover the source (the panel) and the numbers of all wiring circuits passing through the box.

.9 Nameplates for transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

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

2.9 IDENTIFICATION OF POWER OUTLETS AND SWITCHES

.1 Sockets and switches must be identified with a self-adhesive plastic label (Brother P-Touch), indicating the panel number and the power supply circuit. The labels should be white with black letters.

2.10 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 The shed of the generator must be painted the same color as the prefabricated administrative building

PART 3 EXECUTION

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

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

.2 Do overhead 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 3 000 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: 1 3700 mm.

.2 Wall receptacles:

.1 General: 300 mm.

.2 Above top of continuous baseboard heater: 175 mm.

.3 In mechanical rooms: 1 400 mm.

.3 Panelboards: as required by Code or as indicated.

.4 Telephone and interphone outlets: 300 mm.

.5 Wall mounted telephone and interphone outlets: 1 500 mm.

.6 Fire alarm stations: 1 500 mm.

.7 Fire alarm bells: 2 100 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 generation and distribution systems 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.

.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 1 000 V instrument.

.3 Check resistance to ground before energizing.

.3 Carry out tests in presence of Departmental Representative.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 – ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.9 SYSTEM STARTUP

.1 Instruct 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 11 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

.3 Waste Management: in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 – Documents required at start of Work

*These requirements must be met prior to first application for payment.

		Submission Date
1.1	**General Contractor**	
1.1.1	List of subcontractors and their contact information	
1.1.2	List of suppliers with addresses and contact persons	
1.1.3	List of staff assigned to Project and their contact information (foreperson, appraiser, supervisor/project leader)	
1.1.4	Details of specialised contractor's or subcontractor's requests for payments	
1.1.5	Proof of insurance	
1.2	**Electricity**	
1.2.1	Licenses and qualifications	
1.2.2	List of subcontractors and their contact information	
1.2.3	List of suppliers with addresses and contact persons	
1.2.4	List of staff assigned to Project and their contact information (foreperson, appraiser, supervisor/project leader)	
1.2.5	Delivery deadlines for equipment to be supplied	
1.2.6	Proof of insurance	

Part 2 – Documents required while Work is in progress and until interim acceptance*

*These requirements must be met prior to application for interim acceptance (prerequisite for acceptance) for acceptance with reservations.

		Submission Date
2.1	**General Contractor**	
2.1.1	Detailed schedule for start-up and commissioning	
2.1.2	Descriptive table of forseen training as prescribed in section 26 05 00	
2.1.3	Proof of training for fire-wall sealing	
2.1.4	Data sheets of fire-wall systems	
2.1.5	Safety Data sheets of sealing products	
2.1.6	Letter of compliance for fire-wall sealants	
2.1.7	Verification certificates of system trials	
2.1.8	All of the engineers visit reports initialed as being corrected when deficiencies were identified	
2.2	**Electricity**	
	Shop drawings (complete)	
2.2.1	Training programs as specified in Section 26 05 00	
2.2.2	Load balance reports as specified in Section 26 05 00	
2.2.3	Complete verification and start-up report for each piece of equipment	
2.2.4	Thermographic inspection reports as specified in Section 26 05 00.01	
2.2.5	WHMIS Material Safety Data Sheets as specified in Section 26 05 00	
2.2.6	Table summarizing tests to be performed as part of Project	
2.2.7	Tables of contents of operating and maintenance manuals	
2.2.8	Verification reports and trials of generators and the automatic transfer switch	
2.2.9	Verification certificates of tests of the automatic barrier	
2.2.10	Régie du bâtiment certificates	
2.2.11	Certificates signed by Contractor for all tests	
2.2.12	Megger cable insulation report as specified in Section 26 05 00	
2.2.13	Commissioning report for all electrical equipment	

Part 3 – Documents required for final acceptance of Work

*These requirements must be met prior to final acceptance of Work.

		Submission Dates
3.1	**General Contractor**	
	All lists of specialty contractor deficiencies completed and double-checked by Project foreperson. Important notes: Signature of project leader and foreperson will be required to certify that Work is completed. When General Contractor confirms that deficiencies have been fully remedied, Engineer will perform final inspection of Work with General Contractor and Owner. If other visits are required due to incomplete corrections, resulting costs will be borne by General Contractor.	
3.2	**Electricity**	
3.2.1	List of deficiencies 100% remedied and initialed by project leader	
3.2.2	Letter of guarantee	
3.2.3	Operating and maintenance manual completed and accepted by Engineer	
3.2.4	Duly signed certificate of compliance (Appendix C)	
3.2.5	As-built drawings	
3.2.6	List of replacement parts and proof of their delivery	
3.2.7	List of training sessions delivered, with date and signature of participants	
3.2.8	List of specialized tools	

END OF SECTION

This document is meant to be completed electronically rather than by hand

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CERTIFICATE OF COMPLIANCE
(END OF WORK)

PROJECT: _____

PROJECT ADDRESS: _____

DISCIPLINE: _____

SPECIFICATION SECTIONS: _____

We certify that any materials and equipment used, as well as any concealed or exposed work that we have performed or have had performed comply in all respects with the plans, specifications, addenda, changes and documents prepared by the Departmental Representative.

MADE AT _____ THIS _____ DAY OF _____ 20 ____.

COMPANY NAME: _____

ADDRESS: _____

TELEPHONE NUMBER: _____

SIGNATURE: _____

TITLE OF THE SIGNATORY: _____

STAMP

SHOP DRAWINGS REGISTER

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SHOP DRAWING REGISTER - ELECTRICAL

TITLE: Donnacona Establishment - Firing Range Construction
PROJECT: R.079407.001
PROJECT MANAGER
SITE SUPERVISOR

Verification Status	
V : Verified As Is	R : REFUSED
VA : Verified with Notes	AR : TO RESUBMIT

SUBMITTED PRODUCTS
PR : PRODUCT REFERENCE
PE : EQUIVALENT PRODUCT
PS : SUBSTITUTION BY A N UNNAMED PRODUCT

REFERENCE TO SPECIFICATIONS				REV.	RECIEVED		RETURN TO SUBCONTRACTORS		STATUS	COMMENTS
SPECIFICATION SECTION DEVIS	DRAWING NUMBER	DESCRIPTION	DISCIPLINE		DATE	SUBMITTED PRODUCT	DATE	NUMBER OF TRANSMISSION		
		D1 type light fixture	Electrical							
		D2 type light fixture	Electrical							
		D3 type light fixture	Electrical							
		D4 type light fixture	Electrical							
		D5 type light fixture	Electrical							
		D6 type light fixture	Electrical							
		D7 type light fixture	Electrical							
		D8 type light fixture	Electrical							
		D9 type light fixture	Electrical							
		D10 type light fixture	Electrical							
		X1 type light fixture	Electrical							
		X2 type light fixture	Electrical							
		X3 type light fixture	Electrical							
		X4 type light fixture	Electrical							
		B5 type unit heater	Electrical							
		photoelectric cells	Electrical							
		B1 type unit heater	Electrical							
		B2 type unit heater	Electrical							
		B3 type unit heater	Electrical							
		B4 type unit heater	Electrical							
		B5 type unit heater	Electrical							
		B6 type unit heater	Electrical							
		Electronic thermostat (type 1)	Electrical							
		low voltage thermostat (type 2)	Electrical							
		Transformer 120 Vac/24Vdc	Electrical							
		Transformer 75KA	Electrical							
		120/208 V panel board	Electrical							
		Circuit breaker 600 V	Electrical							
		non-fuse disconnectors	Electrical							
		Double outlet 15 A, 120 V	Electrical							

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SHOP DRAWING REGISTER - ELECTRICAL

TITLE: Donnacona Establishment - Firing Range Construction
PROJECT: R.079407.001
PROJECT MANAGER
SITE SUPERVISOR

Verification Status	
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SUBMITTED PRODUCTS
PR : PRODUCT REFERENCE
PE : EQUIVALENT PRODUCT
PS : SUBSTITUTION BY A N UNNAMED PRODUCT

REFERENCE TO SPECIFICATIONS				REV.	RECIEVED		RETURN TO SUBCONTRACTORS		STATUS	COMMENTS
SPECIFICATION SECTION DEVIS	DRAWING NUMBER	DESCRIPTION	DISCIPLINE		DATE	SUBMITTED PRODUCT	DATE	NUMBER OF TRANSMISSION		
		Double outlet 20 A, 120 V	Electrical							
		Exterior double outlet 20 A, 120 V , weatherproof	Electrical							
		Exterior double outlet 20 A, 120 V , weatherproof, DDFT	Electrical							
		Switches 120 V	Electrical							
		Graduators 120 V	Electrical							
		3 positions selector	Electrical							
		Timer (for heating device)	Electrical							
		Fire Alarm System (Equipment, Components and Wiring)	Electrical							
		Telephony system (equipment, components and cabling)	Electrical							
		Computer network system (equipment, components and cabling)	Electrical							
		Intrusion alarm system, including low temperature contact (equipment, components and wiring)	Electrical							
		Underground pipes and bottomless pull boxes	Electrical							
		Optical fiber	Electrical							
		Grounding material (conductor, flange and rod)	Electrical							
		Hardware and Hardware Support and Suspension	Electrical							
		Strobe light with button and door contact	Electrical							

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section Contents

.1 This section is treats the material and accessories for wire and box connectors of 0 to 1000 Volts.

.2 Related requirements

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

1.2 REFERENCES

.1 CSA International

.1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.

.2 CAN/CSA-C22.2 No.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

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.

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 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors 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.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section contents

.1 This section treats copper conductors designed for rated voltages from 0 to 1000 V, and the conduits and the most common electrical insulators. This section does not apply to cables with a degree of fire resistance compliant to ULC S139 and CSA C83, marine cables or cables used in hazardous areas, mining, instrumentation and communications.

.2 Related Sections

.1 26 05 20 – Wire and Box Connectors (0-1000V)

.2 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

.3 33 71 73.02 – Electricity Distribution – Underground connections

1.2 REFERENCES

.1 Canadian Standards Association (CSA)/CSA International

.1 CSA C22.1-15, Canadian Electrical Code, First Part, 23rd edition.

1.3 PRODUCT DATA

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

PART 2 PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE.

2.2 CONTROL CABLES

.1 Type: LVT: (2) soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath: thermoplastic jacket, and armour of closely wound aluminum wire.

.2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated:

.1 Insulation: PVC.

.2 Overall covering: PVC jackets, interlocked armour of aluminum strip.

2.3 FIRE ALARM CABLES

.1 Fire Alarm Cables :

.1 Twisted/shielded cables will be installed in the type of pipe conduit "EMT", without armor and having the following characteristics:

.1 Massive conductors of bare copper.

.2 Insulation PVC.

.3 Sheath red CPV.

.4 According to CSA FAS-105, 300 V, identified FT-4.

.5 Cable (2 # 16 twisted / shielded) for all addressable detection systems, surveillance, command and control. In the pipeline, provide one (1) driver # 14 green for the grounding of all housings and sensing, monitoring, control and command. .

.6 Cable (2 # 16 twisted/shielded) for all phone networks firefighter communication. In the pipeline, provide one (1) driver # 14 green for the grounding of all housings and sensing, monitoring, control and command.

.7 Cables (2 # 14) and (4 # 14) for all conventional detection networks and signaling networks. In the pipeline, provide one (1) driver # 14 green for the grounding of all enclosures and signaling devices.

2.4 COLOUR OF CONDUCTORS

.1 Branch circuit systems, the colors of the phases will be black, red, blue, etc., and neutral will be white.

.2 A color code shall be used for all conductors and the identification of the conductors must comply with the Canadian Electrical Code.

.3 Grounding conductors will be installed in all types of conduits C.P.V., E.M.T., empty metallic flexible conduits. Conductors which are used for the grounding will be insulated and green and will be of required capacity according to the Electrical Code.

.4 Conductors which are used for grounding of equipment, special outings, special outlets, isolated outlets, will be insulated and will be green and of the capacity required by the Code of electricity.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Perform tests using method appropriate to site conditions and to approval of local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Install cable in trenches in accordance with Section 33 71 73.02 – Underground Electrical Service.

.2 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors – (0-1000 V).

.3 Cable Colour Coding: to Section 26 05 00 – Common Work Results for Electrical.

.4 Conductor length for parallel feeders to be identical.

.5 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.6 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.

.7 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.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

.2 In underground ducts in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and conduit Fittings

3.4 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduits.

.2 Ground control cable shield.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section Contents

.1 This section treats the material, accessories and particular prescritptions for the installation of a secondary grounding.

1.2 REFERENCES

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE 837-[02], IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings

.1 Shop drawings are required for, but not limited to, the following articles:

.1 Conductors of copper or tinned copper for grounding.

.2 Crimping straps for grounding

.3 Grounding rods

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, soft annealed, size as indicated.

.3 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors.

.4 Thermit welded type conductor connectors.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

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 Proceed with installation only after unacceptable conditions have been remedied

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, using copper welding by thermit process, permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.8 Install separate ground conductor to outdoor lighting standards.

3.3 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections of primary 120/240 V system.

3.4 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centers, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.5 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section contents

.1 This section treats electrical equipment installation with hangars for wall mounting, suspended mounting or built in to concrete walls or ceiling.

.2 Related requirements

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

1.2 REFERENCES

.1 Canadian Standards Association International

.1 CAN / CSA G164, Hot dip galvanizing of irregularly shaped objects

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Shop Drawings

.1 Shop drawings are required for the following articles, but not limited to:

.1 U-shaped support channels

.2 Threaded rods

.3 Bolts, washers, lock-nuts, etc.

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, suspended.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Secure equipment to hollow masonry, tile and plaster surfaces nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole malleable iron straps to secure surface conduits and cables 50 mm and smaller.

.2 Two-hole steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.

.2 Support two (2) or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1 m on-centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section contents

.1 This section treats the general and particular prescriptions for the splitter, junction and pull boxes.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-[06], Canadian Electrical Code, Part 1, 23rd Edition.

.2 CSA C22.2 no 40 – Cutout, Junction and Pull boxes.

.3 CSA C22.2 no 76 – Splitters

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

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 and the connection blocks to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three (3) 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.

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 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 number of phases.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section Contents

.1 This section treats the general and particular prescriptions for the outlet boxes and conduit boxes and their fittings.

.2 Related Sections

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

.2 Section 26 27 26 – Wiring Devices

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23th Edition.

.2 CAN/CSA C22.2 no 18 – Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware

PART 2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Boxes of galvanized steel.

.2 Size boxes in accordance with CSA C22.1.

.3 102 mm square or larger outlet boxes as required.

.4 Gang boxes where wiring devices are grouped.

.5 Blank cover plates for boxes without wiring devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

.7 Oversize boxes where the number of conductors exceed the standard format.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

.2 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.3 Utility boxes for outlets 102 mm square connected to surface-mounted EMT conduit,

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 BOXES FOR MASONRY MOUNT

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

2.4 BOXES FOR CONCRETE MOUNT

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

.2 Outlet boxes with back opening when installed in a slab.

2.5 CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices. These boxes are design for switches and outlets on surface mounting.

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 35 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated sleeves on sheet metal boxes.

2.7 CONNECTIONS

.1 Base type "main voltage", as per indications.

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 For boxes installed on exterior walls and ceilings, the Contractor must use very thin boxes (37 mm) and take great care to not cut the vapour barrier. In the case of the vapour barrier being perforated, place a 300 x 300 mm minimum sheet of the same material as that which was damaged over the vapour barrier and hermetically seal it the material previously in place to restore the original properties of the insulation/vapour barrier ensemble.

.6 Vacuum clean interior of outlet boxes before installation of wiring devices.

.7 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section Contents

.1 This section treats the conduits, conduit fastenings and conduit fittings as well as the related installation methods.

.2 Related Sections

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.

.2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.

.3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.

.5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.

.6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

PART 2 PRODUCTS

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.

.1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

.3 Identify cables for exclusively dc applications.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel hot dipped galvanized steel threaded.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with connections.

.3 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.4 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible, metal aluminum.

.5 Use conduits of 21 mm diameter or greater only. The conduits of 16 mm will not be accepted.

2.3 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 53 mm and smaller.

.1 Two hole steel straps for conduits larger than 53 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits.

.4 Threaded rods, 6mm diameter, to support suspended channels.

.5 Maximum spacing for conduit fastening :

.1 All rigid metal conduits of the same size must be firmly fastened to the supports or to a solid surface and the maximum spacing between the points of attachements must be:

.1 1.5 m for conduits of 21 mm nominal size

.2 2 m for conduits of 27 mm and 35 mm nominal size

.3 3 m for conduits of 41 mm and greater nominal size

.2 If rigid metal conduits of different sizes are grouped . the maximum spacing of the fasteners must be that specified in paragraph 1 for the smallest pipe of the group.

.3 If a flexible metal conduits is installed, it must be subject to intervals not exceeding 1.5 m and less than 300 mm on each side of any outlet box or trim, unless in the case of a flexible metal conduit installed by random and in the cas of length not exceeding 900 mm if some flexibility is needed at the terminals.

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 27 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 100 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 cord.

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 GENERAL

.1 Where ducts are indicated on the plans, they are represented in schematic form only. Install visible ducts so as not to decrease the clearance of the room. Before starting work, check the location of all conduits with Departmental Representative.

.2 "Daisy chain" connections are not allowed

.3 Conduits installed in parallel must be of the same length.

.4 Arrange for cutting openings, piercing holes and other structural works required to install electrical conduits, cables, pull cords , pull boxes and outlet boxes.

.5 Openings in concrete beams, walls and floors must be approved by Departmental Representative.

3.3 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 unfinished areas.

.3 Use rigid hot dipped galvanized steel threaded conduit.

- .1 Outside for parts exposed to moisture, water and weather.
- .2 Inside for parts exposed to moisture, water and weather
- .3 Inside in areas exposed to mechanical damage.

.4 Use electrical metallic tubing (EMT).

- .1 For exposed interior installations.
- .2 In ceiling spaces and studwalls.
- .3 In blocks walls and other similar walls.
- .4 For electrical distribution.
- .5 For red fire alarm networks.
- .6 For electromagnet systems.
- .7 For the intercom system.
- .8 For telecommunication systems (telephone and computer), blue.
- .9 For grounding systems, green.

.5 Use rigid epoxy coated conduit in corrosive areas.

.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. Visible flexible metal conduit will not be allowed .

.7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations. Conduits of type "AC90 (BX) or Tech 90 are not acceptable. Metal conduits, liquid tight, must be identified as FT-4 and not exceed 1 500 mm in length.

.8 Install conduit sealing fittings in hazardous areas.

- .1 Fill with compound.

.9 Minimum conduit size for lighting and power circuits: 21 mm.

.10 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.11 Mechanically bend steel conduit over 21 mm diameter.

.12 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.13 Run 2-27 mm spare conduits up to ceiling space and 2- 25 mm spare conduits down to ceiling space from each flush panel.

.1 Terminate these conduits in 305 x 305 x 102 mm junction boxes in ceiling space.

.14 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.15 Dry conduits out before installing wire.

.16 Under no circumstance can the conduits touch the mechanical services equipments (excluding their connections). A free space of 75 mm minimum must be respected between the conduits and any insulated steam pipe.

3.4 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.

3.5 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

3.6 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.

3.7 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.

3.8 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Underground conduits must be of PVC.

.3 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

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

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

1.2 REFERENCES

.1 CSA International

.1 CAN/CSA-Z809-08, Sustainable Forest Management.

.2 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.3 Insulated Cable Engineers Association, Inc. (ICEA)

.4 Sustainable Forestry Initiative (SFI)

.1 SFI-2010-2014 Standard.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for cables and ducts and include product characteristics, performance criteria, physical size, finish and limitations.

PART 2 PRODUCTS

2.1 CABLE PROTECTION

.1 Cables between buildings and between external electrical equipment supply and the various buildings are installed in underground conduits. Where ducts pass under a road traffic area, the pipes are installed in a reinforced concrete foundation.

PART 3 EXECUTION

3.1 EXAMINATION

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

.1 Proceed with installation only after unacceptable conditions have been remedied.

3.2 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Perform tests using qualified personnel.

.1 Include necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds.

.1 Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests:

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests:

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

.7 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.4 PROTECTION

.1 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

PART 1 GENERAL

.1 Not used.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Fused disconnect switch: in accordance with Section 26 28 23 – Disconnect Switches – Fused and Non-Fuse.

.2 Enclosed circuit breaker: in accordance with Section 26 28 16.02 – Moulded Case Circuit Breaker.

.3 Panelboard breaker type: in accordance with Section 26 24 16.01 – Panelboards Breaker Type, rating as indicated.

.4 Cabinet type 'B' for utility revenue metering: in accordance with Section 26 05 31 – Splitters, Junction, Pull Boxes and Cabinets, size as indicated.

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 service equipment installation in accordance with manufacturer's written instructions.

.1 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install service equipment.

.2 Connect to incoming service.

.3 Connect to outgoing load circuits.

.4 Make grounding connections in accordance with Section 26 05 28 – Grounding – Secondary.

.5 Make provision for power supply authority's metering.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Contents

.1 This section treats the breaker type panelboards and related methods of installation.

.2 Related Sections

.1 26 28 16.02 – Moulded Case Circuit Breakers.

1.2 REFERENCES

.1 CSA International

.1 CSA C22.2 No.29-11, Panelboards and Enclosed Panelboards.

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 panelboards and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Include on drawings:

.1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

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 panelboards for incorporation into manual.

PART 2 PRODUCTS

2.1 PANELBOARDS

.1 The 120/240 V panelboard shoud be type bolt-on breakers

.2 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.

.3 250 V panelboards: bus and breakers rated for nominal interrupting capacity 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 two (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. The bus bars 225 A and less will receive bolt-on breakers.

.10 Trim with concealed front bolts and hinges.

.11 Trim and door finish: baked enamel.

.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 Common-trip breakers: with single handle for multi-pole 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 Identification applies at all times relevant to the panels of the project, whether new or existing. Provide new cards.

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 Proceed with installation only after unacceptable conditions have been remedied.

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 The upper end of all panels must conform to the Canadian Electrical Code, latest edition.

.5 Connect loads to circuits.

.6 Connect neutral conductors to common neutral bus.

.7 In the enumeration of circuits given on the plans for each panel, the term "free" means that a protection device will be installed for future use; the term "space" means the space and mounting accessories are provided for receiving a future protection device.

3.3 BALANCING

.1 On the panels, the circuits must be distributed in order to allow the best balance between phases. During commissioning, testing and measurements will be made and any significant deviations must be corrected without additional fees.

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 RELATED REQUIREMENTS

.1 Section Contents

.1 This section treats the wiring devices and the related installation methods.

.2 Related Sections

.1 Section 26 05 32 – Outlet boxes, conduit boxes and fittings

1.2 REFERENCES

.1 CSA International

.1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.

.2 NEMA WD-1-1999 (C2015), General Color Requirements for Wiring Devices

.3 NEMA WD-6-2016, Wiring Devices – Dimensional Specifications

.4 CAN/CSA C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.5 CSA C22.2 No.55-M1986(R2008), Special Use Switches.

.6 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

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 wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

PART 2 PRODUCTS

2.1 SWITCHES

.1 Industrial grade.

.2 15 A, 120 V, three-way, four-way switches to: CSA C22.2 No.55.

.3 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 White toggle.

.4 Switches: Toggle operated fully rated for tungsten filament and fluorescent lamps.

.5 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:

.1 White urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight (8) back wired entrances, four (4) side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.2 Double duplex receptacles, NEMA 5-20R configuration, two sliding contacts to plug three (3) pins of a current rating of 20 A at 125 V socket of grounding U comply with the standard CSA C22.2 No. 42, with the following characteristics.

.1 White urea moulded housing

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight (8) back wired entrances, four (4) side wiring screws

.5 Triple wipe contacts and rivetted grounding contacts.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

2.3 SWITCH-TIMERS

.1 Switch-timers, with the following characteristics.

.1 Four preset buttons and a power off button.

.2 Settings 2-4-8-12 hours.

.3 Unipolar or three-way, neutral required.

.4 Load Incandescent: 1800 W.

.5 Resistive/inductive loads: 20 A

.6 Motorized Charges: 1 HP to 120 V ac

.7 Color Change Kit.

2.4 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No.42.1.

.2 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

.3 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.4 Molded UV-resistant polycarbonate molded lids for heavy-duty, weatherproof use, with one (1) vertical sash fixed to the plate with a stainless steel rod and allowing the lid to close when one (1), two (2) or no plug is inserted.

2.5 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

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 wiring devices installation in accordance with manufacturer's written instructions.

.1 Proceed with installation only after unacceptable conditions have been remedied.

3.2 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 as indicated in accordance with Section 26 05 00 – Common Work Results for Electrical.

.4 Place light switches near the doors, on the side of the door handle.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 00 – Common Work Results for Electrical.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.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 For outdoor electrical outlets, the cover model must conform to the Canadian Electrical Code, 2015 edition and be approved to enable the use of the socket when the cover is closed. The socket must be marked as "Extreme service".

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 RELATED REQUIREMENTS

.1 Section 26 28 23 – Disconnect Switches – Fused and Non-fused.

1.2 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 used. Performance data to include: average melting time-current characteristics.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in switchboard.

.3 Store fuses in original containers in moisture free location.

1.4 EXTRA MATERIALS

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

.2 Six spare fuses of each type and size installed up to and including 600 A.

PART 2 PRODUCTS

2.1 FUSES – GENERAL

.1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.

.2 Fuses: product of one manufacturer.

2.2 FUSE TYPES

.1 Class L fuses.

.1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Type L2, fast acting.

.2 Class J fuses.

.1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Type J2, fast acting.

.3 Class R -R fuses.

.1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.

.2 Type R2, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.

.4 Class C fuses.

2.3 FUSE STORAGE CABINET

.1 Fuse storage cabinet, manufactured from 2.0 mm thick aluminum 750 mm high, 600 mm wide, 300 mm deep, hinged, lockable front access door finished in accordance with Section 26 05 00 – Common Work Results for Electrical.

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 RELATED REQUIREMENTS

.1 Section contents

.1 This section looks at the particular characteristics and requirements to respect for the moulded case circuit breakers.

.2 Related sections

.1 26 24 16.01 – Panel Boards – Breaker Type

1.2 REFERENCES

.1 CSA International

.1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Include time-current characteristic curves for breakers with ampacity of 60 A and over.

PART 2 PRODUCTS

2.1 AUTHENTICATION

.1 Before any installation of circuit breakers either in a new or existing installation, the electrical contractor must submit three (3) copies of certificates of origin in French duly signed by manufacturer and the manufacturer's local representative certifying that all breakers come of them, that they are new and that they meet standards and regulations. These certificates must be presented to the Departmental Representative for acceptance.

.2 A delay in the production of the authentication certificate will not justify an extension of the contract nor any additional compensation.

.3 All work of manufacturing, assembly or installation should begin only after the acceptance of authentication certificate by the Departmental Representative. Failure to comply with this requirement, the Departmental Representative reserves the right to mandate the manufacturer listed on circuit breakers to authenticate any new circuit breakers provided in the contract, at the expense of the electrical contractor.

.4 In general, the origin authentication certificate must contain:

.1 Name and address of the manufacturer and the officer in charge of authentication. The officer in charge must date and sign the certificate.

.2 Name and address of the licensed dealer and the dealer's person in charge of the Contractor's.

.3 Name and address of the Contractor and the person in charge of the project.

.4 Name and address of the building in which the breakers will be installed.

.1 The title of the project (title on the specification or the plans)

.2 The Reference number of the Departmental Representative.

2.2 BREAKERS GENERAL

.1 Moulded-case circuit breakers: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications so that an incident on one of the phases triggers the opening of all phases. Do not use single-pole circuit breakers connected together by interlock pin.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

2.3 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.

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 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section Contents

.1 This section presents the characteristics of construction, the accessories and related methods of installation for disconnect switches, fused and non-fused.

1.2 REFERENCES

.1 CSA Group

.1 CAN/CSA-C22.2 No.4-04(R2009), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).

.2 CSA C22.2 No.39-13, Fuseholder Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 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.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible, Non-fusible, disconnect switch in CSA enclosure to CAN/CSA-C22.2 No.4 size as indicated.

.2 Provision for padlocking in off switch position by 3 locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated, in accordance with Section 26 28 13.01 – Fuses – Low Voltage.

.5 Fuseholders: to CSA C22.2 No.39 relocatable and 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.

.8 With pre-opening auxiliary contact (or "early break") to stop the variable frequency drive before switching off power to the motor according to the plans.

.9 With weatherproof housing type NEMA 3R, Industrial grade, when installed outdoors.

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 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install switches and, in some cases fuses, on the surface in un-finished rooms such as the electrical rooms and mechanical rooms.

.2 Install switches on a self-supporting built-in support, type "unistrut" when they are connected to motors installed outdoors or in mechanical rooms where no wall space is available

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Contents of section

.1 This section specifies lighting fixtures, their components and installation methods.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)

.1 ANSI C82.4-02(R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

.3 ASTM International Inc.

.1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 Canadian Standards Association (CSA International)

.5 ICES-005-07, Radio Frequency Lighting Devices.

.6 Underwriters' Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide complete photometric data prepared by independent testing laboratory for luminaires.

.3 Photometric data to include: VCP Table where applicable spacing criterion.

.4 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.4 CLOSE-OUT DOCUMENTS

.1 Submit to Departmental Representative full documentation on the installation, maintenance (list of spare parts and bulbs if required), and incorporation into manual specified in Section 26 05 00 – Common Work Results for Electrical.

1.5 SEISMIC PROTECTION FOR LIGHTING FIXTURES

.1 All lighting fixtures installed on a suspended ceiling and weighing 56 lbs or less must be attached by two steel rods, 12 gauge or un-strained chains vertically between the fixture and the concrete slab and two connectors on each side of the device.

.2 All lighting fixtures 56 lbs and more will be suspended from the concrete slab by two (2) threaded rods 6 mm in diameter, installed in a suspended ceiling.

.3 All fixtures recessed into a suspended ceiling in inverted "T" should be set to "T" with supports integrated into luminaires.

1.6 ACCEPTABLE MATERIALS OR PRODUCTS

.1 Where materials or products are prescribed by their trade-mark, refer to the "Instruction for Bidders" for instructions on approving materials or substitute products.

PART 2 PRODUCTS

2.1 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.2 DRIVERS

.1 Drivers for light emitting diodes (LEDs), unless otherwise stated CSA approved and having the following characteristics:

- .1 Rated voltage 120 V, 60 Hz..
- .2 Totally encased and designed for 40 degrees Celsius ambient temperature.
- .3 Thermal Protection:
  - .1 The driver must decrease the output power in case of high operating temperature to turn off the luminaire at a critical temperature.
  - .2 When the operating temperature is back to normal, the ballast should automatically repower the luminaire.
- .4 Gradation 0-10 V, unless otherwise indicated.
- .5 Class 2 UL drivers must meet the UL1310 standard.
- .6 Class 1 UL drivers must meet the UL1012 standard.
- .7 Harmonic distortion shall not exceed 20%.
- .8 Service life higher or equal to the lifetime of the LED lighting modules.
- .9 Short circuit protected
- .10 Be provided with protection against open circuits or partial loads.
- .11 Be provided with protection against surges.
- .12 Make a noise inaudible to the human ear
- .13 Be powered with the connected load.
- .14 Power Factor greater than 0.9.

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listing[s]and CSA certification[s]related to intended installation.

2.4 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule.

2.5 LUMINAIRES

.1 As indicated in luminaire schedule.

PART 3 EXECUTION

3.1 GENERAL

.1 The following clauses apply to all the lighting fixtures, including the special fixtures, unless otherwise indicated.

3.2 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 The contractor will refer to the architectural plans for the exact location of lighting in architectural fixtures.

.3 The exact location of lighting fixtures must be coordinated with the ceiling plans. In disputed cases, check with the architect and the engineer.

.4 Luminaires shall be adequately supported to the ceiling system of the type in which they are mounted. Installation material must be adapted to the type of ceiling system, provided with lighting and proposed when shop drawings are sent.

3.3 WIRING

.1 Connect luminaires to lighting circuits:

.1 Install flexible or rigid conduit for luminaires as indicated.

3.4 LUMINAIRE SUPPORTS

.1 For suspended ceiling installations support luminaires independently of ceiling.

3.5 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.

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 communication raceway systems 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 Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect communication raceway systems from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Empty telecommunications raceways system consists of outlet boxes, cover plates, terminal distribution cabinets, conduits, cable trays, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts.

.2 Overhead distribution system.

2.2 MATERIAL

.1 Conduits: 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings]

.2 Underground cable ducts: PVC type to 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

.3 Outlet boxes: outlet boxes must conform to 26 05 32 – Outlet,

.4 Fish wire: polypropylene ype.

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 communication raceway systems 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 empty raceway system, including overhead distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable tray, service poles, miscellaneous, positioning material to constitute complete system and grounding material of telecommunication conducts network.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

.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 pathways for communications systems installation.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for fire alarm systems.

.2 Control panel to carry out fire alarm and functions including receiving alarm signals, initiating general alarm, supervising system continuously, and initiating trouble signals.

.3 Trouble signal devices.

.4 Power supply facilities.

.5 Manual alarm stations.

.6 Automatic alarm initiating devices.

.7 Audible signal devices.

.8 End-of-line devices.

1.2 REFERENCE STANDARDS

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

.1 Material Safety Data Sheets (MSDS).

.2 National Fire Protection Agency

.1 CAN/ULC-S524, Standard for Installation of Fire Alarm Systems.

.2 NFPA 90A-2015, Installation of Air Conditioning and Ventilating Systems.

.3 National Research Council Canada (NRC)

.1 National Building Code of Canada [2015](NBC).

.4 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S524-, Standard for the Installation of Fire Alarm Systems.

.2 CAN/ULC-S525-2016, Audible Signal Device for Fire Alarm Systems.

.3 CAN/ULC-S526-2016 Visual Signal Devices for Fire Alarm Systems.

.4 CAN/ULC-S527-Control Units.

.5 CAN/ULC-S528-2014 Manual Pull Stations for Fire Alarm Systems.

.6 CAN/ULC-S529-2016, Smoke Detectors for Fire Alarm Systems.

.7 CAN/ULC-S530-M1991, Heat Actuated Fire Detectors for Fire Alarm Systems.

.8 CAN/ULC-S531-2014, Standard for Smoke Alarms.

.9 CAN/ULC-S536-S537-2004, Burglar and Fire Alarm Systems and Components.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.1 Shop drawings: stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.

.2 Include:

.1 Layout of equipment.

.2 Complete wiring diagram.

.2 Quality assurance submittals: submit following in accordance with Section [01 33 00 – Submittal Procedures].

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.3 Manufacturer's Field Reports: manufacturer's field reports specified.

.3 Closeout Submittals:

.1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals in accordance with ANSI/NFPA 20.

.2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.

.3 Submit to Authority of Jurisdiction 2sets of approved submittals and drawings immediately after approval but no later than 15working days to prior to final inspection.

.4 Submit following:

.1 Manufacturer's Data for:

.1 Control panel and modules.

.2 Storage batteries.

.3 Battery charger.

.4 Manual pull stations.

.5 Heat detectors.

.6 Open-area smoke detectors.

.7 Alarm horns.

.8 Mark data which describe more than one type of item to indicate which type will be provided.

.9 Submit 1original for each item and clear, legible, first-generation photocopies for remainder of specified copies.

.2 System wiring diagrams:

.1 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.

.2 Show modules, relays, switches and lamps in control panel.

.3 Schedules:

.1 Conductor wire marker schedule.

.4 Test Reports:

.1 Open-area 2-wire smoke detectors.

.2 Preliminary testing:

.1 Final acceptance testing.

.2 Submit for inspections and tests specified under [Field Quality Control].

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company or person specializing in fire alarm system installations approved by manufacturer.

.2 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.

.3 System:

.1 To TB OSH Chapter 3-04.

.2 Subject to Fire Commissioner of Canada (FC) approval.

.3 Subject to FC inspection for final acceptance.

.4 Maintenance Service:

.1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Departmental Representative.

1.5 ACCEPTABLE MATERIALS OR PRODUCTS

.1 Where materials or products are prescribed by their trade-mark, refer to the "Instructions to Bidders" for instructions on approving materials or substitute products.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.

.2 Power supply: to CAN/ULC-S524.

.3 Audible signal devices: to CAN/ULC-S525.

.4 Control unit: to CAN/ULC-S527.

.5 Manual pull stations: to CAN/ULC-S528.

.6 Thermal detectors: to CAN/ULC-S530.

.7 Smoke detectors: to CAN/ULC-S529.

2.2 SYSTEM OPERATION

.1 Provide complete, electrically supervised.

.2 Single stage operation. Operation to actuation following:

.1 Manual station.

.2 Heat detector.

.3 Smoke detector.

.3 Actuation of single operation device to initiate following:

.1 Building evacuation alarm devices to operate continuously.

.2 Transmit signal to existing panel inside the building

.3 Operations to remain in alarm mode (except alarm notification appliances if manually silenced) until system is manually restored to normal.

2.3 CONTROL PANEL

.1 Class B.

.2 Single stage operation.

.3 Non-zoned.

.4 Non-coded

.5 Enclosure:

.1 CSA Enclosure 1, c/w lockable concealed hinged door, full viewing window, flush lock and 2 keys.

.2 Provide modular type panel installed in flush mounted steel cabinet with hinged door and cylinder lock.

.3 Mount with panel centerline [1.5] m above finished floor elevation.

.4 Switches and other controls: not accessible without use of key.

.5 Design of control panel: neat, compact assembly containing parts and equipment required to provide specified operating and supervisory functions of system.

.6 Control panel components: CSA approved and approved by control panel manufacturer for use in control panel.

.7 Panel cabinet: finished on inside and outside with factory-applied enamel finish.

.8 Provide main annunciator located on exterior of cabinet door or visible through cabinet door.

.9 Provide audible trouble signal.

.10 Provide permanent engraved metal identification plates, attached to rear face of panel viewing window, for lamps and switches.

.11 Provide 1 set of Form C dry alarm contacts per zone, common system Form C dry alarm contact, and common system Form C dry trouble contact.

.12 Permanently label switches.

.13 Provide panel with following switches:

.1 Trouble silencing switch which silences audible trouble signals including remote trouble deviceswithout extinguishing trouble indicating lamp(s).

.1 For non-self-resetting type switch: Upon correction of trouble condition, audible signals will again sound until switch is returned to its normal position.

.2 For silencing switch of momentary action self-resetting type: trouble signal circuit automatically restored to normal upon correction of trouble condition.

.2 Evacuation alarm silencing switch which when activated will silence alarm notification appliances without resetting panel, and cause operation of system trouble signals. Subsequent alarm(s) from additional zone(s) not originally in alarm to cause activation of notification appliances even with alarm silencing switch in "silenced" position.

.3 Reset switch which when activated will restore the system to normal standby status after cause of alarm has been corrected, and activated initiating devices reset.

.1 Operation of reset switch to restore activated smoke detectors to normal standby status.

.4 Lamp test switch.

.5 Drill switch which will enable test of notification appliances and restoration to normal without tripping the main panel inside the building "Z".

.6 Supervised, modular design:

.1 Alarm receiver with trouble and alarm indications, for class B initiating circuit.

.2 Spare zones: compatible with smoke detectors and open circuit devices.

.3 Latching type supervisory receiver circuits. Discrete indication for both off-normal and trouble.

.7 Components:

.1 Coded alarm receiver panel with trouble and alarm indications for class B initiating circuit.

.2 Single stage alarm pulse rate panels:

.1 Single stroke control type for output to signal control panel continuously.

.3 Common control and power units:

.1 Control panel containing following indications and controls:

.1 "Power on" LED (green) to monitor primary source of power to system.

.2 "Power trouble" indication.

.3 "Ground trouble" indication.

.4 "System trouble" indication.

.5 "System trouble" buzzer and silence switch c/w trouble resound feature.

.6 System reset switch.

.7 "LED test" switch if applicable.

.8 "Alarm silence" switch to silence signals manually. If new alarm occurs after signals have been silenced, signals to resound.

.9 "Signals silenced" indication.

.4 Manufacturer: Control Panel by Siements, modèle TXL

2.4 POWER SUPPLY

.1 120 V, ac, 60 Hz input, 24 V dc output from rectifier to operate alarm and signal circuits, with standby power of gell cell batteries minimum expected life of 4 years, sized in accordance with NBC.

2.5 MANUAL ALARM STATIONS

.1 Provide non-coded single action type with mechanical reset features.

.1 Non-coded single pole normally open contact for single stage.

.2 Equip each station with terminal strip with contacts of proper number and type to perform functions required.

.3 Stations: type not subject to operation by jarring or vibration.

.1 Break-glass-front stations are not permitted.

.4 Station colour: red.

.5 Provide station with visible indication of operation.

.6 Restoration to require use of key.

.1 Keys: identical throughout system for stations and control panel(s).

.7 Mount stations with operating lever not more than 1.2 m above finished floor.

.8 Manufacturer: Siemens, model MS-51C

2.6 AUTOMATIC ALARM INITIATING DEVICES

.1 Heat detectors: combination fixed temperature rate-of-rise principle.

.2 Manufacturer: Siemens, model CDT-135R

.3 Open-Area Smoke Detectors: provide detectors designed for detection of abnormal smoke densities by photoelectric principle.

.1 Provide necessary control and power modules required for operation integral with control panel.

.2 Detectors and associated modules: compatible with control panel and suitable for use in supervised circuit.

.3 Malfunction of electrical circuits to detector or its control or power units to result in operation of system trouble signals.

.4 Equip each detector with visible indicator lamp that will flash when detector is in normal standby mode and glow continuously when detector is activated.

.5 Each detector: plug-in type with tab-lock or twist-lock, quick disconnect head and separate base in which detector base contains screw terminals for making wiring connections.

.6 Detector head: removable from its base without disconnecting wires. Removal of detector head from its base to cause activation of system trouble signals.

.7 Screen each detector to prevent entrance of insects into detection chamber(s).

.8 Manufacturer: Siemens, model OP121

.4 Locate detectors in accordance with their listing by ULC and the requirements of CAN/ULC-S524.

.5 Mount detectors at underside of ceiling or deck above unless otherwise indicated.

.1 For mounting heights greater than 3 m above floor level, reduce actual detector linear spacing from listed spacing as required by CAN/ULC-S524.

.6 Temperature rating of detectors: in accordance with CAN/ULC-S524.

.7 Locate detectors minimum 300 mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.

.8 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by CSA C22.1, are approved for such locations.

.9 Provide detectors with terminal screw type connections.

.10 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.7 ALARM INITIATING DEVICE SPACING AND LOCATION

.1 Detector spacing and location: in accordance with manufacturer's recommendations and requirements of CAN/ULC-S524.

.2 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated.

2.8 AUDIBLE SIGNAL DEVICES

.1 Audible device(s):

.1 Mini-horns: flush or surface mounted, colour red, 24 V dc Siemens, model MH-R

.2 Do not exceed 80 percent of listed rating in amperes of notification appliance circuit. Provide additional circuits above those shown if required to meet this requirement.

.3 Provide appliances specifically listed for outdoor use in locations exposed to weather.

.4 Finish appliances in red enamel.

.5 For surface mounting provide appliance manufacturer's approved back box. Back box finish to match appliance finish.

2.9 END-OF-LINE DEVICES

.1 End-of-line devices to control supervisory current in signalling circuits and alarm circuits, sized to ensure correct supervisory current for each circuit. Open short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.10 OFF-PREMISES FIRE ALARM

.1 Provide auxiliary connection to base fire alarm system XLS of services building (building "Z") in accordance with CAN/ULC-S524, except as specified.

2.11 CONDUIT

.1 Rigid Steel Conduit:

.1 Zinc-Coated.

.2 Intermediate Metal Conduit (IMC):

.1 Zinc-coated steel only.

.3 Electrical Metallic Tubing (EMT)

2.12 WIRING

.1 As per indications.

2.13 MODIFICATIONS TO *SPHINX* COMPUTER

.1 Modify the pages of the penitentiary's existing *Sphinx* computer drawings. Add the new building and the new equipment.

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 Install systems in accordance with CAN/ULC-S524 and TB OSH Chapter 3-04.

.2 Install main control panel and connect to ac power supply.

.3 Locate and install manual alarm stations and connect to alarm circuit wiring.

.4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

.5 Connect alarm circuits to main control panel.

.6 Locate and install horns and connect to signalling circuits.

.7 Connect signalling circuits to main control panel.

.8 Install end-of-line devices [at end of alarm and signalling circuits].

.9 Room detection

.1 Locate and install detectors. Make necessary connections between room detection panel and main fire alarm panel.

.2 Locate and install audible signals.

.3 Locate and install detectors under raised floor. Fasten to steel brackets approximately 300 mm above sub-floor level to clear cables and conduits.

3.3 FIELD QUALITY CONTROL

.1 Site Tests:

.1 Perform tests in accordance with Section [26 05 00 – Common Work Results for Electrical] and CAN/ULC-S537.

.2 Fire alarm system:

.1 Test each device and alarm circuit to ensure manual stations, thermal detectors smoke detectors transmit alarm to control panel and actuate general alarm.

.2 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.

.3 Class B circuits.

.1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.2 Manufacturer's Field Services:

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

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 – QUALITY ASSURANCE.

3.4 TRAINING

.1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.5 CLEANING

.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

1.1 RELATED REQUIREMENTS

.1 Section31 23 33.01 – Excavating, Trenching and Backfilling.

.2 Section 33 36 33 – Utility Drainage Field

1.2 REFERENCES

.1 ASTM International

.1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

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 aggregate materials

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

.3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.

.2 Flat and elongated particles of coarse aggregate: to ASTM D4791.

.1 Greatest dimension to exceed five (5) times least dimension.

.3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

.1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.2 Reclaimed asphalt pavement.

.3 Reclaimed concrete material.

.4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:

.1 Crushed rock.

.2 Gravel [and crushed gravel] composed of naturally formed particles of stone.

.3 Light weight aggregate, including slag and expanded shale.

.4 Reclaimed asphalt pavement.

.5 Reclaimed concrete material.

2.2 SOURCE QUALITY CONTROL

.1 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.

.2 Advise Departmental Representative four (4) weeks minimum in advance of proposed change of material source.

.3 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with topsoil stripping only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Topsoil stripping:

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

.2 Begin topsoil stripping of areas as indicated after area has been cleared of brush and removed from site.

.3 Avoid mixing topsoil with subsoil.

.4 Stockpile height not to exceed 2 m.

.2 Stockpiling:

.1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.

.2 Stockpile aggregates in sufficient quantities to meet project schedules.

.3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

.4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.

.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.

.7 Stockpile materials in uniform layers of thickness as follows:

.1 Maximum 1.5 m for coarse aggregate and base course materials.

.2 Maximum 1.5 m for fine aggregate and sub-base materials.

.3 Maximum 1.5 m for other materials.

.8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.9 Do not cone piles or spill material over edges of piles.

.10 Do not use conveying stackers.

.11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.3 CLEANING

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

END OF SECTION

PART 1 GENERAL

1.1 WORK DESCRIPTION

.1 Contractor must supply required labour, materials, equipment and services for completion of work, including, but not limited to, clearing, grubbing, underbrush clearing, recovery and storage of topsoil, transportation of rubbish to disposal site approved by MDDELCC and all related work.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 CLEARING

.1 Contractor must supply required labour, tools, machinery and materials for completion of all clearing and grubbing work in area indicated in plans.

.2 Work includes:

.1 Establishment of outline and reference points;

.2 Clearing, underbrush clearing and grubbing;

.3 Preservation of certain trees;

.4 Separation of wood and waste;

.5 Cleaning of work site.

.3 Contractor must establish location and exact outline of clearing as indicated in plans and obtain specific authorization from Departmental Representative before starting clearing work.

3.2 CLEARING, UNDERBRUSH CLEARING AND GRUBBING

.1 Clearing, underbrush clearing and grubbing are included in bid price and must be done in locations necessary for completion of work.

3.3 SEPARATION OF WOOD AND WASTE

.1 Contractor must completely remove from Project site all branches, stumps and roots; all deadwood; and other waste from clearing, grubbing and underbrush clearing completed by Contractor. Rubbish to be disposed of in accordance with requirements of *Regulation respecting solid waste* (R.R.Q. 1988, chapter Q-2, r.14).

3.4 REUSABLE WOOD

.1 Correctional Services Canada does not keep wood. Contractor must dispose of it off site at its own expense.

3.5 PRESERVATION OF TOPSOIL

.1 Preservation of topsoil during construction work to be ensured as follows:

.1 Topsoil to be separated from inert soil and stored in work site.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 33 31 13 – Public Sanitary Utility Sewerage Piping.

.2 Section 33 31 13 – Sanitary Utility Sewerage Piping.

.3 Section 33 41 00 – Storm Utility Drainage Piping.

1.2 REFERENCES

.1 Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques

.1 Statutes and Regulations of the Ministry

.2 Bureau de normalisation du Québec

.1 BNQ 1809-300/2004 (R2007): Construction Work - General Technical Specifications - Drinking Water and Sewer Lines.

.3 Government of Quebec, Ministère des Transports

.1 Normes, Tome VII: Matériaux (lastest version)

.4 American Society for Testing and Materials International (ASTM)

.1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-63-2002, Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-00ae1, 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 D1557-02e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).

.6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock : solid material in excess of 0.5 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 m³ bucket. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

.3 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 in any dimension.

.4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

.6 Unsuitable materials:

.1 Weak, chemically unstable, and compressible materials.

.2 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1

.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.

.7 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Quality Control: in accordance with Section 01 45 00 – Quality Control:

.1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.

.2 Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section.

.3 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.

.4 Submit to Departmental Representative written notice when bottom of excavation is reached.

.5 Submit to Departmental Representative results, testing and inspections report as described in PART 3 of this Section.

.3 Preconstruction Submittals:

.1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.

.4 Samples:

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

.2 Inform Departmental Representative at least four (4) weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.

.3 Submit 70 kg samples of type of fill specified

.4 Ship samples prepaid to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.

1.5 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

.2 Submit design and supporting data at least 2 weeks prior to beginning Work.

.3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Quebec.

.4 Keep design and supporting data on site.

.5 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.

.6 Health and Safety Requirements:

.1 Do construction occupational health and safety.

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 Divert excess aggregate materials from landfill to local recycling facility for reuse as directed by Departmental Representative.

1.7 EXISTING CONDITIONS

.1 Examine soil report

.2 Buried services:

.1 Before commencing 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 execution of work: pay costs of relocating services.

.3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

.4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.5 Prior to beginning excavation Work, establish location and state of use of buried utilities and structures and notify Departmental Representative.

.6 Confirm locations of buried utilities by careful test excavations.

.7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

.8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing.

.9 Record location of maintained, re-routed and abandoned underground lines.

.10 Confirm locations of recent excavations adjacent to area of excavation.

.3 Existing buildings and surface features:

.1 Conduct, with 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 event of damage, immediately make repair as directed by Departmental Representative

PART 2 PRODUCTS

2.1 MATERIALS

.1 Fill CG-14 : In accordance with CCDG 2101 and Ministère des Transports standards.

.2 Fill MG-20 (type 1) : In accordance with CCDG 2101 and Ministère des Transports standards.

.3 Fill MG-112 (type 2) : In accordance with CCDG 2101 and Ministère des Transports standards.

.4 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

.5 Borrow quarry pit run.

2.2 GRADATION OF MG-20, MG-112, CG-14 FILL MATERIALS

.1 As follows :

Sieve Sizes (mm)	% passant (according to MTQ-2010)		
	CG-14	MG-20	MG-112
Characteristics	6	5	3
112 mm	none	none	100
31,5 mm	none	100	none
20 mm	100	90 – 100	none
14 mm	none	68 – 93	none
5 mm	35 – 100	35 – 60	12 – 100
1,25 mm	none	15 – 38	none
0,315 mm	none	5 – 17	none
0,160 mm	none	none	none
0,080 mm	0 – 10,0	2 – 7	0 - 10

Notes : - « none » (not used) means there are no requirements for sieve.
- The characteristics could vary depending on the planned use.

PART 3 EXECUTION

3.1 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.2 PREPARATION/PROTECTION

.1 Protect existing features.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

.6 To prevent adverse effects from freezing, all footings subject to changes in outdoor temperature are covered with a minimum 2.1m layer of soil for heated buildings, and 2100 mm for non-heated works. That protection can be provided by thermal insulation, with 30 psi (207 kpa) compression resistance. Overlap sheet joints.

.7 Frost protection to all footings during construction must be equivalent to 1.8 m depth. Contractor shall provide and maintain this protection using a combination of soil, insulation and straw as required.

3.3 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative.

.1 Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

.4 No fill or borrow material can be placed outside construction boundaries.

3.4 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

.2 Provide for Departmental Representative's approval details of proposed dewatering

.3 Protect open excavations against flooding and damage due to surface run-off.

.4 Dispose of water in accordance with Section 01 35 43 – Environmental Procedures collection runoff areas and in 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.

.5 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.5 EXCAVATION

.1 Advise Departmental Representative at least seven (7) days in advance of excavation operations for initial cross sections to be taken.

.2 Excavate to lines, grades, elevations and dimensions as indicated

.3 Under each pavement or concrete structures, excavate existing fill, organic soil and wastes materials to a thickness varying between 0.85 m and 1.2 m from the present surface of the terrain. Otherwise, excavate down to silty clay or deconsolidated rock assimilated to a soil. The Contractor must refer to the geotechnical study and to the plans and specifications.

.4 Remove concrete masonry paving walks demolished foundations and rubble and other obstructions encountered during excavation

.5 Excavation must not interfere with bearing capacity of adjacent foundations.

.6 Do not disturb soil within branch spread of trees or shrubs that are to remain.

.1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Eliminate surplus and unsuitable excavated material from site.

.9 Do not obstruct flow of surface drainage or natural watercourses.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.11 Notify Departmental Representative when bottom of excavation is reached.

.12 Obtain Departmental Representative approval of completed excavation.

.13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.

.14 As soon as the excavation is completed, the deconsolidated rock, like a soil, exposed must be protected as soon as possible by proceeding to fill.

.15 Slopes of excavation must respect the prescription of CNESST

3.6 BEDDING AND COVER OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated Section 33 31 13 – Public Sanitary Utility Sewerage Piping, 33 11 16 – Water Distribution Network, and 33 41 00 – Storm Utility Drainage Piping.

.2 Place bedding and surround material in unfrozen condition.

3.7 ENVIRONMENTAL PROTECTION

.1 Goal of protection measures is to control and contain sediments within site, protect slopes and stockpiles from erosion, promote natural infiltration of water and control run-off during and after Work.

.2 Soil protection measures against aerial and hydraulic erosion

.1 Cover Work site surfaces with stable material, such as sod, gravel or geotextile membrane.

.2 Maintain at minimum reserves of loose material, such as sand, soil or gravel. Materials stockpiled over 2.0 m high should be protected from erosion by canvases or membranes.

.3 During dry weather, water site for dust control.

.3 Protection measures against release of sediment in drainage system or environment

.1 Arrange sloping surfaces towards inside of Work site to avoid run-off water cleaning material towards outside of Work site.

.2 Install geotextile membrane under sump grills impacted by Work site operations.

.3 Arrange 20-56 mm clean stone treadways to help clean tires of Work site vehicles and machinery.

.4 Arrange silt fences to protect areas surrounding Work site.

.5 Water cleared from Work site should be pre-filtered.

.6 As needed, clean surrounding roads using mechanical broom.

.4 Maintenance activities

.1 Inspect installations periodically and clean after each period of rain or snow.

.2 Maintain entrances in good condition to prevent traces or sediment deposits on public roads. On treadways, depending on Work site conditions, add or replace 20-56 mm clean stone.

.3 Clean sediment landed or left on public roads.

3.8 BACKFILLING

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

.1 Departmental Representative has inspected and approved installations.

.2 Departmental Representative has inspected and approved of construction below finish grade.

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

.4 Removal of concrete formwork.

.5 Removal of shoring and bracing;

.6 Backfilling of voids with satisfactory soil material.

.2 The cut of natural soil may be used as class “B” borrow material. See requirements of geotechnical report.

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

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

.5 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.6 Following mass excavation, backfill under pavement structures and concrete structures shall be made using MG-112 granular materials to be placed per layer of maximum 300 mm. The material shall be compacted to a minimum dry density of 90 % of the maximum Proctor modified under pavement structures and a minimum dry density of 95 % of the modified Proctor maximum value under the concrete structures. The Contractor must refer to the geotechnical report, drawings and specifications

.7 Backfilling around installations:

.1 Place bedding and surround material as specified elsewhere.

.2 Allong the foundation walls the filling will be done with a fill material MG-112 set in layers not exceeding 300 mm thick densified to 95 % test modified proctor.

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

.4 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 0.5 m.

.5 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative:

.2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.

.8 Slab on grade

.1 After having excavated the existing fill, waste material, organic soil and other unclean soils of a thickness varying between 0.85 m and 1.2 m, place a geotextile over the silty clay. Then place the controlled fill composed of granular materials MG-112 by 300mm maximum layer, compacted to 95 % modified proctor density. Finishes with a 150 mm of MG-20 fill compacted to 95 % modified proctor density. In areas indicated on the drawings, place membranes and thermal insulation (see geotechnical report).

.9 Foundations:

.1 The foundations must be supported on the deconsolidated rock by an intermediary of 150mm MG-20 caliber material, compacted @ 95% of the modified proctor.

.10 Under the sidewalk and pavement: refer to geotechnical report and other sections

3.9 RESTORATION

.1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by Departmental Representative.

.2 Replace topsoil as directed by Departmental Representative.

.3 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

.4 Clean and reinstate areas affected by Work as directed by Departmental Representative.

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

3.10 FIELD QUALITY CONTROL

.1 Where tests or inspections by testing laboratory reveal Work or materials not in accordance with Contract requirements, Contractor pays costs for additional tests as required by Departmental Representative to verify acceptability of corrected Work. The same rule applies for required tests to verify materials in place after correction.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 Supply and placement of non-woven geotextiles as separators between infrastructure to facilitate evapo-transpiration and oxygen transfer of drain fields.

1.2 REFERENCES

.1 Bureau de normalisation du Québec

.1 BNQ 1809-300/2004 (R2007): Construction Work – General Technical Specifications – Drinking Water and Sewer Lines.

.2 Government of Quebec, Ministère des Transports

.1 Normes, Tome VII: Matériaux (latest version)

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 4.2 number 11.2 M89 (in November, 2004), Methods for textile tests The Resistance in the explosion Try of explosion in the ball (Renewal of November, 2004).

.2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes (complete).

.3 No.2-M85, Methods of Testing Geosynthetics – Mass per Unit Area.

.4 No.3-M85, Methods of Testing Geosynthetics – Thickness of Geotextiles.

.5 No.6.1-93, Methods of Testing Geotextiles and Geomembranes – Bursting Strength of Geotextiles Under No Compressive Load.

.6 No.7.3-92, Methods of Testing Geotextiles and Geomembranes – Grab Tensile Test for Geotextiles.

.7 No. 10-94, Methods of Testing Geosynthetics – Geotextiles – Filtration Opening Size.

.4 ASTM International

.1 ASTM D4491-99a (2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

.2 ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

.3 ASTM D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

.4 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

1.3 DELIVERY, STORAGE AND HANDLING

.1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dust, debris and rodents.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling, in accordance with Waste Management Plan.

.4 Fold up metal banding, flatten and place in designated bins.

PART 2 PRODUCTS

2.1 MATERIAL

.1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.

.2 Physical properties:

Thickness :	0.6 mm ± 15%
Tear resistance :	60 N
Tensile strength min. :	180 N
Elongation at break :	55 à 95 %
Pore opening size :	180 µm
Bursting strength min. :	500 kPa

PART 3 EXECUTION

3.1 INSTALLATION

.1 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.2 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.3 Overlap each successive strip of geotextile 600 mm over previously laid strip.

.4 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.5 After installation, cover with overlying layer within 4 hours of placement.

.6 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

3.2 CLEANING

.1 Remove construction waste from site and dispose of in accordance with regulatory requirements.

3.3 PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENT

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 74 11 – Cleaning.

.4 Section 31 23 33.01 – Excavating, Trenching and Backfiling.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C117-13, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C131-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D422-63(2007), Standard Test Method for Particle-Size Analysis of Soils.

.5 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600kN-m/m^3).

.6 ASTM D1557-12e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft^3) (2,700kN-m/m^3).

.7 ASTM D1883-14, 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.

.2 Canadian General Standards Board.

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 If applicable, always refer to the most current version of the applicable codes and standards.

.3 ASTM international

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

PART 2 PRODUCTS

2.1 MATERIALS

.1 Granular sub-base material MG-112 to requirements of section 31 23 33.01 – Excavation, Trenching and Backfilling.

PART 3 EXECUTION

3.1 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by the Departmental Representative.

.2 Ensure no frozen material is placed.

.3 Place material only on clean unfrozen surface, free from snow or ice.

.4 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.5 Place material to full width in uniform layers not exceeding 300 mm compacted thickness. The Departmental Representative may authorize thicker lifts if specified compaction can be achieved.

.6 Before placing material of the successive layer, give each layer a smooth profile and compact it to the specified compaction.

.7 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 COMPACTION

.1 Compact to density of not less than 95 % corrected maximum dry density.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.3 Apply water as necessary during compaction to obtain specified density. If the soil is too humid, dry it by scarifying with appropriate equipment until the water content returns to normal.

3.3 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 74 11 – Cleaning.

.4 Section 31 23 33.01 – Excavating, Trenching and Backfiling.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C117-13, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C131-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D698-12e1, 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 (56,000ft-lbf/ft^3) (2,700kN-m/m^3).

.6 ASTM D1883-14, 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 Office des normes générales du Canada (ONGC ou CGSB)

.1 Office des normes générales du Canada (CGSB)

.2 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire, Inch Series.

.3 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.

1.3 DOCUMENTS AND SAMPLES TO BE SUBMITTED FOR APPROVAL

.1 Submit documents and samples required according to the section 01 33 00 – Documents and samples to be submitted by the estimate of architecture.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Type MG-20 material compliant to requirements of 31 23 33.01 – Excavating, Trenching and Backfilling:

PART 3 EXECUTION

3.1 SEQUENCE OF OPERATION

.1 Place granular base after sub-base is inspected and approved by the Departmental Representative.

.2 Installation

.1 Place, where indicated the aggregate base course to the depth and level prescribed

.2 Ensure no frozen material is placed.

.3 Place material only on clean unfrozen surface, free from snow and ice.

.4 Place material using methods which do not lead to segregation or degradation of aggregate.

.5 Place material to full width in uniform layers not exceeding 200 mm compacted thickness. The Departmental Representative may authorize thicker layers if specified compaction can be achieved.

.6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.7 Remove and replace portion of layer in which material has become segregated during spreading.

.3 Compaction Equipment

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

.4 Compacting

.1 Compact to density not less than 98 % corrected maximum dry density.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density. If soil is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

3.2 TOLERANCES

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

3.3 CLEANING

.1 Progress cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

3.4 PROTECTION

.1 Maintain finished base in condition conforming to this Section until acceptance by the Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 32 12 16 – Asphalt Paving

1.2 REFERENCES

.1 ASTM International

.1 ASTM D140-01 Standard Practice for Sampling Bituminous Materials.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.

1.3 DOCUMENTS/SAMPLES TO SUBMIT

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

.2 Submit two (2) 1 to 4 L samples of asphalt tack coat material proposed for use in new, clean, airtight, sealed containers to the Departmental Representative, at least 2 weeks prior to beginning work.

.3 Sample asphalt tack coat material to: ASTM D140.

.4 Provide access on tank truck for the Departmental Representative to sample asphalt material to be incorporated into work to ASTM D140.

1.4 QUALITY ASSURANCE

.1 Upon request from the Departmental Representative, submit manufacturer's test data and certification that asphalt prime material meets requirements of this Section.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with ASTM D140.

.2 Provide, maintain and restore asphalt storage area.

1.6 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, and with the Waste Reduction workplan.

.2 Send unused bituminous materials to their proper recycling installation.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Pressure distributor: Designed, equipped, maintained and operated so that asphalt material can be:

.1 Maintained at even temperature.

.2 Applied uniformly on variable widths of surface up to 5 m.

.3 Applied at readily determined and controlled rates between 0.2 L/m² and 5,4 L/m² with uniform pressure, and with allowable variation from any specified rate not exceeding 0.1 L/m².

.4 Distribute in uniform spray without atomization at temperature required.

.2 Equipped with meter, registering travel in metres per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.

.3 Equipped with pump having flow meter graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.

.4 Equipped with easily read, accurate and sensitive device which registers temperature of liquid in reservoir.

.5 Equipped with accurate volume measuring device or calibrated tank.

.6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.

.7 Equipped with nozzle spray bar, with operational height adjustment.

.8 Cleaned if previously used with incompatible asphalt material.

PART 3 EXECUTION

3.1 APPLICATION

.1 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Departmental Representative.

.2 Apply asphalt tack coat only on clean and dry surface.

.3 Dilute asphalt emulsion with water at 1:1 ratio for application.

.1 Mix thoroughly by pumping or other method approved by the Departmental Representative.

.4 Apply asphalt tack coat evenly to pavement surface at rate as directed by the Departmental Representative.

.5 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.

.6 Apply asphalt tack coat only when air temperature greater than 10 degrees C and when rain is not forecast within 2 hours minimum of application.

.7 Apply asphalt tack coat only on unfrozen surface.

.8 Evenly distribute localized excessive deposits of tack coat by brooming as directed by the Departmental Representative.

.9 Where traffic is to be maintained, treat no more than one half of width of surface in one application.

.10 Keep traffic off tacked areas until asphalt tack coat has set.

.11 Re-tack contaminated or disturbed areas as directed by the Departmental Representative

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 32 11 23 Aggregate Base Course

.2 Section 32 12 13.16 Asphalt Tack Coats

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

.3 CAN/CGSB-16.3-M90, Asphalt Cements for Road Purposes.

.2 American Association of State Highway and Transportation Officials (AASHTO).

.1 AASHTO M320-10, Standard Specification for Performance Graded Asphalt Binder.

.2 AASHTO R29-15, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.

.3 AASHTO T245-15, Standard Method of Test for Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.

.3 Asphalt Institute (AI).

.1 AI MS-2 Seventh Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.

.4 ASTM International.

.1 ASTM C88-13, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.

.2 ASTM C117-13, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.

.3 ASTM C123-14, Standard Test Method for Lightweight Particles in Aggregate.

.4 ASTM C127-15, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.

.5 ASTM C128-15, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.

.6 ASTM C131-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.7 ASTM C136-14, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.8 ASTM C207-2011, Standard Specification for Hydrated Lime for Masonry Purposes.

.9 ASTM D995-95b(2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

.10 ASTM D2419-14, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

.11 ASTM D3203-11, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

.12 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.3 SAMPLES

.1 Inform the Departmental Representative of proposed source of aggregates and provide access for sampling one (1) week prior to beginning work.

.2 Submit samples of following materials proposed for use one (1) week prior to beginning work.

.3 One 5 L container of asphalt cement.

1.4 MATERIAL CERTIFICATION

.1 Submit viscosity-temperature chart for asphalt cement to be supplied showing either Saybolt Furol viscosity in seconds or Kinematic Viscosity in centistokes, temperature range 105 to 175 degrees C at least one (1) week prior to beginning work.

.2 Submit manufacturer's test data and certification that asphalt cement meets specification requirements.

.3 Submit calibration charts for each hot load and each cold load.

1.5 SUBMITTAL OF MIX DESIGN

.1 Submit asphalt concrete mix design and trial mix test results to the Departmental Representative at least one (1) week prior to beginning work

1.6 DELIVERY AND STORAGE

.1 Stockpile minimum 50 % of total amount of aggregate required before beginning asphalt mixing operation.

.2 When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.

.3 When using a mixing drum dryer, stockpile fine aggregate separately from coarse aggregate.

.4 Provide approved storage, heating tanks and pumping facilities for asphalt cement, and have them approved.

PART 2 PRODUCTS

1.7 MATERIALS

.1 Basecoat of ESG-14 (Coarse aggregate:type 3C ; fine aggregate; type 2) Bituminous binder to specified performance: conforms to AASHTO M320, grade PG 58-34 when running tests according to AASHTO R29.

.2 Topcoat of ESG-10 (Coarse aggregate:type 3B ; fine aggregate; type 2) Bituminous binder to specified performance: conforms to AASHTO M320, grade PG 58-34 when running tests according to AASHTO R29.

PART 3 EXECUTION

1.8 EQUIPMENT

.1 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.

.2 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:

.1 Boxes with tight metal bottoms.

.2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.

.3 In cool weather or for long hauls, insulate entire contact area of each truck box.

.4 Use only trucks which can be weighed in single operation on scales supplied.

.3 Hand tools:

.1 Lutes or rakes with covered teeth for spreading and finishing operations.

.2 Tamping irons having mass 12 kg minimum and bearing area not exceeding 310 cm2 for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by the Departmental Representative, may be used instead of tamping irons.

.3 Straight edges, 4.5 m in length, to test finished surface.

1.9 PREPARATION OF SURFACES TO COVER

.1 Apply layers of prime coat and tack coat prior to paving.

.2 Prior to laying mix, clean surfaces of loose and foreign material.

1.10 TRANSPORTATION OF MIX

.1 Transport mix to job site in vehicles cleaned of foreign material.

.2 Paint or spray truck beds with limewater, soap or detergent solution, or non petroleum based commercial product, at least daily or as required. Lift bucket to drain any excess solution.

.3 Schedule delivery of material for placing in daylight, unless the Departmental Representative approves artificial light for night placing.

.4 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.

.5 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within range as prescribed, but not less than 135 degrees C.

1.11 PLACING OF ASPHALT

.1 Obtain the Departmental Representative's approval of base, existing surface, tack coat prior to placing asphalt.

.2 Place asphalt concrete to thicknesses, grades and lines as indicated on the drawings or as directed by the Departmental Representative.

.3 Place asphalt mixtures only when air temperature is 5 degrees C minimum.

.4 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.

.5 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

.6 Place asphalt concrete in compacted lifts of thickness as indicated on plans.

.1 Basecoat of at least 60 mm;

.2 Topcoat of at least 45 mm.

.3 A single layer of 75 mm minimum.

.7 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm. Verification of the profile must be done regularly by the Contractor with a 4.5 m straight edge.

.8 Where more than on layer of asphalt concrete is required, spread a fine skin of tack between the layers, according to the Departmental Representative's directions.

.9 Place individual strips no longer than 500 m.

.10 Commence spreading at high side of pavement or at crown and span crowned centerlines with initial strip.

.11 Spread and strike off mixture with self-propelled mechanical finisher.

.1 Construct longitudinal joints and edges true to line markings. The Departmental Representative to establish lines for paver to follow parallel to centerline of proposed pavement. Position and operate paver to follow established line closely.

.2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.

.3 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.

.4 Correct irregularities in alignment left by paver by trimming directly behind machine.

.5 Correct irregularities in surface of pavement course directly behind paver. Remove excess material forming high spots using shovel or lute. Fill and smooth indented areas with hot mix. Do not broadcast material over such areas.

.6 Do not throw surplus material on freshly screed surfaces.

.12 When hand spreading is used:

.1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section. Use measuring blocks and intermediate strips to aid in obtaining required cross-section.

.2 Distribute material uniformly without broad casting material.

.3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.

.4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.

1.12 COMPACTING

.1 Roll asphalt continuously using established rolling pattern for test strip and to density of not less than 98 % of maximum density determined for blow Marshall test strip. Joints must be compacted to a minimum of 96 % of the maximum density of the Marshal sample gathered of the mix used.

.2 General:

.1 Provide rollers and as many additional rollers as necessary to achieve specified pavement density. When more than 2 rollers are required, 1 roller must be pneumatic tired type with a minimum weight of 20 metric tonnes) and as many others as necessary to obtain the maximum density specified for the asphalt layer.

.2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface. Ensure that the temperature of the mix is within the specified limits for compacting as indicated on the asphalt certificate.

.3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and 8 km/h for pneumatic tired rollers.

.4 Overlap successive passes of roller by minimum of one-half width of the roller and vary pass lengths.

.5 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.

.6 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.

.7 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.

.8 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.

.9 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.

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

.11 The equipment and compaction work must not damage concrete slabs or other infrastructures adjacent to the asphalt.

.12 Do not drive on concrete slabs with a metal roller.

.3 Breakdown rolling:

.1 Begin breakdown rolling with static steel wheeled roller or vibratory roller immediately following rolling of transverse and longitudinal joint and edges.

.2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

.3 Operate breakdown roller with drive roll or wheel nearest finishing machine except when working on steep slopes or super-elevated sections.

.4 Use only experienced roller operators.

.4 Intermediate rolling:

.1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.

.2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.

.5 Finish rolling:

.1 Accomplish finish rolling with two-axle or three-axle tandem steel wheeled rollers while material is still warm enough for removal of roller marks. If necessary to obtain desired surface finish, use pneumatic-tired rollers as directed by the Departmental Representative.

.2 Conduct rolling operations in close sequence.

1.13 JOINTS

.1 General:

.1 Prepare the vertical face to supply straight surfaces and profiles on which can be posed a new covering. Eliminate all non-adherent substances.

.2 All cold joints, when the temperature is less than 80°C, longitudal and transversal must be heated before the placing of asphalt concrete with an infrarouge heating device. The heating equipment must be installed on the paver and designed for the type of work. The equipment must heat the joints between 80°C and 120°C. The equipment must be approved by the Departmental Representative.

.3 Overlap by 100 mm on previous strip laid by the paver.

.4 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.

.5 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.

.6 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.

.2 Transverse joints:

.1 Place and compact transverse joints to provide smooth riding surface.

.2 Offset joints by at least 2 m.

.3 Offset transverse joint in succeeding lifts by at least 600 mm.

.4 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.

.3 Longitudinal joints:

.1 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.

.2 Roll longitudinal joints directly behind paving operation.

.3 During rolling with a static roller, overlap the new strip along a maximum width of 100 to 150 mm and then operate the roller to firmly pack fine particles across the width of the joint. Continue rolling until the seal is fully and properly compacted.

.4 During rolling with a vibrating roller, place the roller so that substantially the entire drum is on the new path with no more than 100 to 150 mm wide overlapped on the previously laid and compacted strip.

.5 Shift of at least 150 mm, the longitudinal seal in successive layers.

.6 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint to ensure joint is smooth and without visible breaks in grade. Locate feather joints as indicated.

1.14 FINISH TOLERANCES

.1 Each layer, inferior and superior must have a uniform texture, a firm surface without segregation and pitting, be regular and compliant to the transvers and longitudinal profiles specified.

.2 After final rolling of each layer, the Departmental Representative will check the slopes and surfaces. Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low. Finished asphalt surface not to have irregularities exceeding 5 mm when checked with 4.5m straight edge placed in any direction. The thickness of each layer must not vary more than 5 mm the average thickness specified by the rate of placement specified per square meter, this being transformed to thickness with the help of the net average density obtained during the compaction measurement.

.3 The verification of these irregularities is done with a 4.5 m straight edge that the Contractor must have at all times at the work site.

1.15 DEFECTIVE WORK

.1 The Contractor shall correct deficiencies of Article 3.7 that occur before the end of compacting, by loosening the asphalt mixture and adding or removing materials as needed. If these irregularities or these defects remain, even after the final compaction, quickly remove the top layer and spread a new layer of material to obtain an even and smooth surface and compact immediately to the specified density.

.2 The Contractor shall, at his own expense, repair areas that have signs of cracking or undulations.

.3 All surfaces which present segregation are found to be defective and should be repaired at the expense of the Contractor.

.4 The Contractor shall, at his own expense, correct noncompliant level adjustments under Article 3.8 of the surface of the asphalt and the places that hold water surface.

.5 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

.6 The specifications concerning the physical characteristics mentioned in this specification must be met during production. The paving whose mixture does not meet the requirements of sections 3.1.4, 3.6.1 and the percentage of empty spaces will be judged defective and therefore rejected, unpaid and must be replaced by paving which conforms to the specifications, at the expense of the Contractor.

1.16 QUALITY CONTROL

.1 Control by laboratory

.1 Collect a minimum of two (2) samples of the mix. A comprehensive analysis should be performed on each sample. The briquettes (4) shall be made manually on site without heating the samples, applying 50 strokes/face.

.2 The rate may be reduced if production is not stable.

.2 Control by the Contractor

.1 The Contractor shall provide at his expense the analysis results for at least one sample of the asphalt product. The sample must be taken together with the laboratory of the Departmental Representative. A comprehensive analysis should be performed on this sample.

.2 Briquettes (4) shall be made of manually on site by applying 50 strokes/face and without heating samples of asphalt concrete.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 01 33 00 – Submittal Procedures.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.2 CAN/CGSB-1.5-M91, Thinner, mineral oil with low flash point.

.3 CGSB1-GP-12c-68, Colors standards of paints

.4 CGSB1-GP-71-83, Test methods of paints(paintings) and pigments.

.5 CGSB1-GP-74M-79, Paint alkyde of road demarcation.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section [01 33 00 - Submittal Procedures].

.2 Submit to Departmental Representative following material sample quantities at least 4 weeks prior to commencing work.

.1 Two 1 L samples of each type of paint.

.2 One 1kg sample of glass beads.

.3 Sampling to MPI Painting Manual.

.3 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, MPI specification number and formulation number and batch number.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Paint and Markings:

.1 Marking paint of alkyde resine, for roads, must conform to standard CGSB1-GP-74M

.2 Colour : yellow 505-308 and white 513-301, to standard CGSB1-GP-12cv.

.3 Upon request, Departmental Representative will supply qualified product list of paints applicable to work. Qualified paints may be used but Departmental Representative reserves right to perform further tests.

.2 Thinner: to standard CAN/CGSB-1.5.

.3 Glass reflective beads:

.1 Type suitable for application to wet paint surface for light reflectance. CGSB1-GP-74M.

PART 3 EXECUTION

3.1 MATERIAL

.1 Use approved marking equipment, working under pressure, which can apply paint evenly in a continuous line, two solid lines and broken lines. The equipment used must be capable of applying marking products uniformly, at the prescribed application rate and according to the dimensions shown, and must be provided with a secure locking device.

.2 The equipment used must be able to apply reflective glass beads by sprinkling them on the freshly applied paint.

3.2 SURFACE CONDITION

.1 Pavement surface to be painted must be dry, free of standing water, frost, ice, dust, oil, grease and other foreign matter.

3.3 APPLICATION

.1 Pavement markings: Departmental Representative to lay out pavement markings.

.2 Unless otherwise approved by Departmental Representative, apply paint only when air temperature is above 10 degrees C, wind speed is less than 60 km/h and no rain is forecast within next 4 hours.

.3 Apply traffic paint evenly at rate of 3 m^2/L.

.4 Do not thin paint unless approved by Departmental Representative.

.5 Symbols and letters to dimensions indicated.

.6 Paint lines of uniform colour and density with sharp edges.

.7 Thoroughly clean distributor tank before refilling with paint of different colour.

.8 Apply glass beads at rate of 200 g/m^2 of painted area immediately after application of paint.

3.4 TOLERANCE

.1 Paint markings: within plus or minus 12 mm of dimensions indicated.

.2 Remove incorrect markings and repaint.

3.5 PROTECTION

.1 Protect pavement markings until dry.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

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

PART 2 PRODUCTS

2.1 TOPSOIL

.1 Topsoil should be recovered for replacement.

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 watercourse, according to requirements of authorities having jurisdiction.

.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 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as indicated after area has been cleared of brush and removed from site.

.2 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.

.3 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill as directed by Departmental Representative.

.4 Protect stockpiles from contamination and compaction.

3.3 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.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil after Departmental Representative has accepted subgrade.

.2 Spread topsoil in uniform layers not exceeding 150 mm.

3.5 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 leave surfaces smooth, uniform and firm against deep footprinting.

3.6 ACCEPTANCE

.1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.7 SURPLUS MATERIAL

.1 Dispose of materials except topsoil not required where directed by Departmental Representative.

3.8 CLEANING

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 32 91 19.13 – Topsoil Placement and Grading:

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

.2 Scheduling:

.1 Schedule hydraulic seeding to coincide with preparation of soil surface.

.2 Schedule hydraulic seeding using grass mixtures between dates recommended by Provincial Agricultural Department.

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 erosion control blanket, seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 – Health and Safety Requirements 01 35 43 – Environmental Procedures.

.3 Submit in writing 10 days prior to commencing work:

.1 Volume capacity of hydraulic seeder in litres.

.2 Amount of material to be used per tank based on volume.

.3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

.4 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

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

1.4 QUALITY ASSURANCE

.1 Soils Testing:

.1 Contractor is responsible for soils testing to determine appropriate ratios and application rates for fertilizer, lime, and any soil amendments that may be required.

.2 Soil test report to prescribe ratios and rates for initials applications as well as subsequent applications during establishment and warranty period.

.3 Submit soil test report to Departmental Representative in accordance with Section 01 33 00 – Submittal Procedures.

1.5 **1.7 DELIVERY, STORAGE AND HANDLING**

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.

.2 Inoculant containers to be tagged with expiry date.

.3 Storage and Handling Requirements:

.1 Store fertilizer indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.5 Packaging Waste Management: remove for reuse of packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

1.6 **WARRANTY**

.1 For seeding, 12 months warranty period is extended to 24 months.

PART 2 **PRODUCTS**

2.1 **MATERIALS**

.1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.

.1 Grass mixture: "Certified", "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".

.1 Mixture composition for exterior of range exclosure:

.1 40% Kentucky Bluegrass.

.2 40% Creeping Red Fescue.

.3 20% Annual Ryegrass.

.2 Mixture composition for interior of range exclosure:

.1 30% J-5 Chewing Fescue.

.2 25% Revenge GLX Perennial Ryegrass.

.3 20% Beynd Kentucky Bluegrass.

.4 15% Havana Poa Trivialis.

.5 10% Audabon Creeping Red Fescue.

.2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:

.1 Type I mulch:

.1 Made from wood cellulose fibre.

.2 Organic matter content: 95 % plus or minus 0.5 %.

.3 Value of pH: 6.0.

.4 Potential water absorption: 900 %.

.3 Tackifier: water dilutable, liquid dispersion.

.4 Water: free of impurities that would inhibit germination and growth.

.5 Fertilizer:

.1 To Canada "Fertilizers Act" and Regulations.

.2 Complete synthetic, slow release with 35 % of nitrogen content in water-insoluble form.

.6 Lime: of agriculture source, purity and fineness suitable for growth of turf grass.

.7 Inoculants: inoculant containers to be tagged with expiry date.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for hydraulic seeding 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 PROTECTION OF EXISTING CONDITIONS

.1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.

.2 Immediately remove any material sprayed where not intended as directed by Departmental Representative.

3.3 PREPARATION OF SURFACES

.1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.

.2 Prepare surface in accordance with Section 32 91 19.13 – Topsoil Placement and Grading.

.3 Fine grade areas to be seeded free of humps and hollows.

.1 Ensure areas are free of deleterious and refuse materials.

.4 Cultivated areas identified as requiring cultivation to depth of 25 mm.

.5 Ensure areas to be seeded are moist to depth of 150 mm before seeding.

.6 Obtain Departmental Representative's approval of grade and topsoil depth before starting to seed.

3.4 FERTILIZING PROGRAM

.1 Fertilize prior to fine grading applying fertilizer equally in accordance with the rate and ratio determined from soils tests.

.2 Fertilize during establishment and warranty periods applying fertilizer equally distributed in accordance with the rate and ratio determined from soils tests.

3.5 PREPARATION OF SLURRY

.1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Departmental Representative. Supply equipment required for this work.

.2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.

.3 After materials are in seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.6 SLURRY APPLICATION

.1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.

.2 Hydraulic seeding equipment:

.1 Slurry tank.

.2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/or mechanical agitation method.

.3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.

.3 Slurry mixture applied per hectare.

.1 Seed: 2 kg or as recommended by seed supplier.

.2 Mulch: 10 kg.

.3 Tackifier: as recommended by manufacturer

.4 Water: Minimum 100 L.

.5 Fertilizer: in accordance with rate and ratio determined from soils tests.

.4 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.

.1 Using correct nozzle for application.

.2 Using hoses for surfaces difficult to reach and to control application.

.5 Blend application 300 mm into adjacent grass areas or sodded areas or previous applications to form uniform surfaces.

.6 Re-apply where application is not uniform.

.7 Remove slurry from items and areas not designated to be sprayed.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 – Cleaning.

.1 Clean and reinstate areas affected by Work.

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

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.

3.8 PROTECTION

.1 Protect seeded areas from trespass until plants are established.

.2 Remove protection devices as directed by Departmental Representative.

3.9 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Ensure maintenance is carried out under supervision of certified Landscape Maintenance Supervisor.

.2 Perform following operations from time of seed application until acceptance by Departmental Representative.

.3 Grass Mixture:

.1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.

.2 Fertilize seeded areas after 10 weeks after germination provided plants have mature true leafs. Spread half of required amount of fertilizer in one direction and remainder at right angles.

.3 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.

.4 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

3.10 ACCEPTANCE

.1 Seeded areas will be accepted by Departmental Representative provided that:

.1 Plants are uniformly established and seeded areas are free of rutted, eroded, bare or dead spots.

.2 Areas have been fertilized.

.2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.11 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:

.1 Repair and reseed dead or bare spots to satisfaction of Departmental Representative.

.2 Fertilize seeded 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.

END OF SECTION

PART 1 GENERAL

1.1 SECTION CONTENTS

.1 Materials, equipment and methods of installation related to the main water distribution pipes, valves and other valve devices.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – APPENDIX B – Shop Drawings – Presentation Data.

.2 Section 01-45-00 – Quality control.

.3 Section 01 74 11 – Cleaning.

.4 Section 31 23 33.01 – Excavating Trenching and Backfilling

1.3 REFERENCES

.1 Gouvernement du Québec, Ministère des Transports

.1 BNQ 1809-300/2004(R2007) : Travaux de construction – Clauses techniques générales – Conduites d'eau potable et d'égout.

.2 American National Standards Institute/American Water Works Association (ANSI/AWWA)

.1 ANSI/AWWA B300-10, Hypochlorites.

.2 ANSI/AWWA B301-10, Liquid Chlorine.

.3 ANSI/AWWA B303-13, Sodium Chlorite.

.4 ANSI/AWWA C104/A21.4-08, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

.5 ANSI/AWWA C105/A21.5-10, Polyethylene Encasement for Ductile-Iron Pipe Systems.

.6 ANSI/AWWA C111/A21.12-00, Rubber-Gasket Joints for Ductile-Iron and Gray Iron Pressure Pipe and Fittings.

.7 ANSI/AWWA C110/A21.10-12, Ductile-Iron and Gray Iron Fittings, 3 inch through 48 inch (75 mm through 1200 mm), for Water.

.8 ANSI/AWWA C150/A21.50-08, Thickness Design of Ductile-Iron Pipe.

.9 ANSI/AWWA C151/A21.51-09, Ductile-Iron Pipe, Centrifugally Cast, for Water.

.10 ANSI/AWWA C153/A21.53-11, Ductile-Iron Compact Fittings for Water Service.

.11 ANSI/AWWA C200-12, Steel Water Pipe - 6 in (150 mm) and Larger.

.12 ANSI/AWWA C203-15, Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied. (Includes Addendum C203a-99).

.13 ANSI/AWWA C205-12, Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 Inch (100 mm) and Larger - Shop Applied.

.14 ANSI/AWWA C206-11, Field Welding of Steel Water Pipe.

.15 ANSI/AWWA C207-13, Steel Pipe Flanges for Waterworks Service, 4 Inch through 144 Inch (100 mm through 3,600 mm).

.16 ANSI/AWWA C208-12, Dimensions for Fabricated Steel Water Pipe Fittings.

.17 ANSI/AWWA C300-15, Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.

.18 ANSI/AWWA C301-14, Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.

.19 ANSI/AWWA C303-08, Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type.

.20 ANSI/AWWA C500-09, Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).

.21 ANSI/AWWA C504-15, Rubber-Seated Butterfly Valves.

.22 ANSI/AWWA C600-10, Installation of Ductile-Iron Water Mains, and Their Appurtenances.

.23 ANSI/AWWA C602-11, Cement-Mortar Lining of Water Pipelines - 4 In. (100 mm) and Larger.

.24 ANSI/AWWA C603-04(2008), Installation of Asbestos Cement Pressure Pipe.

.25 ANSI/AWWA C651-14, Disinfecting Water Mains.

.26 ANSI/AWWA C800-14, Underground Service Line Valves and Fittings (Also Included: Collected Standards for Service Line Materials).

.27 ANSI/AWWA C900-07, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 Inch through 12 Inch (100 mm - 300 mm), for Water Distribution.

.3 American Society for Testing and Materials International, (ASTM)

.1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.

.2 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

.3 ASTM B88M-13, Standard Specification for Seamless Copper Water Tube [Metric].

.4 ASTM C117-13, Standard Test Method for Material Finer Than 75 [MU] m (No. 200) Sieve in Mineral Aggregates by Washing.

.5 ASTM C136-14, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.6 ASTM C478M-07, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.

.7 ASTM D698-12a2, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft (600 kN-m/m^3)).

.8 ASTM D2310-06(2012), Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.

.9 ASTM D2657-07, Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.

.10 ASTM D2992-06, Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fitting.

.11 ASTM D2996-15, Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.

.12 ASTM F714-13, Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

.13 ASTM C618-15, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

.4 American Water Works Association (AWWA)/Manual of Practice

.1 AWWA M9-2008, Concrete Pressure Pipe.

.2 AWWA M11-2004, Steel Pipe - A Guide for Design and Installation.

.3 AWWA M17-2006, Installation, Field Testing, and Maintenance of Fire Hydrants.

.4 AWWA C-509-09, Standard for Resilient-Seated Gate Valves for Water Supply Service

.5 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.

.3 CAN/CGSB-1.88-92, Paint (Painting) enamel brilliant in alkydes resins, air-drying ambient and in the oven.

.4 CAN/CGSB-34.1-[94], Pipe, Asbestos Cement, Pressure.

.5 CGSB 41-GP-25M-[77], Pipe, Polyethylene, for the Transport of Liquids.

.6 CSA International

.1 CAN/CSA-A257 - 14, Standards for Concrete Pipe

.2 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.3 CAN/CSA-B137 Series-09, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).

.4 CAN/CSA-B137.1-09, Polyethylene Pipe, Tubing, and Fittings for Cold-Water Pressure Services.

.5 CAN/CSA-B137.3-09, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.

.6 CSA G30.18-2014, Carbon and Steel Bars for Concrete Reinforcement).

.7 Ministère de la Justice Canada (Jus)

.1 Loi canadienne sur la protection de l'environnement (LCPE), 1999.

.8 Transports Canada (TC)

.1 Loi sur le transport des marchandises dangereuses, 1992.

.9 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - September 2012.

.10 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S520-[07], Standard for Fire Hydrants.

.2 CAN/ULC-S543-[09], Standard for Internal-Lug, Quick Connect Couplings for Fire Hose.

1.4 DOCUMENTS/SAMPLES TO SUBMIT

.1 Submit shop drawings in accordance with Section [01 33 00 – Submittal Procedures].

.2 Submit samples in accordance with Section [01 33 00 – Submittal Procedures].

.3 At least four (4) weeks before the beginning of the works, indicate to Departmental Representative the source of procurement proposed for the materials of the foundation layer, to allow him access for sampling.

.4 Ensure that the pipe are certified and stamped.

1.5 WASTE MANAGEMENT

.1 Sort waste according to section 01 74 11 – Cleaning.

PART 2 PRODUCTS

2.1 PIPES, JOINTS AND FITTINGS

.1 Comply technical standard specification BNQ 1809-300 / 2004 - Construction piping - General technical clauses - Potable water pipes and sewer.

.2 Pipes from polyvinyl chloride (PVC) for class pressurized supply DR-18 to the standard BNQ 3624-250, for pipes of 100 mm and more.

2.2 PIPE PROTECTION

.1 Provide means of protection for iron pipe in corrosive soils in accordance with local practices and authorities having jurisdiction to ANSI/AWWA C105/A21.5.

2.3 VALVES AND VALVE BOXES

.1 Valves to open clockwise.

.2 Gate valves: to ANSI/AWWA C500, standard iron body, brass or bronze mounted, wedge or double disc valves with non-rising stems, suitable for 1 Pa with mechanical or flanged, push-on or grooved type coupling joints.

.3 Underground type indicator valve where indicated.

.4 Cast iron valve boxes: 304 stainless steel fixed stem type, with ribbed cast iron cover with bronze pentagonal head cap. The pin holding the connecting valve stem must be made of a mild steel pipe to ASTM A 501, 25 mm nominal diameter, and at least 3.4 mm thich, without welded longitudinel seam, bituminous coated screw type threads of the pipe and cap must be 11 ½ NPT (11½ threads per 25.4 mm) The stainless steel used must comply with the requirements of ASTM A 743 / A 743m.

.5 The bronze should be characterized according to the requirements of one of the following designations: UNS C83600 is of ASTM B 62 or ASTM B 584 or UNS C83800, C84400 or UNS UNS C85700 ASTM B 584.

.6 Specified models Laroche Z112 or Z116 with stem in stainless, Mueller A-726 or A-728 with rod in stainless, or Clow D-1 or D-2 with rod in stainless steel.

.7 If an extension is necessary, it must be threaded at both ends to attach the cap to the top section and be covered with bitumen. Pressure screw extensions on one or the other of its ends is prohibited.

.1 Top of valve box to be marked "WATER"/"EAU.

2.4 WATER CONNECTIONS

.1 Polyvinyl chloride pressure pipe: to CAN/CSA-B137.3, type 1120 series 160, category 1.1 MPa.

.2 Joints: solvent welded in accordance with manufacturer's specifications

.3 Brass corporation stops: red brass compression type having threads to ANSI/AWWA C800.

.4 Brass inverted key-type curb stops: red brass to ASTM B62, compression type with drains.

.1 Stops to have adjustable bituminous coated cast iron service box with stem to suit depth of bury.

.2 Top of cast iron box marked "WATER"/"EAU"

.5 PVC tapping tees on PVC pipe.

.1 Service connections 100 mm and over: use tee fitting or tapping valve and sleeve

.6 Bronze type service clamps: for PVC pipe service connections

.1 . Service clamps to be of strap-type, with confined "O" ring seal cemented in place.

.2 Clamps to be tapped with threads to ANSI/AWWA C800.

.7 Tee connections to be fabricated of same material and to same standards as specified pipe fittings and to have ends matching pipe to which they are joined

.8 Pressurized Water Main connections :

.1 Water main connection to be done without shutting down the existing water supply system. Work to be done by a specialized company. The installed equipment must conform to AWWA C800.

2.5 PIPE BEDDING AND SURROUND MATERIAL

.1 The granular material will be conform to section 31 23 33.01 – Excavation, Trenching and Backfilling.

2.6 BACKFILL MATERIAL

.1 The granular materials will be conform to section 31 23 33.01 – Excavation, Trenching and Backfilling.

2.7 PIPE DISINFECTING

.1 Sodium hypochlorite or Calcium hypochlorite to ANSI/AWWA B300 to disinfect water mains.

.2 Disinfect water mains in accordance with BNQ-1809-300/2004 (R2007.

2.8 INSULATION OF WATER MAINS

.1 . Insulation in HI-60, 38 mm thick sheets.

PART 3 EXECUTION

3.1 PREPARATION WORK

.1 Before installation of the pipes :

.1 Inspect materials for defects to approval of the Departmental Representative. Remove defective materials from site as directed by Departmental Representative.

3.2 TRENCHING

.1 Do trenching work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Ensure trench depth allows coverage of at least 2,15 m over pipe from finished grade as indicated on drawings.

.3 Trench alignment and depth require Departmental Representative's approval prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

.1 Granular Material as Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.4 INSTALLATION OF PIPES

.1 In places where protection against freezing by cover of 2.15 m is ensured, install uninsulated pipe.

.2 In locations where protection against freezing is not ensured, install insulated and heat traced piping.

.3 Finish the building branch line to the building of the foundation wall or until the pipe is protected against frost. Install couplings needed to make the connection to the building of the network.

3.5 INSTALLATION OF VALVES

.1 Install valves to manufacturer's recommendations at locations as indicated

.2 Support valves located in valve boxes or valve chambers by means of the same bedding as adjacent pipe. Maximum length of pipe on each end of valve shall be 1 m. Valves not to be supported by pipe.

.3 Install underground post-type indicator valves as indicated

3.6 PASSAGE SOUS UN OBSTACLE

.1 Excavate working pit to dimensions indicated,outside right-of-way or the facility to be crossed

.2 Excavate working pit to not less than 0.6 m below lowest invert of encasing pipe

.3 Dewater excavation

.4 Dewater the underground zone to be crossed.

.5 Install heavy timber or steel frame backstop.

.6 Place encasing pipe to exact line and grade indicated. Encasing pipe to cross under obstruction at an angle of 45 degrees.

.7 Install encasing pipe by jacking or boring or tunnelling

.8 Ensure encasing pipe is not in tension

.9 Joints for encasing pipe: mechanical or welded type.

.10 Place concrete grout levelling pad in encasing pipe. Control level of grout during placing

.11 Insert water main into encasing pipe, in end with largest open area, after placement of levelling pad

.12 Use approved blocking method to guide water main in true alignment

.13 Clearance between blocks and encasing pipe: maximum 15 mm when water main is in position

.14 Join water main one length at time outside encasing pipe. Push or pull water main into position.

.15 Couplings of water main shall not rest on levelling pad when water main is in position

.16 Place concrete cradle around water main after it is positioned. Cradle to be minimum of 225 mm and maximum of 300 mm above levelling pad

3.7 WATER SERVICE CONNECTIONS

.1 Terminate building water service from the property line to 1 m outside building foundation wall, in line with the point of connection to main

.2 Tappings on PVC pipe to be either PVC valve tees or bronze type service clamps, strap type with "O" ring seal cemented in place

3.8 HYDROSTATIC AND LEAKAGE TESTING

.1 Do leak testing according to the requirements of the MDDEFP directives.

.2 Refer to BNQ 1809-300/2004 (R2007) : Travaux de construction – Clauses techniques générales – Conduites d'eau potable et d'égout.

3.9 SERVICE INTERRUPTION

.1 The Contractor shall carry out the decommissioning work of the existing water main once the new station has been accepted by the Departmental Representative.

3.10 INSULATION OF WATER PIPES

.1 Proceed with the installation of HI-60 insulating sheet according to the details presented the drawing where the thickness of cover of the potable water pipes is less that the frost depth of 2.15 m.

3.11 FLUSHING AND DISINFECTING

.1 Provide labour, equipment and materials required for the flushing and disinfection of the potable water pipes. Disinfect the water distribution network and carry out bacteriological analysis by a specialised firm in this type of work, and assume all costs.

.2 Flushing and disinfecting operations: witnessed by Departmental Representative, carried out by specialist contractor according to the requirements of MDDEFP. Notify the Departmental Representative at least four (4) days in advance of proposed date when disinfecting operations will begin.

3.12 SURFACE RESTORATION

.1 After installing and backfilling over water mains, restore surface to original condition as directed by the Departmental Representative.

3.13 WARNING TAPE

.1 During the water main backfilling, the Contractor must provide and install an warning tape 300 mm above the water main.

3.14 LOCATOR WIRE

.1 In the case of the installation of PVC water mains, the Contractor shall supply and install a 90-RWU number 12 copper wire locator to connect each of the cast iron accessorys as well as valves.

.2 For ductile iron water mains ductile iron, the Contractor shall provide and install a blade or two copper corners to provide electrical conductivity.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

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

.2 Section 01 11 00 – Summary of Work

1.2 REFERENCES

.1 ASTM International

.1 ASTM 1732-12 – Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer and drain pipe Containing Recycled PVC Material

.2 ASTM D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

.2 Bureau de Normalisation du Québec (BNQ)

.1 BNQ 3624-050 Tuyaux perforés et raccords en poly(chlorure de vinyle) non plastifié (PVC-U) - Tuyaux d'un diamètre inférieur ou égal à 150 mm pour la dispersion souterraine des effluents

.2 BNQ 3624-130 Tuyaux et raccords en poly(chlorure de vinyle) non plastifié (PVC-U) – Tuyaux d'un diamètre inférieur ou égal à 150 mm

PART 2 PRODUCTS

2.1 PLASTIC PIPE

.1 PVC Circular pipes with interlocking joints and fittings compliant to the above standards.

.1 50, 75 and 100 mm in diameter minimum stiffness of 320 kPa.

.2 Manholes will be prefabricated.

.3 The backfill around the pipe will be CG-14.

PART 3 EXECUTION

3.1 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.2 Trench alignment and depth require approval of Departmental Representative prior to placing bedding material and pipe.

3.2 GRANULAR BEDDING

.1 Place granular bedding materials in uniform layer not exceeding 300 mm compacted thickness after compacting to the level of the invert of the pipe.

.2 Compact each layer full width of bed to at least 95% corrected maximum dry density.

.3 Fill excavation below bottom of specified bedding adjacent to manholes or structures with lean mix concrete.

3.3 INSTALLATION

.1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.

.2 Handle pipe using methods approved by Departmental Representative.

.1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.

.4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.5 Water to flow through pipe during construction, only as permitted by Departmental.

.6 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.7 Pipe jointing:

.1 Install gaskets in accordance with manufacturer's written recommendations.

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.3 Align pipes before joining.

.4 Maintain pipe joints free from mud, silt, gravel and foreign material.

.5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.8 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.9 Make watertight connections to manholes.

.1 Use shrinkage compensating grout when suitable gaskets are not available.

3.4 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.

.3 Hand place surround material in uniform layers not exceeding 300 mm compacted thickness as indicated.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to mid height of pipe to at least 95% corrected maximum dry density.

.6 Compact each layer from mid height of pipe to underside of backfill to at least 90% corrected maximum dry density.

3.5 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding 300 mm compacted thickness up to grades as indicated.

.3 Under paving and walks, compact backfill to at least 90% corrected maximum dry density.

3.6 FIELD TESTING

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 Remove foreign material from sewers and related appurtenances by flushing with water.

.3 Perform air infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.

END OF SECTION

PART 1 GENERAL

1.1 SECTION CONTENTS

.1 Materials, equipment and installation methods related to storm sewer network.

1.2 RELATED REQUIREMENTS

.1 Section 03 30 00 – Cast in Place Concrete

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

.3 Section 31 05 16 – Aggregate Materials.

1.3 REFERENCES

.1 Bureau de normalisation du Québec (BNQ)

.1 BNQ-1809-300/2004 (R2007), Polyethylene (PE) Pipe and Fittings – Flexible Corrugated Pipes and Drainage – Characteristics and Test Methods

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-[M89], Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.

.3 CAN/CGSB-34.9-[94], Asbestos-Cement Sewer Pipe.

.3 CSA International

.1 CAN/CSA-A3000F98 Cementitious Materials Compendium. (containst : A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98)

.2 CSA A257 Series-[M14 (R2014)], Standards for Concrete Pipe.

.3 CAN/CSA-B1800-[06], Thermoplastic Non-pressure Pipe Compendium - B1800 Series. (contains : B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 et 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 CSA G401-F01, Corrugated Steel Pipe Products.

.4 Ministère de la Justice Canada (Jus).

.1 Loi canadienne sur la protection de l'environnement (LCPE), 1999.

.5 Transports Canada (TC).

.1 Loi sur le transport des marchandises dangereuses,1992.

.6 ASTM International

.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 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.5 ASTM C136-[06], Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

.6 ASTM C425-[04(2009)], Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.

.7 ASTM C428-[97(06)], Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.

.8 ASTM C443M-[10], Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).

.9 ASTM C506M-[10b], Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.

.10 ASTM C507M-[10b], Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe (Metric).

.11 ASTM C663-[98(2008)], Standard Specification for Asbestos-Cement Storm Drain Pipe.

.12 ASTM C700-[11], Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

.13 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)).

.14 ASTM D1056-[07], Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.

.15 ASTM D1869-[95(2010)], Standard Specification for Rubber Rings for Asbestos-Cement Pipe.

.16 ASTM D2680-[01(2009)], Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

.17 ASTM D3034-[08], Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

.18 ASTM F405-[05], Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.

.19 ASTM F667-[06], Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.

.20 ASTM F794-[03(2009)], Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Sort waste according to section 01 74 21 – Construction/Demolition Waste Management and Disposal.

1.5 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

PART 2 PRODUCTS

2.1 PIPE

.1 Comply with technical Standard Specifications BNQ 1809-300/2004 – Construction Piping – General technical clauses - Potable water pipes and sewer.

PART 3 EXECUTION

3.1 PREPARATION

.1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.2 Protect trench from contents of sewer.

.3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material, and compact.

3.4 INSTALLATION

.1 Lay and join pipe in accordance with manufacturer's recommendations.

.2 Connect pipes in accordance with manufacturer's recommendations

.3 Handle pipe using methods approved by manufacturer. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.4 The joints of reinforced concrete pipes are protected against the ingress of soil by laying a geotextile membrane. This membrane must have a minimum width of 600 mm and surround each joint with a minimum overlap of 300 mm.

.5 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.6 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.7 For the control of alignments and levels, use of the laser beam is required and installation is done using a theodolite.

.8 Joint deflection permitted within limits recommended by pipe manufacturer.

.9 Water to flow through pipes during construction only as permitted by Departmental Representative.

.10 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.11 Complete each joint before laying next length of pipe.

.12 Install plastic pipe and fittings in accordance with CAN/CSA-B18 2.11.

.13 Installation of the regulator and the retention basin must be made according to manufacturers' recommendations.

3.5 JOINTS

.1 Concrete or PVC pipe:

.1 Install gaskets as recommended by manufacturer.

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.3 Align pipes before joining.

.4 Maintain pipe joints free from mud, silt, gravel and other foreign material.

.5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Minimize joint deflection after joint has been made to avoid joint damage.

.8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.2 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent "creep" during down time.

.3 Plug lifting holes with Departmental Representative approved prefabricated plugs, set in shrinkage compensating grout.

.4 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

3.6 PIPE SURROUND

.1 In accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Place layers uniformly and simultaneously on each side of pipe.

3.7 BACKFILL

.1 Place unshrinkable backfill in accordance with Section 31 23 33.01 – Excavating, Trenching and Backfilling.

3.8 UNDERCROSSING

.1 Excavate working pit outside right-of-way to be crossed.

.2 Excavate working pit to minimum of 0.5 m below lowest invert of encasing pipe.

.3 Dewater excavation.

.4 Dewater area of undercrossing.

3.9 FIELD TESTS AND INSPECTIONS

.1 Se référer au BNQ 1809-300 : Travaux de construction – Clauses techniques générales – Conduites d'eau potable et d'égout.

.2 Repair or replace pipe, pipe joint or bedding found defective.

.3 Draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction directed by Departmental Representative.

.4 Remove foreign material from sewers and related appurtenances by flushing with water.

.5 Television and photographic inspections. Carry out inspection of installed sewers by television camera, photographic camera or by other related means.

.1 Provide means of access to permit Departmental Representative to do inspections.

.2 Payment for inspection services is the responsibility of the Contractor.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

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

.2 Section 26 05 28 – Grounding – Secondary

.3 Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts

.4 Section 26 24 01 – Service Equipment

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 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.

1.4 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 45 00 – Quality Control.

.2 Regulatory Requirements:

.1 Perform Work to comply with applicable Provincial/Territorial regulations.

.2 Co-ordinate and meet requirements of power supply authority.

.1 Ensure availability of power when required.

.3 Certificates: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

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

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements with manufacturer's written instructions.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Underground ducts: rigid type DB2, size as indicated.

.2 Rigid steel galvanized conduit and fittings: size as indicated.

.3 Conductors: copper, type RWU-90, size and number of conductors as indicated.

.4 Meter socket: weatherproof, and approval of electrical supply authority.

.5 Concrete: to CAN/CSA A23.1/A23.2.

.6 Backfill: clean and free of debris.

PART 3 EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Install cables in trenches and in conduit in accordance with Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts.

.2 Allow adequate conductor length for connection to supply by power supply authority.

.3 Install meter socket and conduit.

.4 Allow adequate conductor length for connection to service equipment.

.5 Make grounding connections in accordance with Section 26 05 28 – Grounding – Secondary.

.6 Install concrete encased ducts for electrical systems as indicated and in accordance with CAN/CSA A23.1.

.7 Seal ducts and conduits at building entrance location after installation of cable.

3.3 FIELD QUALITY CONTROL

.1 Site Tests:

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Perform additional tests if required by authority having jurisdiction.

.2 Submit written test results to Departmental Representative for approval.

END OF SECTION

APPENDIX

APPENDIX A

Geotecnical investigation – March 2017

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Construction of a Firing Range Donnacona Establishment 1537, route 138 Donnacona (Québec)

Geotechnical investigation

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March 2017

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Exploratory drillings location plan 638589-1

1 Introduction

SNC-Lavalin's professional services in Environment and Geoscience, previously known as Qualitas and now known as SNC-Lavalin GEM, has been asked by the department of Public Works and Government Services Canada (for the department of the Correctional Service Canada [CSC]) to make a geotechnical study and an environmental characterization for a firing range construction in Donnacona.

The geotechnical investigation has been done according to the work proposal no 16-01144-rév1 from August16th, 2016.

The objective of the geotechnical study was to determine the nature and characteristics of the underground material and the conditions of the underground water at the proposed building and the related facilities. The results would allow us to determine the carrying capacity of the ground at the ultimate limit state and at the serviceability limit state and to determine the design for the parking lot pavement, the access road and a U-turn.

This report contains the description of the work method used for the geotechnical investigation and the results presentation for the tests done on-site and in the laboratory. It also contains comments and geotechnical recommendations related to the planned works.

The results and the conclusion of the environmental characterization are separately presented in the report no 2 of the same project. In addition, SNC-Lavalin is in charge of the engineering for this project. At the time of the study, the engineering for the whole project was in progress. It is also planned that SNC-Lavalin will provide the quality control of the material during the work.

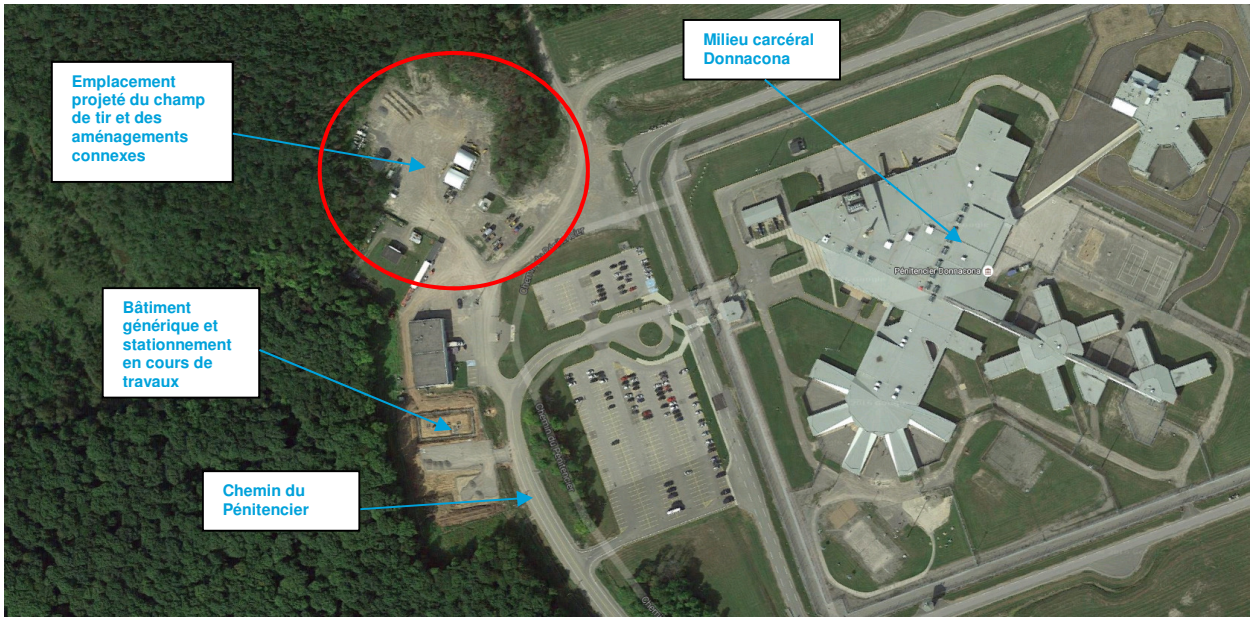
This report has been specifically and exclusively prepared for the department of Public Works and Government Services Canada and the consultants affiliated to the project. The conclusion and the recommendations identified are only valid for the conditions and the hypotheses described in the report. SNC-Lavalin will have to be informed of any changes regarding the location, the nature or the design of the project in order to evaluate the impact and, if necessary, change in a written document the conclusion and recommendations stated in this report. The scope of the report is detailed in the appendix 1.

2 Site Description

According to the obtained information, the project is the construction of a firing range including a shelter, a bullet catcher, a training building, a parking lot, an access road, a U-turn and training cells.

The building is located in 1537, route 138 in Donnacona, between the route 138 and the autoroute 40. It is accessible via le chemin du Pénitencier (approximately 1.5 km long). It is a maximum security prison. However, the works will take place outside the security perimeter. Figure 1 shows an overview of the site.

Figure 1 Overview of the study site (from Google Map, Sept. 15th, 2016)



A kick-off meeting and a site visit took place on June 13, 2016.

The study site is currently used as a material and machine storage site. Many containers and sheds and a lot of material are noted on the site. The site surface is relatively flat, and a wooded area with mature trees is located on the edge of this area. According to the information disclosed at the kick-off meeting, a 1 m backfill is covering the whole site.

The following figures (2–5) show an overview of the site.

Figure 2 Study Site (August 30, 2016)

Figure 3 Study Site (August 30, 2016)

Figure 4 Study Site (August 30, 2016)

Figure 5 Study Site (August 30, 2016)

3 Recognition Process

3.1 Fieldwork

The fieldwork consists of 3 drillings (F-1 to F-3) and 4 exploratory wells (PU-4 and PU-6 to PU-8). The exploratory drilling took place from August 30th to September 1, 2016, under the constant supervision of a geotechnical technician of SNC-Lavalin.

The exploratory well PU-5, located on the planned access road to the firing range has been canceled because of buried underground pipes non-located before the fieldwork.

Table 1 presents the exploratory drillings list and their levels and depths.

Table 1 Information on the exploratory drillings

Exploratory Drilling n°	Date	Level of the exploratory drilling surface (m)	Level of the exploratory drilling bottom (m)	Exploratory drilling depth (m)
F-1	2016-30-08	73,41	66,21	7,20
F-2	2016-30-08	73,50	68,00	5,50
F-3	2016-31-08	73,54	68,04	5,50
PU-4	2016-01-09	73,08	70,78	2,30
PU-6	2016-01-09	73,71	71,26	2,45
PU-7	2016-01-09	73,53	71,33	2,20
PU-8	2016-01-09	73,52	71,02	2,50

Note 1: The levels are geodesics (see section 3.2).
Note 2: The exploratory drilling PU-5 has been canceled during the fieldwork.

The exploration drilling is presented at the appendix 2.

The exploratory drillings has been made with a Diedrich (D-50) hydraulic drill mounted on rubber tracks and equipped with an automatic hammer. The drilling equipment was supplied by a subcontractor (Forage Comeau inc.)

The progression of the exploratory drillings was mostly done by the rotation of an earth auger with an open center of an outside diameter 200 mm (8 inches). Only the F-2 exploratory drilling was partially done by a HW casing and a roller bit.

Between the exploratory drillings, soil samples have been collected using a standard slotted core drill of 610 mm long (B type) with an outside diameter of 51 mm. The N-value of the standard penetration test (STP) (ASTM D 1586) was simultaneously calculated. The N-value indicates the state of compactness of cohesionless soils. The samples of the upper part of the exploratory drillings have been made with an H type slotted core drill. This non-standard core drill is used to pick up a greater amount of soils than a standard B type slotted core drill. However, the H type can't be used to calculate the N-value of the STP.

Solid rock (other than unconsolidated rock) has been reached in the exploratory drillings F-1 to F-3 and has been drilled with a HQ type diamond double tube core drill in order to determine the rock quality designation (RQD)

Observation wells have been constructed inside the exploratory drilling holes. They are made of PVC pipes with diameters of 51 mm. They are perforated at the bottom part and installed to intercept the surface of the water-table. The annulus was filled with silica sand up to about 0.50 m above the perforated casing and then with a granular bentonite stopper to prevent the runoff water infiltration in the piezometer. An aluminum protective cover was put at the ground level at the F-1 and F-2 exploratory drillings whereas the PVC pipe is off-soil at F-3. The graphics for the piezometer are in the exploratory drilling reports in the appendix 2.

Exploration wells have been made with a John Deere hydraulic shovel (50G). This equipment was supplied by Les Entreprises Paul Bertrand.

3.2 Survey Work

The installation of the exploratory drilling has been done by SNC-Lavalin according to the planned work location. The location plan 638589-1 of appendix 4 shows the exploratory drilling location. In addition, the MTM coordinates location (SCOPQC, NAD83, zone 7) is presented on this location plan and in the exploratory drilling reports in the appendix 2. The location has been determined by a GPS with a 3 m (x and y) precision.

All levels indicated in this report are geodesic. The surface level at the exploratory drillings location has been determined by SNC-Lavalin's employees with a surveying level. The bench mark used is a permanent one inlaid in the concrete base of a street light. The exploratory drillings location and the benchmark are shown in appendix 4 on the location plan.

3.3 Laboratory Work

All the soil samples collected have been carried to the SNC-Lavalin geotechnical laboratory, where they passed a detailed visual exam. The geotechnical analyses are summarized in table 2.

Table 2 Laboratory tests

Soil samples tests	Number
Screening article-size analysis with a 5 mm screen and washing with a 80 µm screen	3
Natural water content	4
Atterberg limits (3 points)	4

The results of the soil sample tests are presented in figures 3.1 and 3.2 in the appendix 3, and when appropriate, in the specific column of the individual exploratory drilling reports in the appendix 2.

All the soil and rock samples from F-1 to F-3, PU-4 and PU-6 to PU-8, will be kept in a storage unit of SNC-Lavalin for a 6-month period, starting at the release date of this report. After that, they will all be destroyed if no written request from the department of Public Works and Government Services Canada has been made.

4 Soil and Rock Description

The detailed soil description for the F-1 to F-3, PU-4 and PU-6 to PU-8 exploratory drillings is presented in the individual exploratory drilling reports in the appendix 2. A summary of the stratigraphy is presented in table 3.

Table 3 Stratigraphy Summary

Exploratory drilling no	Backfill		Organic soil		Silty clay		Unconsolidated rock		Rock	
	Upper level (m)	Thickness (m)	Upper level (m)	Thickness (m)	Upper level (m)	Thickness (m)	Upper level (m)	Thickness (m)	Upper level (m)	Thickness explored (m)
F-1	73,41	0,90	72,51	0,10	72,41	0,40	72,01	1,65	70,36	4,15
F-2	73,50	0,60	72,90	0,30	72,60	0,60	72,00	0,95	71,05	3,05
F-3	73,54	0,75	72,79	0,10	72,69	0,95	71,74	0,50	71,24	3,20
PU-4	73,08	1,00	-	-	-	-	72,08	1,30	70,78	0
PU-6	73,71	0,80	72,91	0,35	72,56	0,60	71,96	0,70	71,26	0
PU-7	73,53	0,80	72,73	0,20	72,53	0,70	71,83	0,50	71,33	0
PU-8	73,52	1,00	72,52	0,20	72,32	0,60	71,72	0,70	71,02	0

Note 1: The levels are geodesics (see section 3.2).
Note 2: «-» = Non-intercepted stratigraphic unit for the exploratory drilling depth.

The description of those stratigraphic units is described below.

4.1 Backfill

Backfill has been found on the soil surface of every exploratory drilling. This backfill thickness varies from 0.60 to 1.00 m. Gravel sand to gravel and sand, silt to silty sand, a little gravel and silt is first reached at the ground surface for a thickness between 0.05 and 0.75 m depending on the location. At F-1 and PU-4, those materials are crushed stones. At PU-6 and PU-8, under those materials, there is usually a heterogeneous sand backfill composed of a variable amount of silt and gravel. Debris (masonry, concrete, plastic, metal) have also been observed in this layer at PU-6 and PU-8. Also, organic soil was found in those exploratory drillings. At F-1, under the crushed stones is sand, a bit of silt and to a bit of gravel on a 0.46 m thickness. After all,

under the thin layer of crushed stones at PU-4, a backfill, probably composed of silt with a bit of gravel, sand and clay, has been noted. It is important to note the indurated nature of those materials.

All in all, 2 granulometric analyses have been done on representative crushed stone samples observed on the surface and in a sand backfill. The results are presented at figure 3.1 of appendix 3. The results indicate a gravel content between 2% and 52%, a sand content between 37% and 96%, and a particle of a diameter less than 0.08 mm content between 2% and 8%.

4.2 Organic Soil

At every exploratory drilling location, except at PU-4, there was, under the backfill already described, an organic soil layer which thickness varies between 0.10 m and 0.35 m.

4.3 Silty Clay

A silty clay deposit has been found under the organic soil layer at every exploratory drilling except at PU-4. The deposit thickness varies between 0.40 and 0.95 m depending on the location.

The consistency and the natural water content of the silty clay have been determined in a laboratory on 3 representative samples. The results of those tests are presented in the exploratory drilling reports PU-6 to PU-8 in appendix 2, in the plasticity abacus with the figure 3.2 in appendix 3 and in the following table.

Table 4 Silty Clay Physical Characteristics

Exploratory drilling n°	Sample n°	Depth at the top (m)	Depth at the bottom (m)	Water content w (%)	Atterberg limits			Liquidity index LI	Classification ASTM D 2487
					Liquid limit LL (%)	Plastic limit PL (%)	Plasticity index PI (%)		
PU-6	VR-4	1,15	1,75	26	37	22	15	0,3	CL
PU-7	VR-4	1,00	1,70	29	38	19	19	0,5	CL
PU-8	VR-4	1,20	1,80	27	36	22	14	0,4	CL

According to the USCS regarding the fine-grained soils and based on the Casagrande's plasticity abacus, this material is qualified as medium plastic silty clay.

The natural water content of the 3 samples is below the liquid limit, meaning the liquid limit value is between 0.3 and 0.5 and indicates that it is a material not very sensitive to remodeling.

4.4 Rock

The upper part of the basement rock is unconsolidated. It has been observed in all the exploratory drillings from a depth varying between 1.00 and 1.80 m. The thickness of this material was between 0.50 and 1.65 m.

The solid rock (other than the one unconsolidated previously described) has been reached in all the exploratory drillings from a depth varying between 2.20 and 3.05 m, therefore, at levels of 70.36 to 71.33 m.

More specifically, the rock reached at F-1 to F-3 is composed of calcareous clay pelites and calcareous stoneware. An oriented stratification in relation to the core axis of 0 ° to 5 ° is usually noted.

At F-1 to F-3, the rock has been cored for lengths between 3.05 and 4.15 m which made possible to determine the rock quality designation (RQD). Essentially, based on RQD values, the rock quality is from completely weathered rock to weathered rock on the surface and from moderately weathered rock to hard rock deeper in the soil. The RQD measured in areas with a prevalence of calcareous clay pelites are lower than the areas primarily composed of calcareous stoneware.

5 Underground Water

The underground water level has been measured in the observation wells at the exploratory drillings F-1 to F-3. A low water infiltration has also been noted in the observation well PU-6. Table 5 shows the underground water level at those exploratory drillings..

Table 5 Underground water level measured by the exploratory drilling

Exploratory drilling No	Date	Underground water depth (m)	Corresponding level (m)
F-1	2016-06-09	3,05	70,36
	2016-13-09	3,13	70,28
F-2	2016-31-08	2,62	70,88
	2016-06-09	2,79	70,71
	2016-13-09	2,82	70,68
F-3	2016-06-09	2,53	71,01
	2016-13-09	2,96	70,58
PU-4	2016-01-09	> 2,30 (not observed)	< 70,78
PU-6	2016-01-09	Low infiltration at 1,60 m	72,11
PU-7	2016-01-09	> 2,20 (not observed)	< 71,33
PU-8	2016-01-09	> 2,50 (not observed)	< 71,02

Because of the soil properties, it's possible that the underground water level is not stable.

On June 13th, some water was accumulated in some places on the surface of the wooded area near F-3.

Furthermore, at the beginning of the project, the department of Public Works and Government Services Canada had given us some previous studies conducted near the actual study site. For information purpose, the study conducted by WSP (previously known as GENIVAR) (report No 121-14779-00 from May 2012) for the generic building (see figure 1) indicates an underground water level between 71.7 and 72.1 m at the 4 exploratory drillings then carried out at to the building and its parking lot.

It is important to note that the underground water level may be higher or lower from a year to another depending on the season, weather conditions (heavy rainfall, melting snow, dry periods, etc.) and modifications to the environment (excavation, pumping, etc.).

6 Comments and Recommendations

6.1 Project Description

The project consists of the construction of a firing range on the ground of Donnacona Establishment. This project includes:

- The construction of a firing range of 50 m long and 17 m wide. The area will be defined on the east and west sides by two reinforced concrete walls of 6 m high. There will be no roof. As we understood, the firing range will be accessible all year and heavy equipment will access the area in winter for the snow removal.

- The firing range project includes a shelter (7.3 m x 15.0 m) at the northeastern tip. It will not be heated, but a space heater should be available for the user's comfort.

- A bullet collector shelter (8.2 m x 17.1 m) will be located at the southwestern tip which will not be heated either.

- The construction of a training building (8.2 m x 11.4 m) with only one floor. This building will be heated.

- The construction of training cells near the training building. This is not included in this study.

- The construction of an access road and a parking lot, both paved.

- A non-paved U-turn.

At the time of the preparation and realization of the study, the building and other planned facilities design details are not finished.

6.2 Stratigraphy Summary

The soil stratigraphy at F-1 to F-3, PU-4 and PU-6 to PU-8 exploratory drillings can be summarized like this:

- Heterogeneous cohesionless backfill (thickness between 0.60 and 1.00 m), debris and organic soils.
- Organic soils (thickness between 0.10 and 0.35 m), reached from depths between 0.60 and 1.00 m.
- Silty Clay (thickness between 0.40 and 0.95 m), reached from depths between 0.85 and 1.20 m.

- The unconsolidated rock (thickness between 0.50 and 1.65 m), reached from depths between 1.00 and 1.80 m.
- Solid rock reached in all exploratory drillings from depths between 2.20 and 3.05 m.

The underground water levels at F-1 to F-3 exploratory drillings on September 13, 2016, was between 2.82 and 3.13 m.

6.3 Preliminary Works

Preliminary works are required for the construction of travel lanes, parking lots and for the foundations.

Those preliminary works must include, but not be limited to, the excavation of existing backfill, organic soils, debris and other contaminated soils, and the leveling. Also, they must include the removal and re-localization of the containers, shelters and other materials currently on the site. The stagnant water will have to be removed before the excavation work.

6.4 Measures Against Freezing

For the planned training building, which will be heated, all the peripheral foundation elements will have to be buried to a minimal depth of 1.80 m under the finished ground level in order to protect them from the freezing and unfreezing impacts. Furthermore, a measure against freezing corresponding to 2.10 m will have to be added to every non-heated building foundation (shelter, bullet collector and the 2 reinforced concrete walls of the firing range). A corresponding artificial protection can also be used.

Those recommendations only apply to building foundations. Higher measures against freezing might be necessary for pipe installations (if needed). In this case, the BNQ 1809-300/R2007 standard will have to be followed.

In the case of construction work during a frost period, it will be the contractor's responsibility to take the necessary precautions to protect the foundations of the frost penetration during the works.

6.5 Seismic Response

6.5.1 Site Category

The site category depending on the seismic response is determined by the criteria in table 4.1.8.4. A of section 4.1 in the 2010 edition of the National Building Code of Canada (NBC 2010).

The study site can be classified as a ‘’C“ type according to:

- The criteria of table 4.1.8.4. A from the NBC 2010;
- The stratigraphy identified at F-1 to F-3;

› The fact that the building foundations will be on unconsolidated rock.

If the foundations are set at a higher level than the one of the unconsolidated rock, it is recommended to consider a ‘’D“ type soil for the construction.

6.5.2 Liquefaction

The buildings foundations should be on unconsolidated rock or on a structural backfill. Those soils are not considered prone to liquefaction.

6.6 Foundations

6.6.1 Generalities

This section presents the relevant recommendations for the design of the planned building foundations. By taking into account of the stratigraphy reached in the exploratory drillings, conventional foundations composed of strip or individual footing could be used in this project.

Les commentaires et recommandations qui suivent sont formulés selon le Code national du bâtiment du Canada 2010 (CNBC 2010) et selon la quatrième édition du Manuel canadien d’ingénierie des fondations (MCIF 2013).

6.6.2 Preparation of the foundation beds

6.6.2.1 Foundations on loose rock (depth of 1.80 to 2.10 m)

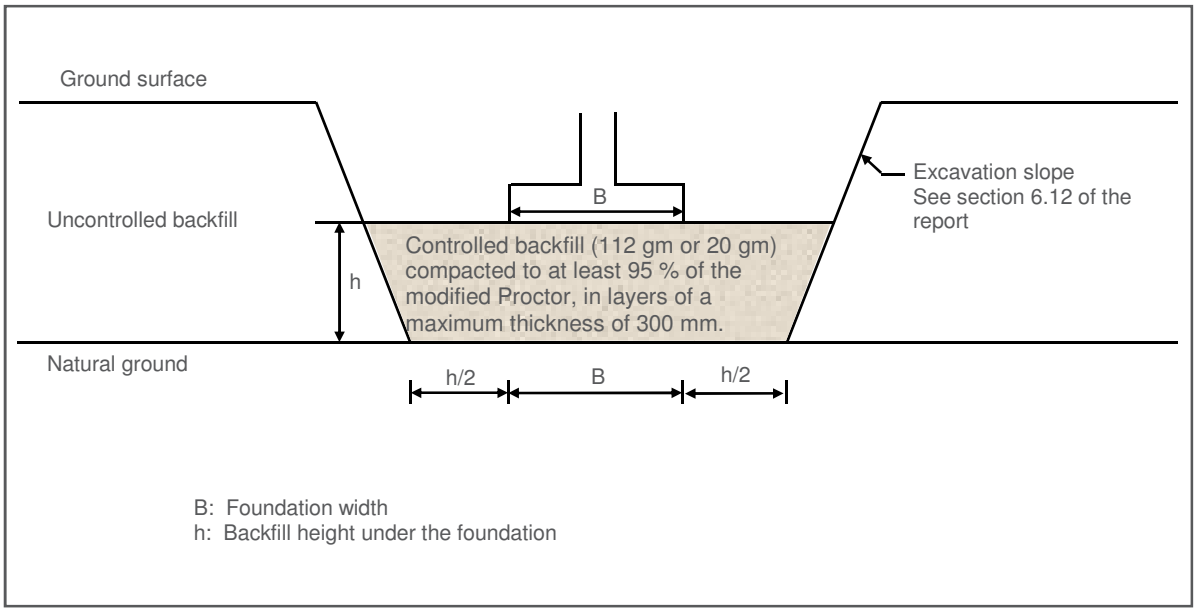
It is recommended to set up the foundation beds of the new buildings, and the one of the reinforced concrete walls of the firing range, on or in unconsolidated rock. For this purpose, the level of the foundation beds could be from 1.80 to 2.10 m depth from the current ground surface in order to correspond to the needed measures against freezing.

The foundation soils will have to be dried, free of organic soils, debris, uncontrolled backfills and frozen soils. It is recommended to eliminate or minimize the circulation of heavy equipment on the foundation beds.

The contractor will have to take the needed measures to keep the foundations bed surfaces in an undisturbed state. Any disturbed. Saturated or unstable soil on the foundation bed surfaces will have to be excavated until the natural and undisturbed soil, and will have to be replaced by a controlled backfill put as described below.

If needed, the difference between the bottom part of the excavation and level planned for the foundation basis will have to be filled with controlled backfill composed of 112 gm or 20 gm granular materials put in layers of maximum 300 mm thick and compacted at 95% of the modified Proctor. As shown in figure 6 below, the width of the controlled backfill base should be at least equal to the width of the footing pressed on this controlled backfill and the height of it. The footing will have to be centered in relation to the controlled backfill.

Figure 6 Drawing of the controlled backfill dimensions



The unconsolidated rock can be sensitive to water, air and humidity alterations. An extended exposure is not recommended. As soon as the excavating limits are reached, it is recommended that the unconsolidated rock exposed surfaces should be protected as soon as possible.

It is recommended to put a 20 gm crushed stone layer with a minimal thickness of 150 mm directly under the foundations. This layer will be compacted to 95% of the modified Proctor. It is possible to replace it with 100 mm thick lean concrete layer.

The fill material used will have to be non-reactive, meaning it is free of potentially blowing minerals such as pyrite. Also, those materials will have to be certified ‘’matériaux DB“ according to the BNQ 2560-510 standards.

The bottom of the excavation will have to be verified by a geotechnical specialized engineer or by its representative before the setup of borrow materials (crushed stones, 112 gm, etc.) and the foundation concreting. This will ensure that the foundation bed corresponds to the recommendations of this study. This will also be used to determine the soil natures, and the foundation bed quality in order to determine any unobservable particularities from the geotechnical investigation.

6.6.2.2 Foundations at a Higher Level

If the designer wants to put the foundations higher than 1.80 to 2.10 m depth, using a thermal insulation to protect it from the freezing and unfreezing impacts, the foundations have to sit on a deposit of silty clay or a controlled backfill.

According to the exploratory drillings, the silty clay is present at depths between 0.85 m and 1.20 m in relation to the current ground surface. This option involves the excavation of existing backfills, debris and organic soils up to those depths.

If the foundation bed is on silty clay, it is recommended having a lean concrete layer of 100 m thick or to have an appropriate geotextile between the foundation bed and the granular cushion.

All the precautions will have to be taken to minimize the disturbance of the materials in place including the use of a smooth bucket for the excavating of the last 600 mm before reaching the limits of the excavation.

The works will have to be done during dry weather and in addition to minimizing the vibrations and avoiding the movement of equipment on the clay surface. As soon as the limits of excavation are reached, it is recommended that the surfaces exposed to clay deposits be protected from surface erosion as soon as possible.

All the recommendations of the sections above are also effective.

6.6.3 Bearing capacity at the ultimate limit state (ULS)

For the calculation of the bearing capacity at the ultimate limit state (ULS), the designer will have to use the Terzaghi's equation, as mentioned in the section 10.2.1 of chapter 10 of the CFEM 2013, and according to the indications of section 10.2.2 related to drained conditions of a pulverulent soil deposit or for non-drained conditions of a cohesive deposit, depending on the level of the footings.

$$q_u = c\ N_c S_c + q_s N_q S_q + \frac{1}{2}\gamma\ B\ N_\gamma S_\gamma$$

Where:

q_u : Bearing capacity at the ultimate limit state (kPa)

c : cohesion of soil under the foundation (kPa)

N_c, N_q, N_γ : Bearing capacity factors, depending on soil friction angle, ϕ'

S_c, S_q, S_γ : shape factors and the depth factors of the foundation, inclined load factors, the gradient of the supporting surface, the gradient of the ground surface (See CFEM 2013, chapter 10)

q_s : maxiumum gross pressure wich the soil can carry safely without shear failure(kPa) = 20, 36 and 42 kPa for embedments of 1.0; 1.8 and 2.1 m.

γ : unit weight (g') of the supporting soil (kN/m³)

B : width of footing largeur at the base according to the vertical loads(m)

The values presented in table 6 can be used in this equation.

Table 6 Geotechnical parameters for the calculation of the bearing capacity at the ULS of the foundations

Soil type	c (kPa) ou s_u	ϕ'(°) ou ϕ_u	N_c	N_q	N_γ	γ_{total} (kN/m^3)	γ' (kN/m^3)
Controlled backfill (112 gm or 20 gm)	0	32	35	23	22	21,0	11,2
Silty clay (hard consistency)	75	0	5,14	1	0	19,5	9,7
Unconsolidated rock	0	33	39	26	27	22,0	12,2

The mechanical properties of the unconsolidated rock are difficult to evaluate due to its nature and state (heterogeneity, structure, friability, etc.).

As mentioned in table K-1 of the NBC 2010, a resistance factor (Φ) equal to 0.5 will have to be used with the bearing capacity at the ultimate limit state (qu) obtained with the equation 10.1 of the CFEM 2013 to obtain an adjusted geotechnical resistance.

The modification factors of table 10.2 from the CFEM will have to be used if needed to take into account:

- The shape of the foundations.
- The inclined loads.
- The installation depth.
- The inclination of the surface and the foundation (if applicable).

6.6.4 Bearing Capacity at the Serviceability limit state (SLS)

The recommended values for the bearing capacity at the serviceability limit state (SLS) are 125 kPa for a foundation sited on a clay deposit and 150 kPa for a foundation sited on a controlled backfill of at least 1 m thick. For a foundation on unconsolidated rock, the bearing capacity at the SLS to consider would be 500 kPa. Those values are only valid if the recommendations of section 6.6.2 are followed. Under the mentioned pressures, being the bearing capacity at SLS values, the total anticipated settlement will be lower than 25 mm. The bearing capacity at SLS is defined as the contact pressure under the foundation that can be transmitted to the soil, in addition to the current ground weight. Any additional backfill weight to the ground weight will have to be considered and subtracted from those bearing capacity values.

6.7 Backfilling of the Foundation Walls

Outside the foundation walls, the backfilling will have to be done with a 112 gm non-frost-riven material compacted up to 90 % of the reference value obtain at the modified Proctor test. The backfill will have to be made of layers with a maximal thickness of 300 mm.

More specifically, the materials used for the backfilling and the needed soil density will have to take into account, if applicable, the planned utilities (sidewalk, access, parking lots, etc.) and will have to be adjusted consequently. Appropriate transitions (3.0 H: 1.0 V or softer) will also have to be used for materials with a different frost potential.

6.8 Slab-on-Ground

According to the information obtained on the project, a slab-on-ground is planned for training the building and for the two shelters. The use of a conventional slab-on-ground (structurally separate from the structure) could be considered. Construction joints will have to be planned so that the loads of the structure will only be transmitted to the foundations, the slab-on-ground having to be independent of the building structure.

For the installation of the slabs-on-ground, the materials of existing backfills, debris, organic soils and other contaminated soils will have to be excavated on their full-thickness up to the silty clay deposit as reached in the exploratory drillings F-1, F-2, F-3, and PU-6 to PU-8. If needed, the difference between the bottom of the excavation and the planned level for the slab base will have to be filled with a controlled backfill composed of 112 or 20 mg granular materials put in layers of 300 mm maximum and compacted up to 95 % of the modified Proctor, as described in section 6.6.2.

The foundation soils will have to be stable and correctly drained.

It is recommended planning, directly under the slab-on-ground, a support layer of 20 gm crushed stones compacted up to 95% of the modified Proctor. The thickness of it will have to be determined by the designer depending on the slab-on-ground thickness and the planned utilization, but, in all cases, will have to be of at least 150 mm.

Since the shelters will not be heated, a thermal insulation well chosen and with the right dimensions will have to be put under those slabs.

The fill material used will have to be non-reactive, meaning it is free of potentially blowing minerals such as pyrite. Also, those materials will have to be certified ‘’matériaux DB“ according to the BNQ 2560-510 standards.

The bottom of the excavation will have to be verified by a geotechnical specialized engineer or by its representative as soon as the works begin. This will ensure that the foundation bed corresponds to the recommendations of this section.

6.9 Pavement Structure

According to the information obtained, a parking lot, an access road and a U-turn is planned.

At the moment of the report redaction, the parking lot and the access road are planned to be paved, but not the U-turn as shown in the drawing 638589-1 in appendix 4.

6.9.1 Basic Data

6.9.1.1 Support Soil Nature

According to the results of the exploratory drillings, the access road, the parking lot and the U-turn pavement could be sat on two different infrastructure types if the pavement elevation is comparable to the one of the existing ground:

- Silty clay: liquidity index between 0.3 and 0.5 and plastic index between 14 and 19 (with PI > 12 and LI < 0.9).
- Unconsolidated rock: soil available with a CL-ML type.

In both cases, the soils for the new pavement must be considered frost-riven. The pavement structure will have to be thick enough to limit frost penetration in those soils in order to prevent frost heaves and asphalt pavement breakages. This minimal thickness will also take away from the soils the soil horizons which are less supporting during the thaw period.

According to the Structures de chaussée du Tome II - Construction routière des normes pour Ouvrages routiers standard of the Ministère des Transports, de la Mobilité durable et de l'Électrification des transports (MTMDET), a local pavement build on a frost-riven infrastructure made of sandy silt (classified as ‘’CL-ML’’) and located in an area where the freezing index is about 1,200℃ – day (as in Donnacona), should be constructed with at least 1,450 mm of non-frost-riven materials. In the case of silty clay (with PI> 12 and LI <0.9), this minimal thickness is about 1,050 mm. A paved area composed with a smaller thickness could degrade faster after freezing and unfreezing cycles and due to frost heaves.

Near the planned parking lot (F-1 to F-3 and PU-6 to PU-8) silky clay is reached from depths between 0.85 and 1.20 m. At the U-turn, the unconsolidated rock is reached at a 1.00 m depth.

The underground water levels at F-1 to F-3, on September 13, 2016, was between 2.82 and 3.13.

6.9.1.2 Expected Traffic

No information about traffic was given to us. For the access road and the parking lot, an annual average daily traffic (AADT) lower than 1,000 is planned. A 2 % truck is considered. Thus, for the dimensions, the hypothesis of a traffic design of a maximum of 100,000 ESAL (Equivalent Single Axle Load) has been considered. If the traffic is underestimated, SNC-Lavalin must be informed in order to review and validate the following recommendations.

6.9.2 Recommendations

6.9.2.1 Site Preparation

According to the deposit found on the site, it is recommended excavating the existing backfill, organic soil and the indurated soil nature up to the silty clay deposit or the unconsolidated rock in order to install the pavement structure presented on table 7.

If the planned level for the infrastructures suggested is higher than the level reached after the excavation of the contaminated materials, the ground will be lifted until the level planned for the infrastructure with a structural backfill composed of 112 gm put in layers of 300 mm and compacted to a minimal dry density of 90% of the modified Proctor maximal value.

In areas where the unconsolidated rock is reached at a shallow depth, it must completely be removed up to the pavement structure depth required or up to the reach of solid rock. Solid rock means rock that cannot be excavated with a high-performance hydraulic shovel.

The infrastructure soils must be free of pebbles, blocs, existing backfills, organic soils, debris and indurated soils. The infrastructure surface must also be free of disturbed materials or of any deformation caused by heavy equipment. The pavement structure must never be put on frozen soils.

Before the installation of the pavement, the infrastructure will have to be subjected to a bearing capacity test as described in the Cahier des charges et devis généraux (CCDG) of the MTMDET. All the soft and flexible areas detected on the infrastructure surface will have to be excavated and filled with material of the same nature as the properly thickened surrounding ground. Essentially, it is about having a stable and homogeneous base to construct the pavement structure.

If the subgrade materials do not respect the filter criteria for an anti-contaminating layer depending on the infrastructure type, an appropriate geotextile membrane will have to be put.

The infrastructure surface will have to be designed in order to help the soil drainage and to avoid water accumulation in the granular foundations. The excavation works must be done during a dry period since the materials can lose their bearing capacity if disturbed, especially in contact with water.

6.9.2.2 Flexible Pavement Structure

According to the information above, we recommend to use the pavement structures presented in table 7. They have been conceived with the tables 2.1-5 to 2.5-3 from the Structures de chaussée du Tome II – Construction routière des Normes pour Ouvrages routiers of the MTMDET.

Table 7 Proposition of Pavement Structures

Pavement component	Material	Thickness (mm)	
		Silty clay (with PI > 12 and LI < 0.9	Unconsolidated rock (ML-CL)
Road Surface			
Surface course	ESG-10 (asphalt PG 58-34)	40	40
Base course	ESG-14 (bitume PG 58-34)	60	60
Granular material			
Foundation	20 gm	200	200
Subgrade	112 gm	750	1 150
Total thickness (mm)		1 050	1 450

Those two options do not ensure a complete protection against freezing; therefore frost heaves must be anticipated.

In addition, has previously mentioned in this report, the exploratory drilling located on the level of the access road leading to the firing range parking lot has not been done due to buried underground pipes non-located before the fieldwork. Depending on the soil nature at the location of the access road after the excavation of the existing backfills, organic soils and other contaminated soils, one of these pavement structures may be used. It will need to be confirmed by a geotechnical engineer or its representative. Material samples and laboratory analyses might be necessary.

For the U-turn, which will not be paved, the pavement structure may be composed of 100 mm of 20b gm, 200 mm of 20 gm and 500 mm of 112 gm. The granular surface will have to be leveled periodically and a granular filling might be necessary after some years. The pavement cannot be covered, because a granular filling of about 650 mm might be required before the asphalt pavement can be done to reach thicknesses presented at table 7. This operation won't be considered with the buildings and structures on the site. This solution will only be considered is the department of Public Services and Procurement Canada is absolutely sure that the site will never be paved. Otherwise, it is recommended using the thicknesses of the foundation and the subgrades indicated in table 7 and to replace the asphalt pavement with 100 mm of 20b gm, which could eventually be removed to put the asphalt.

6.9.2.3 General Conditions

The granular materials will have to respect the NQ 2560-114 standard and be put in layers of maximum 300 mm. The use of recycled materials compliant with the NQ 2560-600 standard might be considered for the foundation and the subgrade. Recycled materials MR-1 or MR-2 corresponding to a 20 gm granular material could be used for the foundation, while granular material MR-1, MR-2, MR-3, MR-4 or MR-5 corresponding to a 112 gm granular material could be used for the subgrade.

The asphalt concrete must respect the requirement of the 4202 standard of the MTMDET. The pavement must respect the 4101 standard of the MTMDET.

If required, the separation geotextile must respect the 13101 standard of the MTMDET.

All materials must be installed with respect to the specifications of the Cahier des charges et devis généraux of the MTMDET.

6.9.2.4 Transitions

To rectify the complications due to soils and rock different behavior with the frost effects, an appropriate transition must be considered between the materials.

For the excavation and refill of the existing infrastructure soils, a 3H: 1V or softer transition must be considered, while a 4H: 1V or softer transition for the soil-rock contact must be considered.

6.10 Firing Range

The construction of a firing range of 50 m long and 17 m wide is planned. As we understood, the Firing range will be accessible all year and heavy equipment will access the area in winter for the snow removal. The exposed surface of the firing range will be covered with crushed stones.

At the firing range, it is recommended excavating the current soils composed of the existing backfill and organic soil up to the silty clay. Then, the ground would be raised with a structural backfill composed of 112 gm material and put by layers of 300 mm and compacted to a minimal dry density of 95 % of the modified Proctor maximal value. A surface layer of 100 mm composed of a 20b gm covering a 200 mm layer of 20 gm compacted to a minimal dry density of 95% of the modified Proctor maximal value could be appropriate.

This option will not ensure a complete protection against freezing; therefore frost heaves must be anticipated.

For the long-term maintenance, the granular surface will have to be periodically leveled and a granular refill might be necessary after some years.

The rise of the field level in relation to its current level will have to be accepted by a geotechnical engineer first.

The infrastructure surface will have to be designed to help the soil drainage and to avoid water accumulation in the granular foundations. The excavation works must be done during a dry period since the materials can lose their bearing capacity if disturbed, especially in contact with water.

All of the other recommendations of section 6.9 are valid for the firing range.

6.11 Permanent Drainage

The finished ground surfaces around the planned buildings will have to be designed in order to take the runoff water away from the site.

Even if the buildings will not have a basement, it is recommended to put a drain along the foundations. It is also recommended to put a drain on each side of the walls of the firing range.

The drain will be composed of a plastic pipe perforated on its upper half, covered with clean stones with a diameter of 20 mm. The drain—clean stone set will have to be surrounded by a non-woven geotextile.

The upper part of the perforated plastic pipe must be placed at the level corresponding to the bottom of the superficial footing to lower the water table. The water will have to drain off towards an appropriate outfall.

In addition, a sealing layer composed of not very permeable and compactible materials of more than 300 mm thick will also have to be put near the ground surface around the building. This sealing barrier, with a slope inclined towards the outside, must be put on the whole excavation area. This will prevent water from accumulating around the structures and will help its evacuation.

6.12 Temporary Excavating

The building foundations will be at a depth between 1.8 and 2.1 m, while an excavation between 1.0 and 1.5 m will be necessary to put the pavement structures. An exceeding excavation will also be necessary for a support layer for the building foundations and to replace, if needed, contaminated materials such as existing backfill, debris and organic soils.

According to the material nature reached at F-1 to F-3, PU-4 and PU-6 to PU-8, and as described in section 4 of this report, the soils needing to be excavated are mainly composed of existing backfills, organic soils, and natural deposits such as silty clay and unconsolidated rock.

The excavation method will have to be adapted to access conditions, depths to reach and soils type. On an indicative basis, the excavation of backfills, natural deposits and unconsolidated rock may be done with a high-performance hydraulic shovel. In solid rock, the excavation must be done with particular equipment such as a pick hammer or explosives.

It is recommended that the temporary excavation slopes needed for the foundations respect the latest requirements of the Safety Code for the construction industry (CNESST).

The excavation of saturated soils, under the underground water level, require less steeper slopes compared to those for an unsaturated soil. It is highly recommended avoiding excavation in a saturated area and to follow the recommendation of section 6.13 below.

Since the work method that will be used is currently unknown and that it is considered as temporary excavations, the slope stability and the security of the workers and buildings is the contractor's responsibility.

The inclination of the excavation sloped must be softened if there is any instability signs. The excavation walls must be regularly inspected in order to see if any part of it may be detached and put the workers' safety at risk. In addition, vehicles and heavy equipment circulation, material storage and stockpiling of excavated soils must be avoided near the excavation crest for a distance at least equal to the excavation depth with a minimum of 3 m distance. The filling of the excavation must be done in as soon as possible to avoid the slopes degradation.

If there is not enough space for the excavation slopes to be compliant with the CNESST recommendations, a temporary land cofferdam may be considered. Since it is a temporary work, the contractor is responsible for its design. The excavation works must never affect the stability of existing structures.

6.13 Temporary Drainage

Due to the measurements of the underground water lever at the exploratory drillings, it is possible that the excavations have to be done above the underground water level. Otherwise, the contractor has to plan the required actions to lower the underground water level at the level of the silty clay level or at the unconsolidated or solid rock level. He also has to plan the needed time to backfill around the foundations.

During the works, infiltration water and all precipitation and runoff water will have to be eliminated to keep the bottom of the excavation dry and avoid the formation of unstable and disturbed zones. It will be the contractor's responsibility to plan the required actions to properly control water infiltration in the excavations in order to have dry conditions for the controlled backfill and the concreting work.

6.14 Re-use of Excavated Materials

It will be possible to re-use a small amount of the excavated materials as B type ''borrow material". B-type soils will, however, have to fulfill the requirements below:

- Water content to allow the material compacting to the required density;
- Free of pebbles and blocks of a diameter above 200 mm, and of debris;
- Free of putrescible organic material and frozen material;
- Appropriate materials from an environmental perspective.

The re-use will not be considered for fine particles high content (diameter <80 µm), as those of the heterogeneous backfill reached in some places and described in section 4, as well as for the organic soil, clay deposit or unconsolidated rock. The silty clay could, eventually, be re-used for the flood coat as described in section 6.11.

Finally, at some exploratory drillings, materials of the granular backfill contain less than 10% of fine particles. In conclusion regarding the re-use of those granular materials, they will have to be subjected to characterization analyses in the laboratory after being excavated and put in homogeneous stacks on the site.

6.15 Soils and Contaminated Water Management

If needed, the excavated and contaminated materials management or their off-site disposal and the pumping water management will have to be done according to the environmental acts and regulations in effect. See the environmental characterization study report by SNC-Lavalin (638589, report no 2).

6.16 Quality Control

It is recommended that the quality control of the materials (soils, concrete, asphalt concrete and roof) and their installation should be done by a materials engineering specialized firm.

Appendix 1

Scope of the report

SCOPE OF REPORT

1. Use of report

a. Use of report

This report has been prepared, and the work mentioned herein was carried out by SNC-Lavalin GEM Québec Inc. (SNC-Lavalin) exclusively for the client (the Client), to whom the report is addressed, and who took part in developing the scope of work and understands the limitations. The methodology, findings, recommendations and results cited in this report are based solely on the scope of work and are subject to the requirements of time and budget, as described in the offer of services and/or the contract under which this report was issued. Use of this report or any decision based on its content by third parties is the sole responsibility of the third parties. SNC-Lavalin is not responsible for any damage incurred by third parties due to the use of this report or of any decision based on its content. The findings, recommendations and results cited in this report (i) have been prepared in accordance with the skill level normally demonstrated by professionals operating in similar conditions in the sector, and (ii) are determined according to the best judgment of SNC-Lavalin, taking into account the information available at the time the report was prepared. The professional services provided to the Client and the findings, recommendations and results cited in this report are not subject to any guarantee, express or implied. The findings and results cited in this report are only valid on the date of the report and may be based in part on information provided by third parties. This report may require modifications in case of inaccurate information, discovery of new information or changes in project parameters. The results of this study are in no way a guarantee that the site in the study is free of contamination. This report must be considered as a whole and its parts or sections must not be taken out of context. If discrepancies were to appear between the draft and the final version of this report, the final version shall prevail. Nothing in this report is mentioned with the intention to provide or constitute legal advice. The content of this report is confidential and proprietary. It is prohibited for any person other than the Client to reproduce or distribute this report, to use or take a decision based on its content, in whole or in part, without the express written permission of the Client and SNC-Lavalin.

b. Modifications to project

The evidence, interpretations and recommendations contained in this report relate to the specific project as described in the report and do not apply to any other project or any other site. If the project is modified from a perspective of design, dimensioning, location or level, SNC-Lavalin must be consulted to confirm that the recommendations already given remain valid and enforceable.

c. Number of soundings

The recommendations in this report are intended only as a guide for the design engineer. The number of soundings to determine all subsurface conditions that may affect construction (costs, techniques, equipment, schedule) should normally be greater than that for the purpose of design. The number of sample sites and chemical analyzes as well as the sampling frequency and choice of parameters can influence the nature and extent of corrective actions as well as treatment or disposal technology and cost. Contractors bidding or subcontracting the work should rely on their own research and their own interpretations of the surveys' factual results to assess how underground conditions can affect their work and the cost of work.

d. Interpretation of data, comments and recommendations

Unless otherwise noted, data and results interpretation, comments and recommendations contained in this report are based, to the best of our knowledge, on environmental policies, criteria and regulations in force at the location of the project and on the production date of the report. If these policies, criteria and regulations are subject to change after submission of the report, SNC-Lavalin must be consulted to review the recommendations in the light of these changes. When no policy, criteria or regulation is available to allow for the interpretation of data and analytical results, comments or recommendations expressed by SNC-Lavalin are based on the best knowledge of the rules accepted in professional practice. The analyzes, comments and recommendations contained in this report are based on data and observations collected on the site, which come from sample work on the site. It is understood that only the data collected directly at the survey sites, sample sites and on the sample date are accurate and that any interpolation or extrapolation of these results to all or part of the site carries the risk of errors, which may themselves influence the nature and extent of the actions required on the site.

2. Sounding reports and interpretation of subsurface conditions

a. Soil and rock descriptions

The soil and rock descriptions given in this report are from classification and identification methods commonly accepted and used in the practice of geotechnical engineering. The classification and identification of soil and rock involves judgment. SNC-Lavalin does not guarantee that the descriptions will be identical in all respects to those made by another geotechnician possessing the same knowledge of geotechnical rules, but ensures accuracy only to what is commonly used in geotechnical practice.

b. Condition of soil and rock at sounding sites

The sounding reports only provide subsurface conditions and only at sounding sites. The boundaries between different layers on sounding reports are often approximate, rather corresponding to the transition zones and therefore subject to interpretation. The precision of subsurface conditions depends on the sounding method, frequency and method of sampling and consistency of the terrain encountered. The spacing between surveys, the sampling frequency and the type of sounding also reflect budgetary considerations and timelines that are outside the control of SNC-Lavalin.

c. Condition of soil and rock between sounding sites

The soil and rock formations are variable over a considerably large area. Subsurface conditions between sounding sites are interpolated and may vary significantly from the conditions encountered at sounding sites. SNC-Lavalin can guarantee the results at the site where sounding are conducted. Any interpretation of the conditions presented between sounding sites carries risks. These interpretations can lead to the discovery of conditions that are different from those that were expected. SNC-Lavalin cannot be held responsible for the discovery of different soil and rock conditions from those described elsewhere than at the site where soundings are conducted.

d. Groundwater levels

The groundwater levels provided in this report only correspond to those observed at the site and on the date indicated in the report and depends on the type of piezometric installation used. These conditions may vary based on the season or due to construction work on the site or on adjacent sites. These variations are beyond the control of SNC-Lavalin.

3. Contamination levels

The contamination levels described in this report (if within the scope) correspond to those detected at the site and on the date indicated in the report. These levels can vary based on the season or due to activities on the study site or on adjacent sites. These variations are beyond our control. Contamination levels are determined from the results of chemical analyzes of a limited number of soil, surface water or groundwater samples. The nature and degree of contamination between sample site may vary greatly. The chemical composition of groundwater at each sample site is likely to change due to groundwater flow, surface recharge conditions, stress of the formation investigated (i.e. pump or injection wells near the site) and natural seasonal variability. The accuracy of groundwater contamination levels depends on the frequency and the number of analyzes. The list of parameters analyzed is based on our best knowledge of the history of the site and the contaminants likely to be found on the site and is also a reflection of budgetary considerations and timelines. The fact that a parameter has not been analyzed does not exclude its presence at a concentration above the background noise or the detection limit of this parameter.

4. Study and work monitoring

a. Final phase verification

All design and construction details are not known at the time of issue of the report. It is therefore recommended that SNC-Lavalin's services be retained to provide light on the possible consequences of construction on the final work.

b. Inspection during execution

It is recommended that SNC-Lavalin's services be retained during construction to verify and confirm that groundwater conditions throughout the site do not differ from those given in the report and that the construction work will not have an adverse effect on the conditions of the site.

5. Changing conditions

The soil conditions described in this report are those observed during the study. Unless otherwise stated, these conditions are the basis for recommendations in the report. Soil conditions can be significantly affected by construction work (traffic, excavation, etc.) on the site or on adjacent sites. Excavation may expose the soil to changes due to humidity, drying or freezing. Unless otherwise indicated, the soil must be protected from these changes or rearrangements during construction. When conditions encountered at the site differ significantly from those provided in this report, due to the heterogeneous nature of the subsurface or due to construction work, it is the responsibility of the Client and the user of this report to notify SNC-Lavalin of changes and give SNC-Lavalin the opportunity to review the report's recommendations. Recognizing a change in ground conditions requires experience. It is therefore recommended that an experienced geotechnical engineer be dispatched to the site to see if conditions have changed significantly.

6. Drainage

Groundwater drainage is often required for both temporary and permanent project facilities. An incorrect drainage design or execution can have serious consequences. SNC-Lavalin cannot under any circumstance take responsibility for the effects of drainage unless SNC-Lavalin is specifically involved in the detailed design and monitoring of the drainage system's construction.

7. Environmental characterization – Phase I

This report was written after diligent research and evaluation of point data sources or information obtained from third parties that may present uncertainties, gaps or omissions. These sources of information are subject to change over time, for example, according to the progress of activities on the site and surrounding area. Phase I includes no testing, sampling or characterization analysis by a laboratory. Subject to exceptions, Phase I is based on the observation of visible and accessible components on the property and those nearby and could bring environmental harm to the quality of the land in the study. The property titles mentioned in this report are used to identify the former owners of the study site and cannot under any circumstance be considered as an official document for reproduction or other uses. Finally, any sketch, plan view or diagram appearing in the report or any statement specifying dimensions, capacities, quantities or distances are approximate and are included to help the reader visualize the property.

Appendix 2

Notes

Exploratory drillings F-1 à F-3, PU-4, PU-5 à PU-8

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EXPLANATORY NOTES
BOREHOLE AND TEST PIT LOG
(page 1 of 2)

The object of the borehole and test pit log is to present field and laboratory data concerning soil, bedrock and groundwater conditions. The purpose of this note is to explain the terminology, symbols and abbreviations used on the log.

STRATIGRAPHY

1. DEPTH - ELEVATION

The depth and elevation of contacts between the various geological strata are given in relation to the ground surface at the borehole or test pit location. Elevations refer to a datum as specified in the general heading of the log.

2. SOIL DESCRIPTION

Soils are described according to their physical and geotechnical properties.

Soil particle size classification is given below:

IDENTIFICATION	PARTICLE SIZE (mm)		
Clay		<	0.002
Silt	0.002	-	0.08
Sand	0.08	-	5
Gravel	5	-	80
Cobble	80	-	300
Boulder		>	300

The proportion of each soil constituent, as identified by the particle size range, is defined by the following descriptive terms:

DESCRIPTION	PARTICLE SIZE FRACTION (%)		
Trace	1	-	10
Some	10	-	20
Adjective (ex.: sandy silt, silty)	20	-	35
And (ex.: sand and gravel)		>	35

2.1 STATE OF COMPACTNESS OF COHESIONLESS SOILS

The state of compactness of cohesionless soils is evaluated using the "N-value" obtained during the Standard Penetration Test (SPT).

COMPACTNESS	N-VALUE (blows / 300 mm)		
Very loose		<	4
Loose	4	-	10
Compact	10	-	30
Dense	30	-	50
Very dense		>	50

2.2 CONSISTENCY AND PLASTICITY OF COHESIVE SOIL

The consistency of cohesive soils is defined by the undrained shear strength. The undrained shear strength of the intact clay (s_u) and remoulded clay (s_r) is measured in situ or in the laboratory.

CONSISTENCY	UNDRAINED SHEAR STRENGTH, s_u (kPa)		
Very soft		<	12
Soft	12	-	25
Firm	25	-	50
Stiff	50	-	100
Very stiff	100	-	200
Hard		>	200

DEGREE OF PLASTICITY	LIQUID LIMIT, W_L (%)		
Low		<	30
Medium	30	-	50
High		>	50

3. ROCK DESCRIPTION

Rock is described according to its geological origin, composition, structural characteristics and mechanical properties.

The Rock Quality Designation (RQD) is determined according to the ASTM D 6032 Standard.

CLASSIFICATION	RQD VALUE (%)		
Very poor quality		<	25
Poor quality	25	-	50
Fair quality	50	-	75
Good quality	75	-	90
Excellent quality	90	-	100

JOINT SPACING CLASSIFICATION	SPACING WIDTH (mm)		
Extremely close	0	-	60
Close	60	-	200
Moderately close	200	-	600
Wide	600	-	2000
Very wide		>	2000

STRENGTH	UNCONFINED COMPRESSIVE STRENGTH, q_u (MPa)		
Extremely weak		<	1
Very weak	1	-	5
Weak	5	-	25
Medium strong	25	-	50
Strong	50	-	100
Very strong	100	-	250
Extremely strong		>	250

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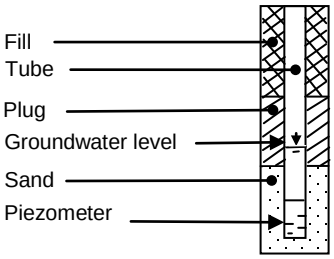
EXPLANATORY NOTES
BOREHOLE AND TEST PIT LOG
(page 2 of 2)

GROUNDWATER LEVEL

The column "Groundwater Level" gives the groundwater level measured in a stand pipe, piezometer, monitoring well or directly in the borehole or test pit. The survey date is also indicated in this column. The sketch opposite illustrates the different symbols used.



SAMPLES

1. TYPE AND NUMBER

The column "Type and Number" corresponds to the sample number. It includes 2 letters indicating the sample type followed by a sequence number. The sample types are as follows:

SS :	Split spoon	RC :	Rock core
LS :	Large diameter sampler	GS :	Grab sample
TW :	Thin wall tube	AS :	Auger sample
TU :	Geoprobe™ sampling tube		

2. CONDITION

The depth, strength and condition of each sample is given in this column. The following symbols indicate the condition of the sample:

3. RECOVERY

Sample recovery corresponds to the recovered length of the sample in relation to the length of penetration of the sampler, expressed in percentage. The sample length is equal to the distance from the top of the sampler to the cutting edge whether or not the lower part of the sample is lost.

IN SITU AND LABORATORY TESTS

In situ and laboratory test results are indicated in the column "In Situ and Laboratory Tests" at the corresponding depth.

The following list of abbreviations identifies these tests.

ABBREVIATIONS

A	Absorption, L/min-m (Packer Test in rock)
CA	Chemical analysis
C	Consolidation test
C_c	Curvature coefficient
C_U	Uniformity coefficient
s_u	Intact undrained shear strength, measured with the field vane, kPa
s_{ur}	Remoulded undrained shear strength, measured with the field vane, kPa
s_{uc}	Intact undrained shear strength, measured with the Swedish fall-cone, kPa
s_{urc}	Remoulded undrained shear strength, measured with the Swedish fall-cone, kPa
s_{up}	Intact undrained shear strength, measured with the portable vane apparatus, kPa
s_{rp}	Remoulded undrained shear strength, measured with the portable vane apparatus, kPa
D_r	Relative density
E_M	Pressuremeter modulus, kPa or MPa
G	Particle size distribution by sieve and washing
I_L	Liquidity index
I_p	Plasticity index, %
k_c	Coefficient of permeability (hydraulic conductivity), measured in situ, m/s
k_L	Coefficient of permeability (hydraulic conductivity), measured in the laboratory, m/s
N_{dc}	Dynamic cone penetrometer blow count (DCPT)
N	Standard penetration test (SPT) index
P_{80}	Sieve analysis by washing on the 80 μm sieve
P_L	Pressuremeter limit pressure, kPa
P_r	Proctor Test
γ	Unit weight, kN/m^3
γ'	Effective unit weight, kN/m^3
q_u	Unconfined compressive strength of rock, MPa
R	Split spoon penetration refusal
S	Particle size distribution by hydrometer testing
S_t	Sensitivity (s_u/s_r)
CPV	Corrosivity point value
w	Water content, %
w_L	Liquid limit, %
w_p	Plastic limit, %

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BOREHOLE LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589

BOREHOLE : F-3

DATE : 2016-08-31
COORDINATES : MTM 7 NAD83
E : 213482 **N :** 5172784

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL 2016-09-13	SAMPLES: CALIBRE	SAMPLES: TYPE AND NUMBER	SAMPLES: CONDITION	SAMPLES: RECOVERY (%)	SAMPLES: N or RQD (%)	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS: OTHER TESTS
	73.54	Fill: sand, some gravel and silt.			CF-1		65			CA
0.75	72.79					A				
0.85	72.69	Organic soil.				B				
		Silty clay. Medium plasticity (CL). Deemed stiff.			CF-2	C	65	4		CA
					CF-3		70	12		
1.80	71.74	Fragmented and weathered bedrock (soil-like behavior).			CF-4		65			Refusal
2.30	71.24	Bedrock: alternation between a limestone clay and a calcareous sand stone. Stratification from 0 to 5° to core axis. Rock quality: poor becoming average at 3.50 m.	70.58 m		CR-5		100	30		
					CR-6		100	70		
					CR-7		100	90		
5.50	68.04	**End of borehole**								

WATER CONTENT AND ATTERBERG LIMITS (%): W_P — W — W_L; 20 40 60 80

REMARKS : Track-mounted hydraulic drill rig, Diedrich D-50 equiped with an automatic SPT hammer.

DRILLING METHOD : Rotation of hollow-stem auger and coring (HQ).

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SNC·LAVALIN

BOREHOLE LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589

BOREHOLE : F-2

DATE : 2016-08-30
COORDINATES : MTM 7 NAD83
E : 213456 **N :** 5172735

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL 2016-09-13	SAMPLES: CALIBRE	SAMPLES: TYPE AND NUMBER	SAMPLES: CONDITION	SAMPLES: RECOVERY (%)	SAMPLES: N or RQD (%)	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS: OTHER TESTS
	73.50	Fill: sandy gravel, some silt.			CF-1		60			CA
0.60	72.90	Organic soil.			CF-2 A		65	11		CA
0.90	72.60	Silty clay. Medium plasticity (CL). Deemed stiff.			CF-2 B					
1.50	72.00	Fragmented and weathered bedrock (soil-like behavior).			CF-3 A		75	10		
					CF-3 B					
					CF-4		85	30		CA
2.45	71.05	Bedrock: alternation between a limestone clay and a calcareous sandstone. Stratification from 0 to 5 ° to core axis. Rock quality: very poor to poor.	70.68 m		CR-5		90	10		
					CR-6		100	50		
					CR-7		65	20		
5.50	68.00	**End of borehole**								

WATER CONTENT AND ATTERBERG LIMITS (%): W_P — W — W_L; 20 40 60 80

REMARKS : Track-mounted hydraulic drill rig, Diedrich D-50 equiped with an automatic SPT hammer.

DRILLING METHOD : Rotation of hollow-stem auger down to 1.80 m. Cased wash boring (HW) from 1.80 to 2.44 m and coring (HQ).

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BOREHOLE LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589

BOREHOLE : F-1

DATE : 2016-08-30
COORDINATES : MTM 7 NAD83
E : 213471 **N :** 5172714

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL 2016-09-13	SAMPLES: CALIBRE	SAMPLES: TYPE AND NUMBER	SAMPLES: CONDITION	RECOVERY (%)	N or RQD (%)	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
	73.41								W_P W W_L 20 40 60 80	
0.15	73.26	Fill: crushed rock (sandy gravel, some silt).			CF-1 A		60			
		Fill: sand, some silt, trace to some gravel.			CF-1 B					CA
0.61	72.80	Fill: sand, some silt to silty.			CF-2 A					
0.90	72.51				CF-2 B		65	5		CA
1.00	72.41	Organic soil.			CF-2 C					CA
		Silty clay. Medium plasticity (CL). Deemed stiff.			CF-3 A					
1.40	72.01	Fragmented and weathered bedrock (soil-like behavior).			CF-3 B		85	25		
					CF-4		95	71		
					CF-5		90	97		
			70.28 m							
3.05	70.36	Bedrock: alternation between a limestone clay and a calcareous sandstone. Stratification from 0 to 5° to core axis. Rock quality: very poor becoming average at 3.66 m.			CR-6		90	0		
					CR-7		100	75		
					CR-8		77	50		
					CR-9		95	60		
7.20	66.21	**End of borehole**								

REMARKS : Track-mounted hydraulic drill rig, Diedrich D-50 equiped with an automatic SPT hammer.

DRILLING METHOD : Rotation of hollow-stem auger and coring (HQ).

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TEST PIT LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589-02

TEST PIT : PU-8

DATE : 2016-09-01
COORDINATES : MTM 7 NAD83
E : 213465 **N :** 5172757

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES TYPE AND NUMBER	SAMPLES CONDITION	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS: OTHER TESTS
	73.52				W_P — W — W_L; 10 20 30	
0.08	73.44	Fill: sandy gravel, traces to some silt.	VR-1			
		Heterogeneous fill: composed of silt and sand, traces of gravel. Presence of organics and concrete debris.		A		CA
			VR-2			
				B		
1.00	72.52	Organic soil.	VR-3			
1.20	72.32	Silty clay. Medium plasticity (CL). Deemed stiff.				
			VR-4		22 27 36	CA
1.80	71.72	Fragmented and weathered bedrock (soil-like behavior).				
			VR-5			
2.50	71.02	**Refusal on possible sound bedrock.**				

REMARKS :

No water seepage observed.

EQUIPMENT : John Deere 50G, hydraulic excavator.

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TEST PIT LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589-02

TEST PIT : PU-7

DATE : 2016-09-01
COORDINATES : MTM 7 NAD83
E : 213486 **N :** 5172763

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES TYPE AND NUMBER	SAMPLES CONDITION	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS: OTHER TESTS
	73.53	Fill: gravel and sand, traces of silt. Local presence of silty bed.	VR-1			G, CA
0.50	73.03	Fill: sand, traces of silt and gravel.	VR-2			G, CA
0.80	72.73	Organic soil.	VR-3			
1.00	72.53	Silty clay. Medium plasticity (CL). Deemed stiff.	VR-4		W_P 19, W 29, W_L 38	CA
1.70	71.83	Fragmented and weathered bedrock (soil-like behavior).	VR-5			
2.20	71.33	**Refusal on possible sound bedrock.**				

Water content and Atterberg limits (%): 10 20 30

REMARKS :

No water seepage observed.

EQUIPMENT : John Deere 50G, hydraulic excavator.

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TEST PIT LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589-02

TEST PIT : PU-6

DATE : 2016-09-01
COORDINATES : MTM 7 NAD83
E : 213485 **N :** 5172733

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES TYPE AND NUMBER	SAMPLES CONDITION	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS: OTHER TESTS
	73.71	Fill: gravel and sand, traces of silt.	VR-1			G, CA
0.30	73.41	Heterogeneous fill: composed of a sandy silt to silty sand. Presence of organics, concrete, plastic and metal debris.	VR-2			CA
0.80	72.91	Organic soil.	VR-3			CA
1.15	72.56	Silty clay. Medium plasticity (CL). Deemed stiff.	VR-4		22 W 26 (37)	
1.75	71.96	Fragmented and weathered bedrock (soil-like behavior).	VR-5			
2.45	71.26	**Refusal on possible sound bedrock.**				

REMARKS :

Weak water seepage observed at 1.60 m.

EQUIPMENT : John Deere 50G, hydraulic excavator.

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TEST PIT LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589-02

TEST PIT : PU-4

DATE : 2016-09-01
COORDINATES : MTM 7 NAD83
E : 213597 **N :** 5172707

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES TYPE AND NUMBER	SAMPLES CONDITION	IN SITU AND LABORATORY TESTS WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS OTHER TESTS
	73.08				W_P — W — W_L; 10 20 30	
0.05	73.03	Fill: crushed rock (gravel and silty sand).	VR-1			
		Possible fill: silt, some gravel, sand and clay. Indurated soil.	VR-2			CA
			VR-3			
1.00	72.08	Fragmented and weathered bedrock (soil-like behavior).	VR-4			CA
			VR-5			
			VR-6			
2.30	70.78	**Refusal on possible sound bedrock.**				

REMARKS :

No water seepage observed.

EQUIPMENT : John Deere 50G, hydraulic excavator.

Appendix 3

Laboratory tests

Figures 3.1 et 3.2

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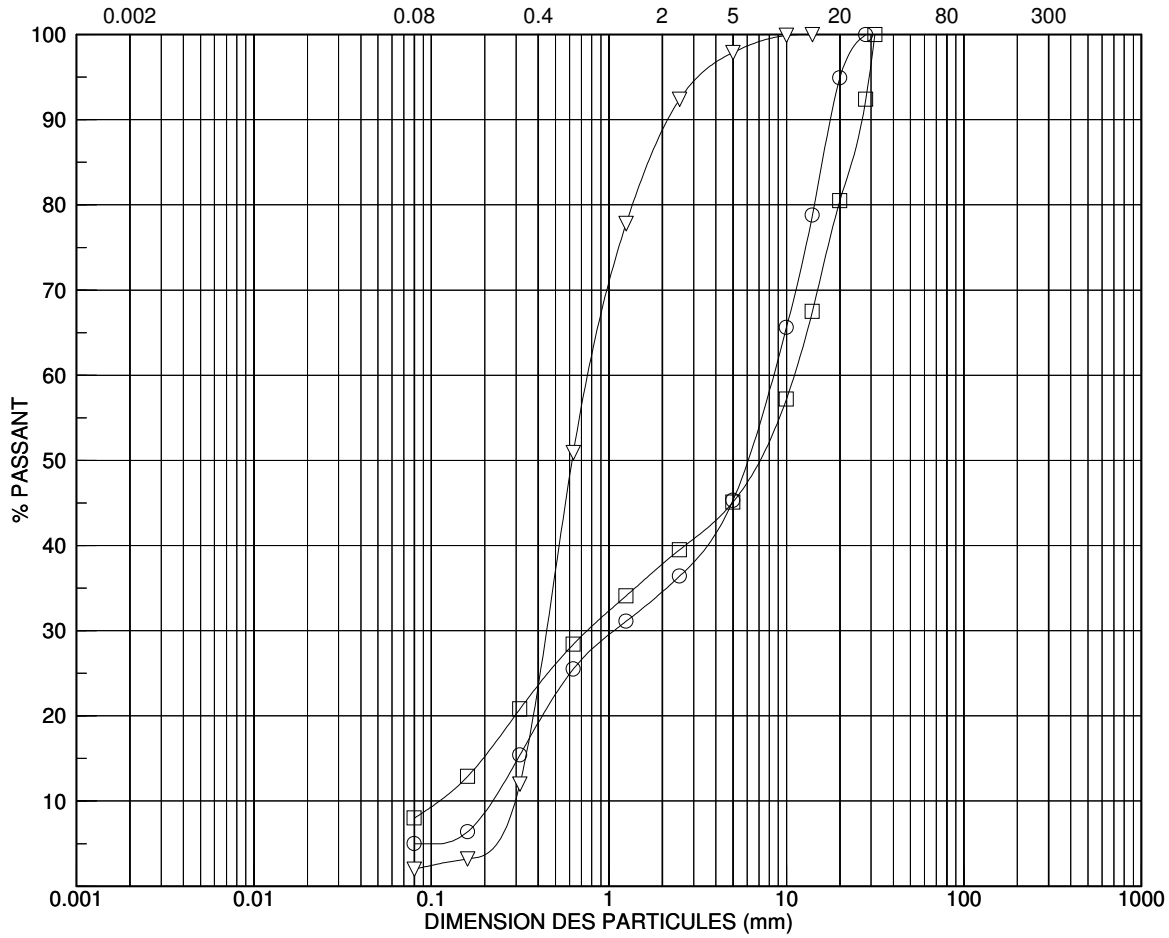
ANALYSE GRANULOMÉTRIQUE

CLIENT : Travaux publics et Service gouvernementaux Canada
PROJET : Construction d'un champ de tir
LOCALISATION : Établissement Donnacona, 1537, route 138, Donnacona (Québec)
DOSSIER : 638589

FIGURE 3.1

PARTICULES FINES		SABLE			GRAVIER		CAILLOUX	BLOCS
ARGILE	SILT	FIN	MOYEN	GROS	FIN	GROS		



	Sondage	Éch.	Prof. (m)	Description	Gravier (%)	Sable (%)	Silt & argile (%)
○	PU-6	VR-1	0,00 - 0,30	Gravier et sable, traces de silt.	54.7	40.3	5.0
□	PU-7	VR-1	0,00 - 0,50	Gravier et sable, traces de silt.	54.9	37.1	8.0
▽	PU-7	VR-2	0,50 - 0,80	Sable, traces de gravier et de silt.	2.1	95.9	2.0

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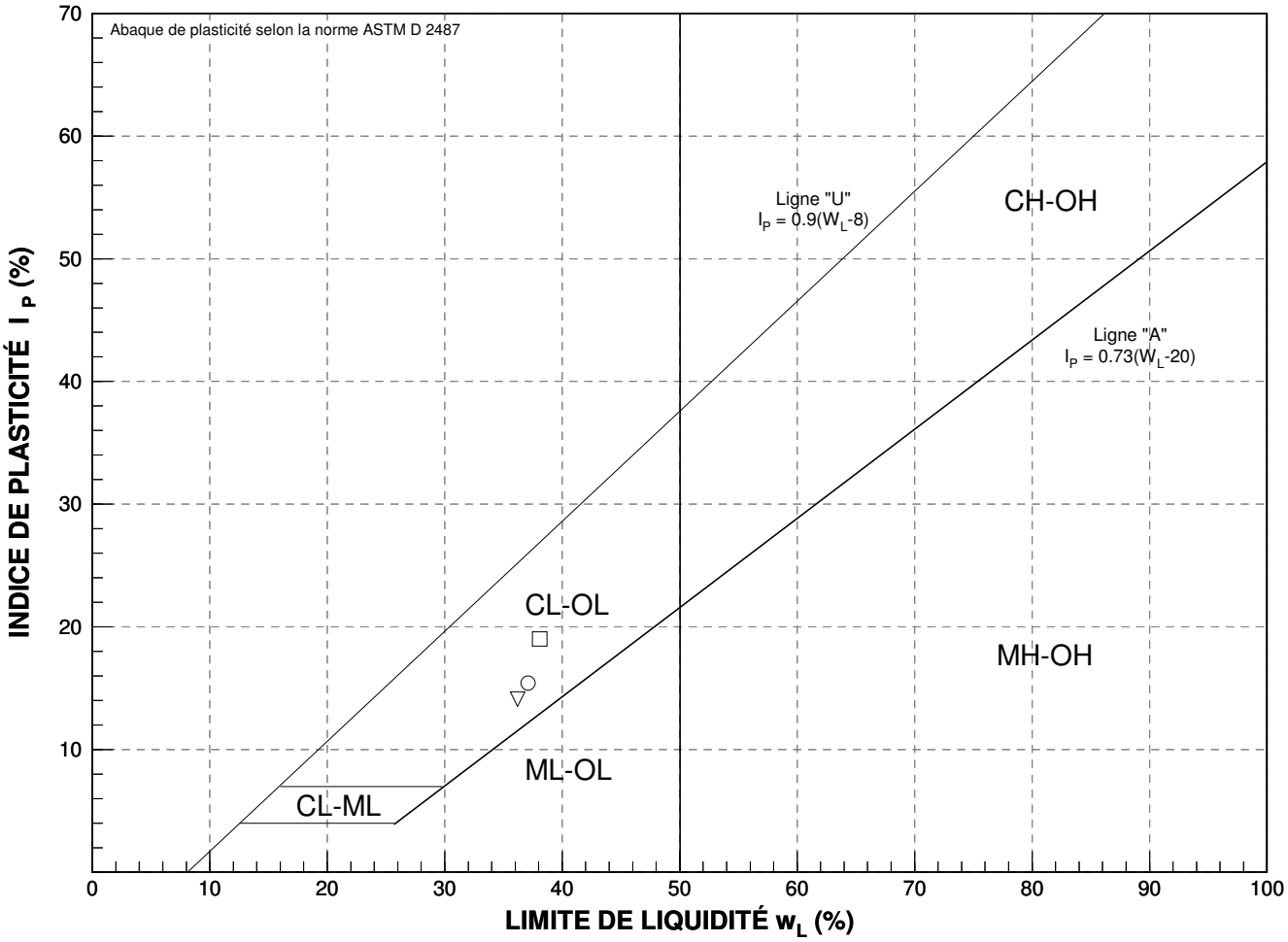
ABAQUE DE PLASTICITÉ

CLIENT : Travaux publics et Service gouvernementaux Canada
PROJET : Construction d'un champ de tir
LOCALISATION : Établissement Donnacona, 1537, route 138, Donnacona (Québec)
DOSSIER : 638589

Figure 3.2



Symbole	Sondage	Type	Éch.	Profondeur de	Profondeur à	w	w_L	w_P	I_L	I_P	USCS	Description
○	PU-6	VR	4	1.15	1.75	26	37	22	0.3	15	CL	Argile silteuse de plasticité moyenne (CL).
□	PU-7	VR	4	1.00	1.70	29	38	19	0.5	19	CL	Argile silteuse de plasticité moyenne (CL).
▽	PU-8	VR	4	1.20	1.80	27	36	22	0.4	14	CL	Argile silteuse de plasticité moyenne (CL).

Appendix 4

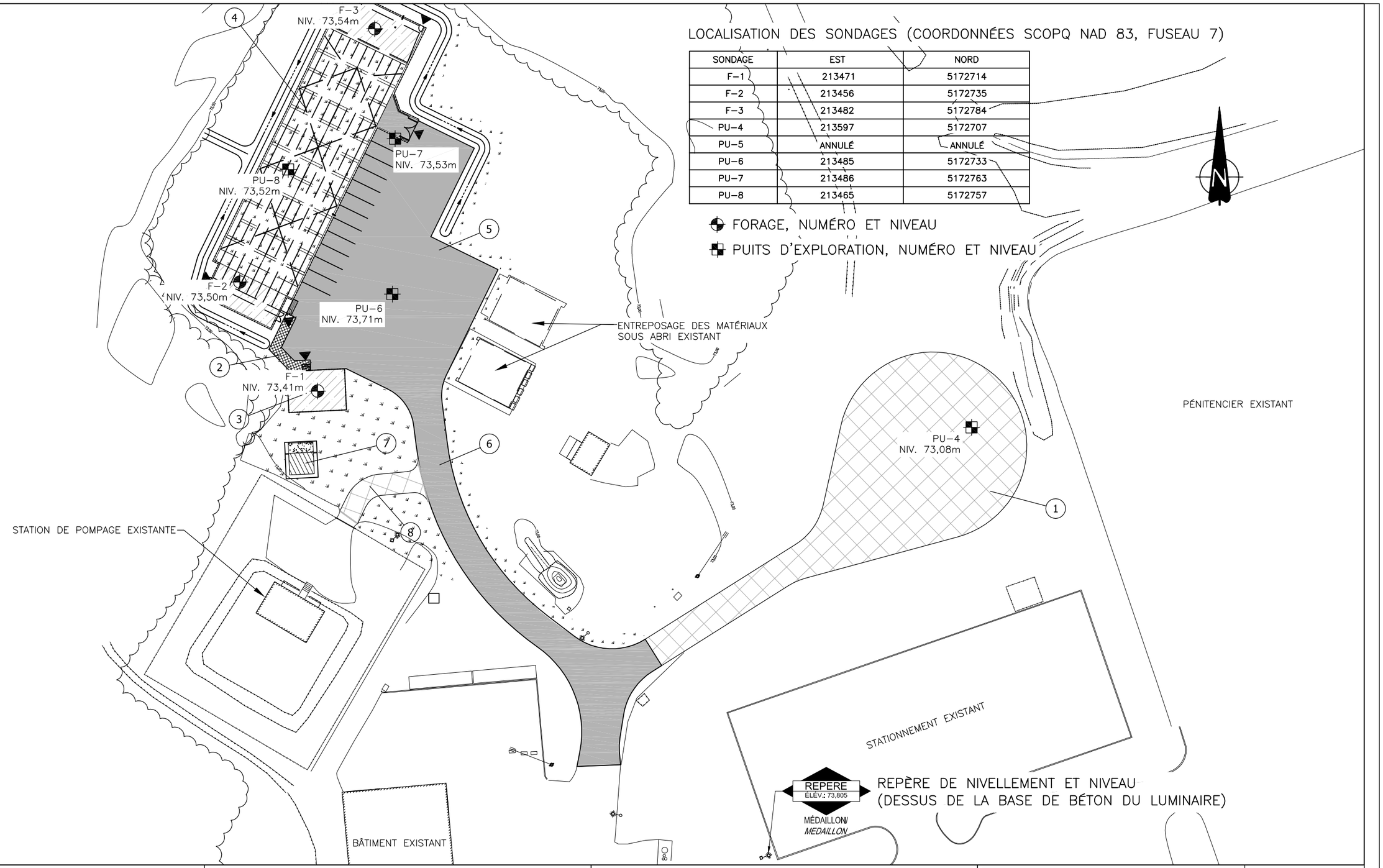
Exploratory drillings location plan 638589-1

LÉGENDE

- ASPHALTE/ *ASPHALT*
- GRAVIER/ *GRAVEL*
- GAZON/ *GRASS*
- TOITURE/ *ROOF*
- ZONE DES TRAVAUX/ *WORKING ZONE*
- ACCÈS AU BÂTIMENT/ *ACCESS TO THE BUILDING*
- FOSSÉ/ *DITCH*
- LIMITE DE BOISÉ/ *WOODLAND BOUNDARY*

NOTES

1. BOUCLE DE VIRAGE/ *LOOP TURN*
2. ZONE PIÉTONNE/ *PEDESTRIAN ZONE*
3. SALLE DE FORMATION/ *TRAINING ROOM*
4. CHAMP DE TIR/ *SHOOTING RANGE*
5. NOUVEAU STATIONNEMENT: 12 VÉHICULES/ *NEW PARKING: 12 VEHICLES*
6. VOIE D'ACCÈS AU CHAMP DE TIR/ *ACCES ROAD TO THE SHOOTING RANGE*
7. CELLULES/ *CELLS*
8. ACCÈS À LA STATION DE POMPAGE/ *ACCES TO THE PUMPING STATION*



LOCALISATION DES SONDAGES (COORDONNÉES SCOPQ NAD 83, FUSEAU 7)

SONDAGE	EST	NORD
F-1	213471	5172714
F-2	213456	5172735
F-3	213482	5172784
PU-4	213597	5172707
PU-5	ANNULÉ	ANNULÉ
PU-6	213485	5172733
PU-7	213486	5172763
PU-8	213465	5172757

⊕ FORAGE, NUMÉRO ET NIVEAU

⊞ PUITS D'EXPLORATION, NUMÉRO ET NIVEAU

SNC·LAVALIN

Groupe SNC-LAVALIN inc.
6155, rue des Tournelles, Québec (Québec), Canada G2J 1P7
Téléphone: (418) 621-5211, Télécopieur: (418) 626-9312

PROJET :

TRAVAUX PUBLICS ET SERVICES GOUVERNEMENTAUX CANADA
800, rue de la Gauchetière Ouest, Bureau 7300
Montréal (Québec) H5A 1L6

TITRE :

CONSTRUCTION D'UN CHAMPS DE TIR
ÉTABLISSEMENT DONNACONA
LOCALISATION DES SONDAGES

NO.	DESCRIPTIONS	DATE

PRÉP. PAR : S. CÔTÉ
DESS. PAR : J. JUTEAU
DATE : 2016-09-29

ÉCHELLES	AUCUNE
# PROJET :	638589
# DESSIN :	638589-1

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APPENDIX B

Preliminary Environnemental Caracterisation Study – Phase II – Final Report – March 2017

SNC-Lavalin GEM Québec inc.
6155, rue des Tournelles
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Construction of a Firing Range
Donnacona Establishment
1537, route 138
Donnacona (Québec)

Preliminary Environmental Characterisation Study – Phase II

PUBLIC WORKS AND GOVERNMENT SERVICES CANADA
800, rue de la Gauchetière Ouest, bureau 7300
Montréal (Québec) H5A 1L6

Mohammed Afoundo, M. Sc.

Ahmed Ouarzidini, Eng. M. Sc.

March, 2017

N° de membre de l'OIQ : 108509
N/Dossier n° : 638589, rapport final Mars 2017

Distribution : Madame Hélène Maurice, m. arch. – Travaux publics et Services gouvernementaux Canada (PDF)
Monsieur Michel Grégoire, ing., SNC-Lavalin (PDF)

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SNC-Lavalin GEM Québec inc.
6155, rue des Tournelles
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March 28, 2017

Mrs. Hélène Maurice, m. arch.
Public Works and Government Services Canada
800 Gauchetière Ouest, suite 7300
Montréal , QC H5A 1L6

Subject: Preliminary Environmental Characterisation Study – Phase II
Construction of a Firing Range
Donnacona Establishment
1537 route 138
Donnacona, Quebec
N/File: 638589, Final Report

Dear Mrs. Maurice

Please find attached the report concerning the preliminary environmental characterisation study, phase II, carried out by SNC-Lavalin Environment and geosciences (SNC-Lavalin), previously named Qualitas,

An operating now under the legal entity of SNC-Lavalin GEM Quebec Inc in this present project.

We hope the contents of this report is to your satisfaction. Please do not hesitate to communicate with us if you desire additional information related to this report.

Best Regards,

Mohammed Afoundo, M.Sc.
Project Manager
Environment and Geoscience
Infrastructure Engineering – Eastern Canada

MA/mcb

Enclosure: Report

Table of Contents

Appendices

1. Introduction

SNC-Lavalin's professional services Environment and geosciences (SNC-Lavalin), previously known as Qualitas and now operating under the legal entity SNC-Lavalin GEM Québec inc., have been retained by Public Works and Government Services Canada (PWGSC), to conduct an environmental characterization study, within the framework of the Construction of a firing range on the grounds of the Donnacona Penitentiary Québec (hereinafter: "The Site"). This study is carried out on behalf of Correctional Services of Canada. The site is located at 1537 Route 138 in Donnacona between Route 138 and Highway 40. The geographic coordinates at the center of the site are 46.687610 N, - 71.689278 O (NAD-83).

The site under study is shown on drawing 638589.02-01, Appendix 3.

2. Methodology

2.1 Establishment of Test Boring

The work plan was prepared by the project design team of the firing range project. A total of 3 boreholes and 5 exploration wells were requested to understand the nature of the soil in place at the construction site and then be able to make recommendations for foundations, road structures, soil management, etc. Due to existing underground infrastructure in the roadway near the potable water pumping station, one of the exploration wells was canceled.

Surveys were requested in areas where foundation construction for buildings would be carried out either in the area of the firing range, the bullet collector or the training building. The exploration well was required in the central section of the firing to assess whether the existing soil could be conserved while allowing the drainage of the zone. The other exploration wells were designed to allow for pavement structures for parking, the access road and turn-around loop.

Before starting the sampling campaign on the site, a work plan describing the works, the location of the borehole drilling and exploration wells, and associated costs was forwarded to the PWGSC Project Manager. The work plan was approved prior to the start of work on the ground.

2.2 Test Boring Work

Test boring works were conducted between August 30 and September 13, 2016. In total, 3 boreholes (F-1 to F-3) and 4 exploration wells (PU-4, PU-6 to PU-8) were carried out (due to the presence of non-localized underground infrastructures, the PU-5 survey was abandoned). These holes were used for environmental and geotechnical studies. All wells that were transformed into observation wells (identified boreholes F-1 to F-3), were carried out under the constant supervision of a technician experienced in Geoenvironment from our firm. Drill reports are presented in appendix 2 , and appendix 4 presents photographs of the work carried out.

Drilling was carried out using a Diedrich hydraulic drill, model D-50 crawler mounted and equipped with an automatic hammer. Drilling was advanced by the rotation of augers with hollow centers. Between the bores of the auger sections, soil samples were taken using a standard 51 mm outside diameter by 610 mm in length borehole drill. The boreholes were of varying depths.

2.3 Observation Wells and Tubes

In order to verify the quality of the groundwater, the 3 boreholes (F-1 to F-3) were transformed into observation wells (OWs). In each of the observation wells, a PVC tube was installed in its cavity. This tube has a diameter of 50 mm, the length of the borehole and is screened over its lower end. In order to avoid possible breakages or vandalism, the observation wells were provided with a protective metal cover. The observation wells are shown on the drill reports in appendix 2. The approximate location of the exploratory wells and observation tubes is shown on the drawing 638589.02-02 in appendix 3, while appendix 4 contains photographs of the works made.

2.4 Measurement of Free Phase, Purging and Groundwater Sampling

Observation wells were developed on September 6, 2016. The absence of a free phase at the surface of the observation wells was checked using a "bailer" ball scoop. The wells were developed using a dedicated high-density polyethylene tubing equipped with an inertial pump, all connected to a mechanical arm.

2.5 Groundwater Sampling

Groundwater sampling operations were conducted in accordance with the Sampling methodology as set out in booklet 3 of the "*Guide d'échantillonnage à des fins d'analyses environnementales, échantillonnage des eaux souterraines*" (Sampling Guide for Environmental analysis, Groundwater Sampling) of the MDDELCC

Groundwater sampling was conducted using the passive method of direct sample by Hydrasleeve®. The Hydrasleeves® were installed on September 6, 2016. After a period of stabilization of 7 days, the sampling was carried out on September 13, 2016. No solid or floating phase was observed within the Hydrasleeves®. In total, three (3) samples were taken and analyzed.

2.6 Survey

The MTM coordinates (x, y, z) of the surveys were collected by SNC-Lavalin using a GPS. These coordinates are presented on the drill reports in appendix 2 and have an accuracy of about 3 m. The elevation benchmark used is a flat medallion embedded in the concrete base of a light post located in a nearby parking lot. The location of boreholes and the benchmark is shown in appendix 3 on drawing 638589.02-02.

3. Analytic Program

3.1 General

Soil sampling operations were carried out in accordance with the Specified method in the "*Guide d'échantillonnage à des fins d'analyses environnementales, cahier 5, échantillonnage des sols*" (Sampling Guide for Environmental Analysis, book 5, Soil Sampling) of the MDDELCC.

Groundwater sampling operations were conducted in accordance with the sampling methodology as set out in "*Guide d'échantillonnage à des fins d'analyses environnementales, cahier 3, échantillonnage des sols*" (booklet 3 of the Sampling Guide for Environmental analysis, groundwater sampling) of the MDDELCC

All recovered samples were handled and stored in accordance with Guidelines set out in "*Guide d'échantillonnage à des fins d'analyses Environnementales, Cahier 1* » (Book 1 of the Sampling Guide for Analytical Purposes Environmental issues) of the MDDELCC. Soil and groundwater specimens were collected in suitable jars supplied by AGAT Laboratories, accredited by the MDDELCC, which carried out the chemical analyses.

3.2 Analytical Parameters

Some soil samples from unknown quality fill and underlying natural deposits underwent chemical analyses to establish the concentration of certain parameters for the detection of contamination indices, namely petroleum hydrocarbons HP C10-C50, polyaromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and metals.

3.3 Quality Control

Laboratory chemical analyses were submitted to AGAT's control program. This program includes, but is not limited to, method blanks, certified controls and dosed additions. The results of these checks are presented in the chemical analyses certificates issued by AGAT, in appendix 6.

3.4 Organoleptic Indications of Contamination

For each sample taken from each borehole (geotechnical and environmental) in the field, an organoleptic examination was performed.

4. Results

4.1 Stratigraphy Summary

Briefly, the results of the boreholes indicate the presence of a sand, silt and gravel fill, combined in varying proportions. Within PU-6 and PU-8, dry waste, or pieces of concrete, plastic and metal. The fill covers a layer of black earth. Under this level, a layer of clayey silt which is supported by a disintegrated, friable rock which can be assimilated to a soil. This level rests on a rock base and is an alternation of limestone clay and calcareous sandstone. The detail of the stratigraphy can be found in the drill reports in appendix 2.

4.2 Organoleptic Observations

Dry debris: pieces of concrete, plastic and metal were encountered within the fill in the PU-6 and PU-8 wells. In the other boreholes, no organoleptic contamination was found in the soil and groundwater sampled during the borehole drilling.

4.3 Free Phase Measurements and Piezometric Readings

Table 1 presents the results of the piezometric surveys at the installed observation wells. It should be noted that no free-phase of oily nature was detected at the location of observation wells.

Table 1 Groundwater Level Measured in Observation Wells as of September 13, 2016

Observation Well	Level of Groundwater (m)
F-1 (PO)	70.36 m
F-2 (PO)	70.68 m
F-3 (PO)	70.58 m

4.4 Classification of soils

As a first step, the criteria of the *Politique de protection des sols et de réhabilitation des terrains contaminés* (Soil Protection and Rehabilitation Policy Contaminated Sites) of the *Ministère du Développement durable , Environnement et Lutte contre les changements climatiques* (MDDELCC) were used for the soil classification. The policy establishes three thresholds of contamination, namely the A-B-C criteria.

The corrective actions required and the acceptable levels according to MDDELCC are based on use or future use of a site. The definition of each of the 3 reference levels Is given in Table 2.

Table 2 Definition of Generic A-B-C Contamination Criteria of MDDELCC

Level	Definition
A	Background levels for inorganic parameters and limit of quantification for parameters organic. The limit of quantification is defined as the minimum concentration that can be quantified using an analytical method with a defined reliability.
B	(Regulatory Limit Values in Schedule I of the TPRR): Maximum Acceptable Limit for residential land or land in which certain institutional uses take place (primary or secondary education, early childhood centers, child care centers, hospitals, residential and long-term care centers, rehabilitation centers, and youth facilities, detention facilities) and the first meter of municipal parks.
C	(Regulatory limit values in annex II to the TPRR): Maximum acceptable limit for Industrial, commercial, institutional and non-recreational (bike paths and municipal parks, except the first meter of playgrounds), as well as for the base of a pavement or a sidewalk at the edge of it.

For the present project, it is in the area of a detention facility. The Criterion B, prescribed by the MDDELCC for more sensitive (residential) uses, was retained for the purposes of this environmental assessment.

In addition, since it is a federal site, the analytical results were compared Canadian recommendations for the quality of the environment for soil quality of the Canadian Council of Ministers of the Environment (CCME) in the context of residential or park use.

4.5 Classification of Groundwater

The groundwater classification was determined on the basis of the criteria prescribed by the MDDELCC for the provincial and CCME for the federal government.

- The groundwater classification was determined on the basis of the prescribed criteria by the MDDELCC for the resurgence of groundwater in surface waters.
- In addition, since this is a federal site, the analytical results were compared to the recommendations of the Canadian Council of Ministers of the Environment (CCME) for the Quality of fresh water

4.6 Chemical Analysis Results

4.6.1 Soils

An examination of the results presented in Table 1 of appendix 5 shows the classification of the soil:

4.6.1.1 Application of Provincial Criteria (MDDELCC, 2014)

- At F-2 Borehole:
  - F-2 / CF-2A of drilling F-2, located between 0.61 to 0.90 m depth, is classified B-C in HP C10-C50.
  - F-2 / CF-4, drilling F-2, located between 1.83 to 2.44 m deep, is rated A-B in HP C10-C50.

- Within the PU-4:
  - PU-4 / Dup-1, of the PU-4 exploration well, between 1.83 and 2.44 m deep, is Rated A-B in HP C10-C50.
  - PU-4 / VR-4, of the PU-4 exploration well, between 1.00 and 1.50 m deep, is Class A-B metal (Arsenic).
- Within the PU-6:
  - PU-6 / VR-2, of the PU-6 exploration well, between 0.30 and 0.80 m deep, is Rated A-B Metals (Lead) and HP C10-C50.
  - PU-6 / VR-3, of the PU-6 exploration well, between 0.80 and 1.15 m deep, is Class A-B in metals (Lead, Molybdenum) and PAH.
- Within the PU-8:
  - PU-8 / VR-2A, of the PU-8 exploration well, between 0.08 and 0.50 m deep, is Rated A-B in HP C10-C50.
  - PU-8 / VR-4, of the PU-8 exploration well, between 1.20 and 1.80 m deep, is Classified A-B in HP C10-C50 and in metals (Arsenic).

4.6.1.2 Application of the Federal Criteria (CCME)

The Canadian recommendations for quality of the environment with respect to residences and parks are exceeded:

- For metals (Nickel), at the PU-4 / VR-2 level between 0.05 and 0.50 m deep PU-4 exploration wells.
- For fraction F-3 (C_{10}-C_{34}) at the F-2 CF-2A, between 0.61 and 0.90 m depth of drilling F-2.

The other samples do not exceed these recommendations. The AGAT analytical certificates no. 16Q135034 and 16Q141781 are in appendix 6 for more information.

4.6.2 Groundwater

The results of analyses of groundwater samples obtained in the study are shown on Table 2 of appendix 5 and certificates of analysis of the AGAT laboratory no. 16Q137583, 16Q141781 are presented in appendix 6.

4.6.2.1 Application of Provincial Criteria (MDDELCC, 2014)

Generally, the results presented fall under the criteria prescribed by the MDDELCC for groundwater resurgences in surface waters. They are even often close to the detection limits of the laboratory for organic parameters characterized. The exception is Barium, for which there is an excess for resurgence in fresh water, at the level of the three wells of observations. When analyzed as a whole, the presence of this parameter does not appear to be at the bottom, the Donnacona sector not having this type of "anomaly". Without prejudice to, the presence of barium could be explained by the agricultural past of the sector where the Donnacona Penitentiary is situated. Indeed, barium, in certain forms, has been and is being used as an agricultural fertilizer. These concentrations may therefore be past agricultural activities in and around the past.

4.6.2.2 Application of the Federal Criteria (CCME)

There is no evidence that the CCME guidelines for freshwater have been exceeded.

4.6.2.2.1 Classification of the site according to the National Classification System Contaminated Sites (NCSCS)

The NCSCS is a tool designed specifically for the classification and prioritization of places Contaminated sites in order to facilitate the assessment of national contaminated sites. The NCSCS Does not provide a qualitative or quantitative risk assessment, but rather scientific and technical support to identify and prioritize sites of high, medium or low risk. The system allows the selection of places according to the need

(characterization, risk assessment, rehabilitation, etc.) with a view to protecting human health and the environment.

According to the analytical results obtained, the site under study is found in class N corresponding to "No intervention priority", due to a total rating of the NCSCS less than 37. This result indicates that a significant environmental effect or threat Important for human health are unlikely. Probably no intervention will be necessary unless new information reveals a more serious problem, In which case the site should be reassessed.

4.7 Quality Control

The relative difference was calculated between the duplicate PU-4/DUP-1 and the corresponding soil sample PU-4/VR-2 for analysis of HP C10-C50 petroleum hydrocarbons, metals and PAHs. The results obtained represent deviations below the 30% value recommended by the MDDELCC. The accuracy of the results obtained is considered satisfactory.

5. Conclusions and Recommendations

The environmental characterisation study was carried out by means of soundings (boreholes and exploration wells) at a maximum depth of 7.20 m on part of the Donnacona penitentiary site. Soil and groundwater samples were the subject of observations and laboratory analyses for some common screening tracers of selected alteration. A total of 7 holes characterized the soil samples while the 3 boreholes were converted into observation wells to assess and characterise groundwater.

5.1 Soils

5.1.1 Provincial Criteria

Our study revealed that the land contains soils that meet the criteria for residential use B of the MDDELCC except in drilling F-2 where the soils are B-C in HP C10-C50 between 0.61 and 0.90 m depth. Elsewhere, the distribution of soil alteration is as follows:

At the F-2 level, soils classified as A-B:

- In HP C10-C50 between 1.83 and 2.44 m depth.

At the level of PU-4, soils are classified A-B:

- In HP C10-C50 between 1.83 and 2.44 m depth.
- Metals (Arsenic) between 1.00 m and 1.50 m deep.

At the level of the PU-6, the soils are classified A-B:

- Metals (lead, molybdenum) in HP C10-C50 and in PAH between 0.30 and 1.15 m of depth.

At the level of PU-8, soils are classified A-B:

- In HP C10-C50 between 0.08 and 0.50 m depth.
- In HP C10-C50 and in metals (arsenic) between 1.20 and 1.80 m depth.

5.1.2 At The Federal Level

The Canadian recommendations for quality of the environment with respect to residences and parks is exceeded at the level of:

- PU-4 for metals (nickel) between 1.00 and 1.50 m deep.
- F-2 for the fraction of F-3 (C_{10}-C_{34}) of petroleum hydrocarbons, between 0.61 and 0.90 m of depth.

Regarding the exceedance of metals (nickel), according to the CCME, one must compare its measured content of 48 ppm to the lower level of the geological province of the St-Lawrence Lowlands, which is 50 ppm. It is noted that the nickel content measured is lower than its content in the provincial lower level (geological province of the St-Lawrence Lowlands).Therefore, no intervention is necessary.

With regard to hydrocarbon exceedance, the area is classified as N – Priority intervention null (Total rating of SNCLCC <37), according to the CCME. Find in appendix 7 the CCME National Classification System. It should be added that this contamination is due to the presence of nuggets (fine particles) of disseminated bitumen in the fill material. Therefore, no intervention is required.

Since it is a federal site, the CCME's recommendations are applicable, however, in terms of management, the applicable provincial regulations will apply. As mentioned above, the environmental intervention is null, so during the work of mass excavation these soils can be reused on site. On the other hand, if soils are surplus and must be disposed off-site, we recommend controlling the contaminated areas. Once delineation is made, these soils must be managed as recommended by the MDDELCC. A-B soils can be reused on site, however B-C soils should be managed following the excavated soil management grid shown In appendix 8.

5.2 Groundwater

5.2.1 Provincial Criterion

With regard to groundwater, the results of analyses obtained in the study for characterized alterations show concentrations above the resurgence in surface water, for metals (barium) within the three (3) observations wells

5.2.2 Federal Criterion

There is no evidence that the CCME guidelines for freshwater have been exceeded.

5.2.3 Recommendations

In an off-site management framework, groundwater is non-compliant for barium. To offset the high cost of managing barium during mass excavation work, we recommend carrying out a water sampling and analysis campaign prior to the start of the work in order to validate the concentrations.

The conclusions of this report are based on the analytical results of the soil samples in the sectors investigated for the above-mentioned specific parameters and at the locations investigated. Consequently, these results do not constitute a guarantee for the property not investigated at the time of this characterisation.

APPENDIX 1 – Scope of Report

SCOPE OF REPORT

1. Use of report

a. Use of report

This report has been prepared, and the work mentioned herein was carried out by SNC-Lavalin GEM Québec Inc. (SNC-Lavalin) exclusively for the client (the Client), to whom the report is addressed, and who took part in developing the scope of work and understands the limitations. The methodology, findings, recommendations and results cited in this report are based solely on the scope of work and are subject to the requirements of time and budget, as described in the offer of services and/or the contract under which this report was issued. Use of this report or any decision based on its content by third parties is the sole responsibility of the third parties. SNC-Lavalin is not responsible for any damage incurred by third parties due to the use of this report or of any decision based on its content. The findings, recommendations and results cited in this report (i) have been prepared in accordance with the skill level normally demonstrated by professionals operating in similar conditions in the sector, and (ii) are determined according to the best judgment of SNC-Lavalin, taking into account the information available at the time the report was prepared. The professional services provided to the Client and the findings, recommendations and results cited in this report are not subject to any guarantee, express or implied. The findings and results cited in this report are only valid on the date of the report and may be based in part on information provided by third parties. This report may require modifications in case of inaccurate information, discovery of new information or changes in project parameters. The results of this study are in no way a guarantee that the site in the study is free of contamination. This report must be considered as a whole and its parts or sections must not be taken out of context. If discrepancies were to appear between the draft and the final version of this report, the final version shall prevail. Nothing in this report is mentioned with the intention to provide or constitute legal advice. The content of this report is confidential and proprietary. It is prohibited for any person other than the Client to reproduce or distribute this report, to use or take a decision based on its content, in whole or in part, without the express written permission of the Client and SNC-Lavalin.

b. Modifications to project

The evidence, interpretations and recommendations contained in this report relate to the specific project as described in the report and do not apply to any other project or any other site. If the project is modified from a perspective of design, dimensioning, location or level, SNC-Lavalin must be consulted to confirm that the recommendations already given remain valid and enforceable.

c. Number of soundings

The recommendations in this report are intended only as a guide for the design engineer. The number of soundings to determine all subsurface conditions that may affect construction (costs, techniques, equipment, schedule) should normally be greater than that for the purpose of design. The number of sample sites and chemical analyzes as well as the sampling frequency and choice of parameters can influence the nature and extent of corrective actions as well as treatment or disposal technology and cost. Contractors bidding or subcontracting the work should rely on their own research and their own interpretations of the surveys' factual results to assess how underground conditions can affect their work and the cost of work.

d. Interpretation of data, comments and recommendations

Unless otherwise noted, data and results interpretation, comments and recommendations contained in this report are based, to the best of our knowledge, on environmental policies, criteria and regulations in force at the location of the project and on the production date of the report. If these policies, criteria and regulations are subject to change after submission of the report, SNC-Lavalin must be consulted to review the recommendations in the light of these changes. When no policy, criteria or regulation is available to allow for the interpretation of data and analytical results, comments or recommendations expressed by SNC-Lavalin are based on the best knowledge of the rules accepted in professional practice. The analyzes, comments and recommendations contained in this report are based on data and observations collected on the site, which come from sample work on the site. It is understood that only the data collected directly at the survey sites, sample sites and on the sample date are accurate and that any interpolation or extrapolation of these results to all or part of the site carries the risk of errors, which may themselves influence the nature and extent of the actions required on the site.

2. Sounding reports and interpretation of subsurface conditions

a. Soil and rock descriptions

The soil and rock descriptions given in this report are from classification and identification methods commonly accepted and used in the practice of geotechnical engineering. The classification and identification of soil and rock involves judgment. SNC-Lavalin does not guarantee that the descriptions will be identical in all respects to those made by another geotechnician possessing the same knowledge of geotechnical rules, but ensures accuracy only to what is commonly used in geotechnical practice.

b. Condition of soil and rock at sounding sites

The sounding reports only provide subsurface conditions and only at sounding sites. The boundaries between different layers on sounding reports are often approximate, rather corresponding to the transition zones and therefore subject to interpretation. The precision of subsurface conditions depends on the sounding method, frequency and method of sampling and consistency of the terrain encountered. The spacing between surveys, the sampling frequency and the type of sounding also reflect budgetary considerations and timelines that are outside the control of SNC-Lavalin.

c. Condition of soil and rock between sounding sites

The soil and rock formations are variable over a considerably large area. Subsurface conditions between sounding sites are interpolated and may vary significantly from the conditions encountered at sounding sites. SNC-Lavalin can guarantee the results at the site where sounding are conducted. Any interpretation of the conditions presented between sounding sites carries risks. These interpretations can lead to the discovery of conditions that are different from those that were expected. SNC-Lavalin cannot be held responsible for the discovery of different soil and rock conditions from those described elsewhere than at the site where soundings are conducted.

d. Groundwater levels

The groundwater levels provided in this report only correspond to those observed at the site and on the date indicated in the report and depends on the type of piezometric installation used. These conditions may vary based on the season or due to construction work on the site or on adjacent sites. These variations are beyond the control of SNC-Lavalin.

3. Contamination levels

The contamination levels described in this report (if within the scope) correspond to those detected at the site and on the date indicated in the report. These levels can vary based on the season or due to activities on the study site or on adjacent sites. These variations are beyond our control. Contamination levels are determined from the results of chemical analyzes of a limited number of soil, surface water or groundwater samples. The nature and degree of contamination between sample site may vary greatly. The chemical composition of groundwater at each sample site is likely to change due to groundwater flow, surface recharge conditions, stress of the formation investigated (i.e. pump or injection wells near the site) and natural seasonal variability. The accuracy of groundwater contamination levels depends on the frequency and the number of analyzes. The list of parameters analyzed is based on our best knowledge of the history of the site and the contaminants likely to be found on the site and is also a reflection of budgetary considerations and timelines. The fact that a parameter has not been analyzed does not exclude its presence at a concentration above the background noise or the detection limit of this parameter.

4. Study and work monitoring

a. Final phase verification

All design and construction details are not known at the time of issue of the report. It is therefore recommended that SNC-Lavalin's services be retained to provide light on the possible consequences of construction on the final work.

b. Inspection during execution

It is recommended that SNC-Lavalin's services be retained during construction to verify and confirm that groundwater conditions throughout the site do not differ from those given in the report and that the construction work will not have an adverse effect on the conditions of the site.

5. Changing conditions

The soil conditions described in this report are those observed during the study. Unless otherwise stated, these conditions are the basis for recommendations in the report. Soil conditions can be significantly affected by construction work (traffic, excavation, etc.) on the site or on adjacent sites. Excavation may expose the soil to changes due to humidity, drying or freezing. Unless otherwise indicated, the soil must be protected from these changes or rearrangements during construction. When conditions encountered at the site differ significantly from those provided in this report, due to the heterogeneous nature of the subsurface or due to construction work, it is the responsibility of the Client and the user of this report to notify SNC-Lavalin of changes and give SNC-Lavalin the opportunity to review the report's recommendations. Recognizing a change in ground conditions requires experience. It is therefore recommended that an experienced geotechnical engineer be dispatched to the site to see if conditions have changed significantly.

6. Drainage

Groundwater drainage is often required for both temporary and permanent project facilities. An incorrect drainage design or execution can have serious consequences. SNC-Lavalin cannot under any circumstance take responsibility for the effects of drainage unless SNC-Lavalin is specifically involved in the detailed design and monitoring of the drainage system's construction.

7. Environmental characterization – Phase I

This report was written after diligent research and evaluation of point data sources or information obtained from third parties that may present uncertainties, gaps or omissions. These sources of information are subject to change over time, for example, according to the progress of activities on the site and surrounding area. Phase I includes no testing, sampling or characterization analysis by a laboratory. Subject to exceptions, Phase I is based on the observation of visible and accessible components on the property and those nearby and could bring environmental harm to the quality of the land in the study. The property titles mentioned in this report are used to identify the former owners of the study site and cannot under any circumstance be considered as an official document for reproduction or other uses. Finally, any sketch, plan view or diagram appearing in the report or any statement specifying dimensions, capacities, quantities or distances are approximate and are included to help the reader visualize the property.

APPENDIX 2 – Report of Boreholes and Schematic of Exploration Wells

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EXPLANATORY NOTES
BOREHOLE AND TEST PIT LOG
(page 1 of 2)

The object of the borehole and test pit log is to present field and laboratory data concerning soil, bedrock and groundwater conditions. The purpose of this note is to explain the terminology, symbols and abbreviations used on the log.

STRATIGRAPHY

1. DEPTH - ELEVATION

The depth and elevation of contacts between the various geological strata are given in relation to the ground surface at the borehole or test pit location. Elevations refer to a datum as specified in the general heading of the log.

2. SOIL DESCRIPTION

Soils are described according to their physical and geotechnical properties.

Soil particle size classification is given below:

IDENTIFICATION	PARTICLE SIZE (mm)		
Clay		<	0.002
Silt	0.002	-	0.08
Sand	0.08	-	5
Gravel	5	-	80
Cobble	80	-	300
Boulder		>	300

The proportion of each soil constituent, as identified by the particle size range, is defined by the following descriptive terms:

DESCRIPTION	PARTICLE SIZE FRACTION (%)		
Trace	1	-	10
Some	10	-	20
Adjective (ex.: sandy silt, silty)	20	-	35
And (ex.: sand and gravel)		>	35

2.1 STATE OF COMPACTNESS OF COHESIONLESS SOILS

The state of compactness of cohesionless soils is evaluated using the "N-value" obtained during the Standard Penetration Test (SPT).

COMPACTNESS	N-VALUE (blows / 300 mm)		
Very loose		<	4
Loose	4	-	10
Compact	10	-	30
Dense	30	-	50
Very dense		>	50

2.2 CONSISTENCY AND PLASTICITY OF COHESIVE SOIL

The consistency of cohesive soils is defined by the undrained shear strength. The undrained shear strength of the intact clay (s_u) and remoulded clay (s_r) is measured in situ or in the laboratory.

CONSISTENCY	UNDRAINED SHEAR STRENGTH, s_u (kPa)		
Very soft		<	12
Soft	12	-	25
Firm	25	-	50
Stiff	50	-	100
Very stiff	100	-	200
Hard		>	200

DEGREE OF PLASTICITY	LIQUID LIMIT, W_L (%)		
Low		<	30
Medium	30	-	50
High		>	50

3. ROCK DESCRIPTION

Rock is described according to its geological origin, composition, structural characteristics and mechanical properties.

The Rock Quality Designation (RQD) is determined according to the ASTM D 6032 Standard.

CLASSIFICATION	RQD VALUE (%)		
Very poor quality		<	25
Poor quality	25	-	50
Fair quality	50	-	75
Good quality	75	-	90
Excellent quality	90	-	100

JOINT SPACING CLASSIFICATION	SPACING WIDTH (mm)		
Extremely close	0	-	60
Close	60	-	200
Moderately close	200	-	600
Wide	600	-	2000
Very wide		>	2000

STRENGTH	UNCONFINED COMPRESSIVE STRENGTH, q_u (MPa)		
Extremely weak		<	1
Very weak	1	-	5
Weak	5	-	25
Medium strong	25	-	50
Strong	50	-	100
Very strong	100	-	250
Extremely strong		>	250

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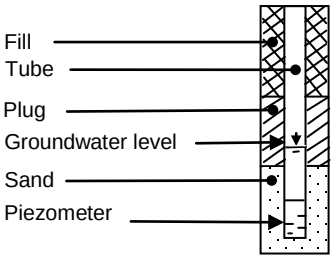
EXPLANATORY NOTES
BOREHOLE AND TEST PIT LOG
(page 2 of 2)

GROUNDWATER LEVEL

The column "Groundwater Level" gives the groundwater level measured in a stand pipe, piezometer, monitoring well or directly in the borehole or test pit. The survey date is also indicated in this column. The sketch opposite illustrates the different symbols used.



SAMPLES

1. TYPE AND NUMBER

The column "Type and Number" corresponds to the sample number. It includes 2 letters indicating the sample type followed by a sequence number. The sample types are as follows:

SS :	Split spoon	RC :	Rock core
LS :	Large diameter sampler	GS :	Grab sample
TW :	Thin wall tube	AS :	Auger sample
TU :	Geoprobe™ sampling tube		

2. CONDITION

The depth, strength and condition of each sample is given in this column. The following symbols indicate the condition of the sample:

3. RECOVERY

Sample recovery corresponds to the recovered length of the sample in relation to the length of penetration of the sampler, expressed in percentage. The sample length is equal to the distance from the top of the sampler to the cutting edge whether or not the lower part of the sample is lost.

IN SITU AND LABORATORY TESTS

In situ and laboratory test results are indicated in the column "In Situ and Laboratory Tests" at the corresponding depth.

The following list of abbreviations identifies these tests.

ABBREVIATIONS

A	Absorption, L/min-m (Packer Test in rock)
CA	Chemical analysis
C	Consolidation test
C_c	Curvature coefficient
C_U	Uniformity coefficient
s_u	Intact undrained shear strength, measured with the field vane, kPa
s_{ur}	Remoulded undrained shear strength, measured with the field vane, kPa
s_{uc}	Intact undrained shear strength, measured with the Swedish fall-cone, kPa
s_{urc}	Remoulded undrained shear strength, measured with the Swedish fall-cone, kPa
s_{up}	Intact undrained shear strength, measured with the portable vane apparatus, kPa
s_{rp}	Remoulded undrained shear strength, measured with the portable vane apparatus, kPa
D_r	Relative density
E_M	Pressuremeter modulus, kPa or MPa
G	Particle size distribution by sieve and washing
I_L	Liquidity index
I_p	Plasticity index, %
k_c	Coefficient of permeability (hydraulic conductivity), measured in situ, m/s
k_L	Coefficient of permeability (hydraulic conductivity), measured in the laboratory, m/s
N_{dc}	Dynamic cone penetrometer blow count (DCPT)
N	Standard penetration test (SPT) index
P_{80}	Sieve analysis by washing on the 80 μm sieve
P_L	Pressuremeter limit pressure, kPa
P_r	Proctor Test
γ	Unit weight, kN/m^3
γ'	Effective unit weight, kN/m^3
q_u	Unconfined compressive strength of rock, MPa
R	Split spoon penetration refusal
S	Particle size distribution by hydrometer testing
S_t	Sensitivity (s_u/s_r)
CPV	Corrosivity point value
w	Water content, %
w_L	Liquid limit, %
w_p	Plastic limit, %

SNC·LAVALIN

BOREHOLE LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589

BOREHOLE : F-3

DATE : 2016-08-31
COORDINATES : MTM 7 NAD83
E : 213482 **N :** 5172784

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL 2016-09-13	SAMPLES: CALIBRE	SAMPLES: TYPE AND NUMBER	SAMPLES: CONDITION	SAMPLES: RECOVERY (%)	SAMPLES: N or RQD (%)	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS: OTHER TESTS
	73.54	Fill: sand, some gravel and silt.			CF-1		65			CA
0.75	72.79					A				
0.85	72.69	Organic soil.				B				
		Silty clay. Medium plasticity (CL). Deemed stiff.			CF-2	C	65	4		CA
					CF-3		70	12		
1.80	71.74	Fragmented and weathered bedrock (soil-like behavior).			CF-4		65			Refusal
2.30	71.24	Bedrock: alternation between a limestone clay and a calcareous sand stone. Stratification from 0 to 5° to core axis. Rock quality: poor becoming average at 3.50 m.	70.58 m		CR-5		100	30		
					CR-6		100	70		
					CR-7		100	90		
5.50	68.04	**End of borehole**								

WATER CONTENT AND ATTERBERG LIMITS (%): W_P — W — W_L; 20 40 60 80

REMARKS : Track-mounted hydraulic drill rig, Diedrich D-50 equiped with an automatic SPT hammer.

DRILLING METHOD : Rotation of hollow-stem auger and coring (HQ).

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SNC·LAVALIN

BOREHOLE LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589

BOREHOLE : F-2

DATE : 2016-08-30
COORDINATES : MTM 7 NAD83
E : 213456 **N :** 5172735

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL 2016-09-13	SAMPLES: CALIBRE	SAMPLES: TYPE AND NUMBER	SAMPLES: CONDITION	SAMPLES: RECOVERY (%)	SAMPLES: N or RQD (%)	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS: OTHER TESTS
	73.50	Fill: sandy gravel, some silt.			CF-1		60			CA
0.60	72.90	Organic soil.			CF-2 A		65	11		CA
0.90	72.60	Silty clay. Medium plasticity (CL). Deemed stiff.			CF-2 B					
1.50	72.00	Fragmented and weathered bedrock (soil-like behavior).			CF-3 A		75	10		
					CF-3 B					
					CF-4		85	30		CA
2.45	71.05	Bedrock: alternation between a limestone clay and a calcareous sandstone. Stratification from 0 to 5 ° to core axis. Rock quality: very poor to poor.	70.68 m		CR-5		90	10		
					CR-6		100	50		
					CR-7		65	20		
5.50	68.00	**End of borehole**								

WATER CONTENT AND ATTERBERG LIMITS (%): W_P — W — W_L; 20 40 60 80

REMARKS : Track-mounted hydraulic drill rig, Diedrich D-50 equiped with an automatic SPT hammer.

DRILLING METHOD : Rotation of hollow-stem auger down to 1.80 m. Cased wash boring (HW) from 1.80 to 2.44 m and coring (HQ).

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SNC·LAVALIN

BOREHOLE LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589

BOREHOLE : F-1

DATE : 2016-08-30
COORDINATES : MTM 7 NAD83
E : 213471 **N :** 5172714

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	WATER LEVEL 2016-09-13	SAMPLES: CALIBRE	SAMPLES: TYPE AND NUMBER	SAMPLES: CONDITION	RECOVERY (%)	N or RQD (%)	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	OTHER TESTS
	73.41								W_P W W_L 20 40 60 80	
0.15	73.26	Fill: crushed rock (sandy gravel, some silt).			CF-1 A		60			
		Fill: sand, some silt, trace to some gravel.			CF-1 B					CA
0.61	72.80	Fill: sand, some silt to silty.			CF-2 A					
0.90	72.51				CF-2 B		65	5		CA
1.00	72.41	Organic soil.			CF-2 C					CA
		Silty clay. Medium plasticity (CL). Deemed stiff.			CF-3 A					
1.40	72.01	Fragmented and weathered bedrock (soil-like behavior).			CF-3 B		85	25		
					CF-4		95	71		
					CF-5		90	97		
			70.28 m							
3.05	70.36	Bedrock: alternation between a limestone clay and a calcareous sandstone. Stratification from 0 to 5° to core axis. Rock quality: very poor becoming average at 3.66 m.			CR-6		90	0		
					CR-7		100	75		
					CR-8		77	50		
					CR-9		95	60		
7.20	66.21	**End of borehole**								

REMARKS : Track-mounted hydraulic drill rig, Diedrich D-50 equiped with an automatic SPT hammer.

DRILLING METHOD : Rotation of hollow-stem auger and coring (HQ).

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SNC·LAVALIN

TEST PIT LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589-02

TEST PIT : PU-8

DATE : 2016-09-01
COORDINATES : MTM 7 NAD83
E : 213465 **N :** 5172757

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES TYPE AND NUMBER	SAMPLES CONDITION	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS: OTHER TESTS
	73.52				W_P — W — W_L; 10 20 30	
0.08	73.44	Fill: sandy gravel, traces to some silt.	VR-1			
		Heterogeneous fill: composed of silt and sand, traces of gravel. Presence of organics and concrete debris.		A		CA
			VR-2			
				B		
1.00	72.52	Organic soil.	VR-3			
1.20	72.32	Silty clay. Medium plasticity (CL). Deemed stiff.				
			VR-4		22 27 36	CA
1.80	71.72	Fragmented and weathered bedrock (soil-like behavior).				
			VR-5			
2.50	71.02	**Refusal on possible sound bedrock.**				

REMARKS :

No water seepage observed.

EQUIPMENT : John Deere 50G, hydraulic excavator.

SNC·LAVALIN

TEST PIT LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589-02

TEST PIT : PU-7

DATE : 2016-09-01
COORDINATES : MTM 7 NAD83
E : 213486 **N :** 5172763

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES TYPE AND NUMBER	SAMPLES CONDITION	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS: OTHER TESTS
	73.53	Fill: gravel and sand, traces of silt. Local presence of silty bed.	VR-1			G, CA
0.50	73.03	Fill: sand, traces of silt and gravel.	VR-2			G, CA
0.80	72.73	Organic soil.	VR-3			
1.00	72.53	Silty clay. Medium plasticity (CL). Deemed stiff.	VR-4		W_P 19, W 29, W_L 38	CA
1.70	71.83	Fragmented and weathered bedrock (soil-like behavior).	VR-5			
2.20	71.33	**Refusal on possible sound bedrock.**				

Water content and Atterberg limits (%): 10 20 30

REMARKS :

No water seepage observed.

EQUIPMENT : John Deere 50G, hydraulic excavator.

SNC·LAVALIN

TEST PIT LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589-02

TEST PIT : PU-6

DATE : 2016-09-01
COORDINATES : MTM 7 NAD83
E : 213485 **N :** 5172733

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES TYPE AND NUMBER	SAMPLES CONDITION	IN SITU AND LABORATORY TESTS: WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS: OTHER TESTS
	73.71	Fill: gravel and sand, traces of silt.	VR-1			G, CA
0.30	73.41	Heterogeneous fill: composed of a sandy silt to silty sand. Presence of organics, concrete, plastic and metal debris.	VR-2			CA
0.80	72.91	Organic soil.	VR-3			CA
1.15	72.56	Silty clay. Medium plasticity (CL). Deemed stiff.	VR-4		22 W 26 (37)	
1.75	71.96	Fragmented and weathered bedrock (soil-like behavior).	VR-5			
2.45	71.26	**Refusal on possible sound bedrock.**				

REMARKS :

Weak water seepage observed at 1.60 m.

EQUIPMENT : John Deere 50G, hydraulic excavator.

SNC·LAVALIN

TEST PIT LOG

CLIENT : Public Works and Government Services Canada
PROJECT : Construction of a Firing Range
LOCATION : Donnacona Establishment, 1537, route 138, Donnacona (Québec)
FILE : 638589-02

TEST PIT : PU-4

DATE : 2016-09-01
COORDINATES : MTM 7 NAD83
E : 213597 **N :** 5172707

DEPTH (m)	ELEVATION (m) Geodesic	DESCRIPTION	SAMPLES TYPE AND NUMBER	SAMPLES CONDITION	IN SITU AND LABORATORY TESTS WATER CONTENT AND ATTERBERG LIMITS (%)	IN SITU AND LABORATORY TESTS OTHER TESTS
	73.08				W_P — W — W_L; 10 20 30	
0.05	73.03	Fill: crushed rock (gravel and silty sand).	VR-1			
		Possible fill: silt, some gravel, sand and clay. Indurated soil.	VR-2			CA
			VR-3			
1.00	72.08	Fragmented and weathered bedrock (soil-like behavior).	VR-4			CA
			VR-5			
			VR-6			
2.30	70.78	**Refusal on possible sound bedrock.**				

REMARKS :

No water seepage observed.

EQUIPMENT : John Deere 50G, hydraulic excavator.

APPENDIX 3 – Drawing 635252.02-01: Approximate Location of Study Site
Drawing 635252.02-02: Location Plan of Boreholes and Contamination

N°	DESCRIPTION	DATE

Qualitas

CLIENT :TRAVAUX PUBLICS ET SERVICES GOUVERNEMENTAUX CANADA

PROJET :ÉTUDE DE CARACTÉRISATION ENVIRONNEMENTALE

ENDROIT : ÉTABLISSEMENT DONNACONA
1537, ROUTE 138 DONNACONA

TITRE : LOCALISATION APPROXIMATIVE DU SITE À L'ÉTUDE

ÉCHELLE : AUCUNE

DATE :	DOSSIER :	DIV.	DESSIN :
2016-10-04	638589.02		638589.02-01

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FORMAT 11x17

LOCALISATION DES SONDAGES (COORDONNÉES SCOPQ NAD 83, FUSEAU 7)

FORAGE, NUMÉRO ET NIVEAU
PUITS D'EXPLORATION, NUMÉRO ET NIVEAU
E.S.: ÉLÉVATION D'EAU SOUTERRAINE
NIV.: ÉLÉVATION DU SONDAGE

SONDAGE	EST	NORD
F–1	213471	5172714
F–2	213456	5172735
F–3	213482	5172784
PU–4	213597	5172707
PU–5	ANNULÉ	ANNULÉ
PU–6	213485	5172733
PU–7	213486	5172763
PU–8	213465	5172757

F–3
NIV. 73,54m
E.S. 70,58m

PU–7
NIV. 73,53m

PU–8
NIV. 73,52m

F–2
NIV. 73,50m
E.S. 70,68m

PU–6
NIV. 73,71m

F–1
NIV. 73,41m
E.S. 70,36m

PU–4
NIV. 73,08m

ENTREPOSAGE DES MATÉRIAUX
SOUS ABRI EXISTANT

SENS D'ÉCOULEMENT DES EAUX SOUTERRAINES

STATION DE POMPAGE EXISTANTE

3 706 463

3 706 464

BÂTIMENT EXISTANT

STATIONNEMENT EXISTANT

REPÈRE
ELEV.: 73,805
MÉDAILLON/
MEDAILLON

REPÈRE DE NIVELLEMENT ET NIVEAU
(DESSUS DE LA BASE DE BÉTON DU LUMINAIRE)

LÉGENDE
- ASPHALTE/*ASPHALT*
- GRAVIER/*GRAVEL*
- GAZON/*GRASS*
- TOITURE/*ROOF*
- ZONE DES TRAVAUX/*WORKING ZONE*
- ACCÈS AU BÂTIMENT/*ACCESS TO THE BUILDING*
- FOSSÉ/*DITCH*
- LIMITE DE BOISÉ/*WOODLAND BOUNDARY*

NOTES
1. BOUCLE DE VIRAGE/*LOOP TURN*
2. ZONE PIÉTONNE/*PEDESTRIAN ZONE*
3. SALLE DE FORMATION/*TRAINING ROOM*
4. CHAMP DE TIR/*SHOOTING RANGE*
5. NOUVEAU STATIONNEMENT; 12 VÉHICULES/*NEW PARKING; 12 VEHICLES*
6. VOIE D'ACCÈS AU CHAMP DE TIR/*ACCESS ROAD TO THE SHOOTING RANGE*
7. CELLULES/*CELLS*
8. ACCÈS À LA STATION DE POMPAGE/*ACCESS TO THE PUMPING STATION*

Tableau 1; répartition des sols altérés au sein des sondages et leur classification

Sondage	Échantillon	Profondeur (m)	Contamination	Classification MDDELCC[1]	Classification CCME
F-2	F-2 / CF-2A	0,61 à 0,90	C10-C50	B-C	--
			F-3(C10-C34)		2
	F-2/ CF-4	1,83 à 2,44	C10-C50	A-B	--
PU-4	PU-4/Dup-1	1,83 à 2,44	C10-C50	A-B	--
PU-6	PU-6/VR-2	0,30 à 0,80	Métaux (Plomb) C10-C50	A-B	--
	PU-6/VR-3	0,80 à 1,15	Métaux (Plomb, Molybdène) HAP	A-B	--
PU-8	PU-8/VR-2A,	0,08 à 0,50	C10-C50	A-B	--
	PU-8/VR-4	1,20 à 1,80	Métaux (Arsenic) C10-C50	A-B	--

Note :

Au niveau provincial.

1 : Critère générique du MDDELCC; ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques.

Dans un cadre de gestion hors site, gérer les sols selon la classification du MDDELCC, voir Grille de gestion des sols excavés en annexe.

Au niveau fédéral
CCME : Le Conseil canadien des ministres de l'environnement

2 : supérieur aux recommandations Résidentiel /Parc, du standard pancanadien relatifs aux hydrocarbures pétroliers dans les sols du CCME.

Le site est classé N-Priorité d'intervention environnementale nulle (cote totale du SNCLCC= 17,3 <37). **Aucune gestion, ni décontamination n'est requise.**

N°	DESCRIPTION	DATE

Qualitas

CLIENT :TRAVAUX PUBLICS ET SERVICES GOUVERNEMENTAUX CANADA

PROJET :ÉTUDE DE CARACTÉRISATION ENVIRONNEMENTALE

ENDROIT : ÉTABLISSEMENT DONNACONA
1537, ROUTE 138 DONNACONA

TITRE : PLAN DE LOCALISATON DES SONDAGES ET RÉPARATION DE LA CONTAMINATION

ÉCHELLE : AUCUNE

DATE :	DOSSIER :	DIV.	DESSIN :
2016-10-04	638589.02		638589.02-02

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APPENDIX 4 – Photomontage of the Work Carried Out

Picture 1 : Site under study: General view and survey positioning

Picture 2 : Diedrich Model D-50 Crawler mounted drill rig

Picture 3 : Realization of hollow auger boreholes

Picture 4 : Slotted spoon sampling - Drilling F-2

Picture 5 : Development of an observation well – Above-ground protection

Picture 6 : Development of an observation well – Low level protection

Picture 7 : Realization of exploratory shovels

Picture 8 : Example of exploration well walls (1/2)

Picture 9 : Example of exploration well walls (2/2)

Picture 10 : Leveling an Exploration Well

APPENDIX 5 – Detailed Tables of Chemical Analyses Results of Soils and Groundwater

SNC·LAVALIN

Étude de Caractérisation environnementale
TRAVAUX PUBLICS ET SERVICES GOUVERNEMENTAUX CANADA,
1537, Route 138
Donnacona (Québec)

Tableau 1: Résultats des analyses chimiques des sols (critères de la *Politique*, MDDELCC 2014)

Paramètres	Unité	Critère A	Critère B	Critère C	RESC	Source	F-1		F-2			F-3		PU-4				PU-6				PU-7			PU-8	
						Échantillon	F-1 CF-1B	F-1 CF-2C	F-2 CF-1	F-2 CF-2A	F-2 CF-4	F-3 CF-1	F-3 CF-2C	PU-4/DUP-1	PU-4/VR-2	Écart	PU-4/VR-4	PU-6/DUP-2	PU-6/VR-1	PU-6/VR-2	PU-6/VR-3	PU-7/VR-1	PU-7/VR-2	PU-7/VR-4	PU-8/VR-2A	PU-8/VR-4
						Profondeur	0,15 à 0,61	1,00 à 1,22	0,00 à 0,61	0,61 à 0,90	1,83 à 2,44	0,00 à 0,61	0,85 à 1,22	0,05 à 0,50			1,00 à 1,50	0,00 à 0,30	0,00 à 0,30	0,30 à 0,80	0,80 à 1,15	0,00 à 0,50	0,50 à 0,80	0,80 à 1,70	0,08 à 0,50	1,20 à 1,80
HP C10-C50																										
Hydrocarbures pétroliers C10 à C50	mg/kg	**300**	**700**	**3500**	**10000**		nd	nd	157	**1620**	**413**	298	155	**306**	293	4%	204	109	nd	**340**	197	148	nd	183	**379**	**452**
HP C10-C50_IPP										huiles/Bitume				Diesel/Huiles						Huiie/Bitume					Diesel/Huiles	Diesel/Huiles
IPP	NA	--	--	--	--		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd		nd	nd	nd	nd	nd	nd
HAM																										
Benzène	mg/kg	**0,2**	**0,5**	**5**	**5**		nd	--	nd	--	--	nd	--	--	nd	nd	--	--	--	<0.1	--	nd	--	--	nd	--
Chlorobenzène	mg/kg	**0,2**	**1**	**10**	**10**		nd	--	nd	--	--	nd	--	--	nd	nd	--	--	--	<0.2	--	nd	--	--	nd	--
Dichloro-1,2 benzène	mg/kg	**0,2**	**1**	**10**	**10**		nd	--	nd	--	--	nd	--	--	nd	nd	--	--	--	<0.2	--	nd	--	--	nd	--
Dichloro-1,3 benzène	mg/kg	**0,2**	**1**	**10**	**10**		nd	--	nd	--	--	nd	--	--	nd	nd	--	--	--	<0.2	--	nd	--	--	nd	--
Dichloro-1,4 benzène	mg/kg	**0,2**	**1**	**10**	**10**		nd	--	nd	--	--	nd	--	--	nd	nd	--	--	--	<0.2	--	nd	--	--	nd	--
Éthylbenzène	mg/kg	**0,2**	**5**	**50**	**50**		nd	--	nd	--	--	nd	--	--	nd	nd	--	--	--	<0.2	--	nd	--	--	nd	--
Styrène	mg/kg	**0,2**	**5**	**50**	**50**		nd	--	nd	--	--	nd	--	--	nd	nd	--	--	--	<0.2	--	nd	--	--	nd	--
Toluène	mg/kg	**0,2**	**3**	**30**	**30**		nd	--	nd	--	--	nd	--	--	nd	nd	--	--	--	<0.2	--	nd	--	--	nd	--
Xylènes	mg/kg	**0,4**	**5**	**50**	**50**		nd	--	nd	--	--	nd	--	--	nd	nd	--	--	--	<0.2	--	nd	--	--	nd	--
HAP																										
Acénaphtène	mg/kg	**0,1**	**10**	**100**	**100**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Acénaphtylène	mg/kg	**0,1**	**10**	**100**	**100**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Anthracène	mg/kg	**0,1**	**10**	**100**	**100**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (a) anthracène	mg/kg	**0,1**	**1**	**10**	**134**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (a) pyrène	mg/kg	**0,1**	**1**	**10**	**34**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (b) fluoranthène	mg/kg	**0,1**	**1**	**10**	**136**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0,2**	nd	nd	nd	nd	nd
Benzo (b+j+k) fluoranthène	mg/kg	**0,1**	**1**	**10**	**136**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0,2**	nd	nd	nd	nd	nd
Benzo (c) phénanthrène	mg/kg	**0,1**	**1**	**10**	**56**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (e) pyrène	mg/kg	**0,1**	**1**	**10**	--		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0,1**	nd	nd	nd	nd	nd
Benzo (g,h,i) pérylène	mg/kg	**0,1**	**1**	**10**	**18**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (j) fluoranthène	mg/kg	**0,1**	**1**	**10**	**136**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (k) fluoranthène	mg/kg	**0,1**	**1**	**10**	**136**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chrysène	mg/kg	**0,1**	**1**	**10**	**34**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0,2**	nd	nd	nd	nd	nd
Dibenzo (a,h) anthracène	mg/kg	**0,1**	**1**	**10**	**82**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzo (a,h) pyrène	mg/kg	**0,1**	**1**	**10**	**34**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzo (a,i) pyrène	mg/kg	**0,1**	**1**	**10**	**34**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzo (a,l) pyrène	mg/kg	**0,1**	**1**	**10**	**34**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Diméthyl-1,3 naphtalène	mg/kg	**0,1**	**1**	**10**	**56**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Diméthyl-7,12 benzo (a) anthracène	mg/kg	**0,1**	**1**	**10**	**34**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Fluoranthène	mg/kg	**0,1**	**10**	**100**	**100**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0,2**	nd	nd	nd	nd	nd
Fluorène	mg/kg	**0,1**	**10**	**100**	**100**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Indéno (1,2,3-cd) pyrène	mg/kg	**0,1**	**1**	**10**	**34**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Méthyl-1 naphtalène	mg/kg	**0,1**	**1**	**10**	**56**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Méthyl-2 naphtalène	mg/kg	**0,1**	**1**	**10**	**56**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Méthyl-3 cholanthrène	mg/kg	**0,1**	**1**	**10**	**150**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Naphtalène	mg/kg	**0,1**	**5**	**50**	**56**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Phénanthrène	mg/kg	**0,1**	**5**	**50**	**100**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0,2**	nd	nd	nd	nd	nd
Pyrène	mg/kg	**0,1**	**1**	**10**	**100**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**0,1**	nd	nd	nd	nd	nd
Triméthyl-2,3,5 naphtalène	mg/kg	**0,1**	**1**	**10**	**56**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Métaux																										
Argent	mg/kg	**2**	**20**	**40**	**200**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Arsenic	mg/kg	**6**	**30**	**50**	**250**		nd	nd	nd	nd	**6**	nd	nd	5	5	0%	**8**	nd	nd	nd	nd	nd	nd	nd	nd	**9**
Baryum	mg/kg	**340**	**500**	**2000**	**10000**		24	187	34	60	309	60	80	111	106	5%	168	26	28	44	125	106	nd	254	66	208
Cadmium	mg/kg	**1,5**	**5**	**20**	**100**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chrome	mg/kg	**100**	**250**	**800**	**4000**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	51	nd	50	nd	nd	nd	nd
Cobalt	mg/kg	**25**	**50**	**300**	**1500**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	18	nd	nd	nd	nd	nd	nd	nd	nd	18
Cuivre	mg/kg	**50**	**100**	**500**	**2500**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Étain	mg/kg	**5**	**50**	**300**	**1500**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Manganèse	mg/kg	**1000**	**1000**	**2200**	**11000**		101	68	133	88	714	198	79	294	281	5%	183	82	90	111	106	211	49	74	136	685
Mercure	mg/kg	**0,2**	**2**	**10**	**50**		nd	--	nd	--	--	nd	--	nd	nd	nd	--	--	--	nd	--	nd	--	--	nd	--
Molybdène	mg/kg	**2**	**10**	**40**	**200**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	2	nd	nd	nd	**3**	nd	nd	nd	nd	2
Nickel	mg/kg	**50**	**100**	**500**	**2500**		nd	nd	nd	nd	nd	nd	nd	32	30	6%	48	nd	nd	nd	nd	nd	nd	30	nd	43
Plomb	mg/kg	**50**	**500**	**1000**	**5000**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	**138**	**68**	nd	nd	nd	nd	nd
Sélénium	mg/kg	**1**	**30**	**10**	**50**		nd	--	nd	--	--	nd	--	nd	nd	nd	--	--	--	nd	--	nd	--	--	nd	--
Zinc	mg/kg	**140**	**500**	**1500**	**7500**		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Critère basé sur la province géologiques des basses terres Saint Laurent

SNC·LAVALIN

Étude de Caractérisation environnementale
TRAVAUX PUBLICS ET SERVICES GOUVERNEMENTAUX CANADA,
1537, Route 138
Donnacona (Québec)

Tableau 2 : Résultats des analyses chimiques des sols (Recommandations du CCME)

		Recommandations canadiennes pour la qualité de l'environnement [1]			Standards pancanadien relatifs aux hydrocarbures pétroliers dans les sols [1,2]			Source	F-1		F-2			F-3		PU-4			
Paramètres	**Unité**	**Residentiel / Parc**	**Commerciale**	**industriel**	**Residentiel / Parc**	**Commerciale**	**industriel**	**Échantillon**	**F-1 CF-1B**	**F-1 CF-2C**	**F-2 CF-1**	**F-2 CF-2A**	**F-2 CF-4**	**F-3 CF-1**	**F-3 CF-2C**	**PU-4/DUP-1**	**PU-4/VR-2**	**Écart**	**PU-4/VR-4**
								Profondeur	0,15 à 0,61	1,00 à 1,22	0,00 à 0,61	0,61 à 0,90	1,83 à 2,44	0,00 à 0,61	0,85 à 1,22	0,05 à 0,50			1,00 à 1,50
HP C10-C50																			
F_1 (C_6 - C_{10})		- [3]	- [3]	- [3]	**30**	**320**	**320**					--							
F_2 (>C_{10} - C_{16})		- [3]	- [3]	- [3]	**150**	**260**	**260**					<50.0				14,9			
F_3 (C_{16} - C_{34})		- [3]	- [3]	- [3]	**300**	**1,700**	**1,700**					**618**				163			
F_4 (>C_{34} - C_{50})		- [3]	- [3]	- [3]	**2,800**	**3,300**	**3,300**					2220				79,9			
HP C10-C50_IPP												huiles/Bitume				Diesel/Huiles			
IPP	NA																		
HAM																			
Benzène	mg/kg	- [3]	- [3]	- [3]	**0,03**	**0,03**	**0,03**			nd		nd			nd			nd	nd	
Chlorobenzène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**			nd		nd			nd			nd	nd	
Dichloro-1,2 benzène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**			nd		nd			nd			nd	nd	
Dichloro-1,3 benzène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**			nd		nd			nd			nd	nd	
Dichloro-1,4 benzène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**			nd		nd			nd			nd	nd	
Éthylbenzène	mg/kg	- [3]	- [3]	- [3]	**0,082**	**0,082**	**0,082**			nd		nd			nd			nd	nd	
Styrène	mg/kg	- [3]	- [3]	- [3]	**5**	**50**	**50**			nd		nd			nd			nd	nd	
Toluène	mg/kg	- [3]	- [3]	- [3]	**0,37**	**0,37**	**0,37**			nd		nd			nd			nd	nd	
Xylènes	mg/kg	- [3]	- [3]	- [3]	**11**	**11**	**11**			nd		nd			nd			nd	nd	
HAP																			
Acénaphtène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Acénaphtylène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Anthracène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (a) anthracène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (a) pyrène	mg/kg	- [3]	- [3]	- [3]	20	72	72			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (b) fluoranthène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (j) fluoranthène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (k) fluoranthène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (b+j+k) fluoranthène	mg/kg	- [3]	- [3]	- [3]	1	10	10			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (c) phénanthrène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (e) pyrène	mg/kg	- [3]	- [3]	- [3]						nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (g,h,i) pérylène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chrysène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzo (a,h) anthracène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzo (a,h) pyrène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzo (a,i) pyrène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzo (a,l) pyrène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Diméthyl-1,3 naphtalène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Diméthyl-7,12 benzo (a) anthracène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Fluoranthène	mg/kg	- [3]	- [3]	- [3]	**50**	**180**	**180**			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Fluorène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Indéno (1,2,3-cd) pyrène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Méthyl-1 naphtalène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Méthyl-2 naphtalène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Méthyl-3 cholanthrène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Naphtalène	mg/kg	- [3]	- [3]	- [3]	**0,6**	**22**	**22**			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Phénanthrène	mg/kg	- [3]	- [3]	- [3]	5	50	50			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Pyrène	mg/kg	- [3]	- [3]	- [3]	**10**	**100**	**100**			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Triméthyl-2,3,5 naphtalène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Métaux																			
Argent	mg/kg	20	40	40	N/A	N/A	N/A			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Arsenic	mg/kg	12	12	12	N/A	N/A	N/A			nd	nd	nd	nd	6	nd	nd	5	5	0%	8
Baryum	mg/kg	500	2000	2000	N/A	N/A	N/A			24	187	34	60	309	60	80	111	106	5%	168
Cadmium	mg/kg	10	22	22	N/A	N/A	N/A			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chrome	mg/kg	64	87	87	N/A	N/A	N/A			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Cobalt	mg/kg	50	300	300	N/A	N/A	N/A			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	18
Cuivre	mg/kg	63	91	91	N/A	N/A	N/A			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Étain	mg/kg	50	300	300	N/A	N/A	N/A			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Manganèse	mg/kg	-	-	-	N/A	N/A	N/A			101	68	133	88	714	198	79	294	281	5%	183
Mercure	mg/kg	6,6	24	50	N/A	N/A	N/A			nd	--	nd	--	--	nd	--	nd	nd	nd	--
Molybdène	mg/kg	10	40	40	N/A	N/A	N/A			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	2
Nickel	mg/kg	45	89	89	N/A	N/A	N/A			nd	nd	nd	nd	nd	nd	nd	32	30	6%	**48**
Plomb	mg/kg	140	260	600	N/A	N/A	N/A			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Sélénium	mg/kg	1	2,9	2,9	N/A	N/A	N/A			nd	--	nd	--	--	nd	--	nd	nd	nd	--
Zinc	mg/kg	200	360	360	N/A	N/A	N/A			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

1: standard Pancanadien relatif aux hydrocarbures pétroliers dans le sol, et Recommandations canadiennes pour la qualité de l'environnement
2: sols gorssiers, dont la granulo est supérieur à 75 µm
3: pas de valeur

SNC·LAVALIN

Étude de Caractérisation environnementale
TRAVAUX PUBLICS ET SERVICES GOUVERNEMENTAUX CANADA,
1537, Route 138
Donnacona (Québec)

Tableau 2 : Résultats des analyses chimiques des sols (Recommandations du CCME)

		Recommandations canadiennes pour la qualité de l'environnement [1]			Standards pancanadien relatifs aux hydrocarbures pétroliers dans les sols [1,2]			Source	PU-6				PU-7			PU-8	
Paramètres	**Unité**	**Residentiel / Parc**	**Commerciale**	**industriel**	**Residentiel / Parc**	**Commerciale**	**industriel**	**Échantillon**	**PU-6/DUP-2**	**PU-6/VR-1**	**PU-6/VR-2**	**PU-6/VR-3**	**PU-7/VR-1**	**PU-7/VR-2**	**PU-7/VR-4**	**PU-8/VR-2A**	**PU-8/VR-4**
								Profondeur	0,00 à 0,30	0,00 à 0,30	0,30 à 0,80	0,80 à 1,15	0,00 à 0,50	0,50 à 0,80	0,80 à 1,70	0,08 à 0,50	1,20 à 1,80
HP C10-C50																	
F_1 (C_6 - C_{10})		- [3]	- [3]	- [3]	**30**	**320**	**320**										
F_2 (>C_{10} - C_{16})		- [3]	- [3]	- [3]	**150**	**260**	**260**				<10.0					<10.0	20,2
F_3 (C_{16} - C_{34})		- [3]	- [3]	- [3]	**300**	**1,700**	**1,700**				167					164	290
F_4 (>C_{34} - C_{50})		- [3]	- [3]	- [3]	**2,800**	**3,300**	**3,300**				269					70,4	117
HP C10-C50_IPP											Huile/Bitume					Diesel/Huiles	Diesel/Huiles
IPP	NA																
HAM																	
Benzène	mg/kg	- [3]	- [3]	- [3]	**0,03**	**0,03**	**0,03**				<0.1		nd			nd	
Chlorobenzène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**				<0.2		nd			nd	
Dichloro-1,2 benzène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**				<0.2		nd			nd	
Dichloro-1,3 benzène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**				<0.2		nd			nd	
Dichloro-1,4 benzène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**				<0.2		nd			nd	
Éthylbenzène	mg/kg	- [3]	- [3]	- [3]	**0,082**	**0,082**	**0,082**				<0.2		nd			nd	
Styrène	mg/kg	- [3]	- [3]	- [3]	**5**	**50**	**50**				<0.2		nd			nd	
Toluène	mg/kg	- [3]	- [3]	- [3]	**0,37**	**0,37**	**0,37**				<0.2		nd			nd	
Xylènes	mg/kg	- [3]	- [3]	- [3]	**11**	**11**	**11**				<0.2		nd			nd	
HAP																	
Acénaphtène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Acénaphtylène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Anthracène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (a) anthracène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**		nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (a) pyrène	mg/kg	- [3]	- [3]	- [3]	20	72	72		nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (b) fluoranthène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**		nd	nd	nd	0,2	nd	nd	nd	nd	nd
Benzo (j) fluoranthène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (k) fluoranthène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**		nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (b+j+k) fluoranthène	mg/kg	- [3]	- [3]	- [3]	1	10	10		nd	nd	nd	0,2	nd	nd	nd	nd	nd
Benzo (c) phénanthrène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzo (e) pyrène	mg/kg	- [3]	- [3]	- [3]					nd	nd	nd	0,1	nd	nd	nd	nd	nd
Benzo (g,h,i) pérylène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Chrysène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	0,2	nd	nd	nd	nd	nd
Dibenzo (a,h) anthracène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**		nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzo (a,h) pyrène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzo (a,i) pyrène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibenzo (a,l) pyrène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Diméthyl-1,3 naphtalène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Diméthyl-7,12 benzo (a) anthracène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Fluoranthène	mg/kg	- [3]	- [3]	- [3]	**50**	**180**	**180**		nd	nd	nd	0,2	nd	nd	nd	nd	nd
Fluorène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Indéno (1,2,3-cd) pyrène	mg/kg	- [3]	- [3]	- [3]	**1**	**10**	**10**		nd	nd	nd	nd	nd	nd	nd	nd	nd
Méthyl-1 naphtalène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Méthyl-2 naphtalène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Méthyl-3 cholanthrène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Naphtalène	mg/kg	- [3]	- [3]	- [3]	**0,6**	**22**	**22**		nd	nd	nd	nd	nd	nd	nd	nd	nd
Phénanthrène	mg/kg	- [3]	- [3]	- [3]	5	50	50		nd	nd	nd	0,2	nd	nd	nd	nd	nd
Pyrène	mg/kg	- [3]	- [3]	- [3]	**10**	**100**	**100**		nd	nd	nd	0,1	nd	nd	nd	nd	nd
Triméthyl-2,3,5 naphtalène	mg/kg	- [3]	- [3]	- [3]	- [3]	- [3]	- [3]		nd	nd	nd	nd	nd	nd	nd	nd	nd
Métaux																	
Argent	mg/kg	20	40	40	N/A	N/A	N/A		nd	nd	<0.5	nd	nd	nd	nd	nd	nd
Arsenic	mg/kg	12	12	12	N/A	N/A	N/A		nd	nd	<5	nd	nd	nd	nd	nd	9
Baryum	mg/kg	500	2000	2000	N/A	N/A	N/A		26	28	44	125	106	nd	254	66	208
Cadmium	mg/kg	10	22	22	N/A	N/A	N/A		nd	nd	<0.9	nd	nd	nd	nd	nd	nd
Chrome	mg/kg	64	87	87	N/A	N/A	N/A		nd	nd	51	nd	50	nd	nd	nd	nd
Cobalt	mg/kg	50	300	300	N/A	N/A	N/A		nd	nd	<15	nd	nd	nd	nd	nd	18
Cuivre	mg/kg	63	91	91	N/A	N/A	N/A		nd	nd	<40	nd	nd	nd	nd	nd	nd
Étain	mg/kg	50	300	300	N/A	N/A	N/A		nd	nd	<5	nd	nd	nd	nd	nd	nd
Manganèse	mg/kg	-	-	-	N/A	N/A	N/A		82	90	111	106	211	49	74	136	685
Mercure	mg/kg	6,6	24	50	N/A	N/A	N/A		--	--	<0.2	--	nd	--	--	nd	--
Molybdène	mg/kg	10	40	40	N/A	N/A	N/A		nd	nd	<2	3	nd	nd	nd	nd	2
Nickel	mg/kg	45	89	89	N/A	N/A	N/A		nd	nd	<30	nd	nd	nd	30	nd	43
Plomb	mg/kg	140	260	600	N/A	N/A	N/A		nd	nd	138	68	nd	nd	nd	nd	nd
Sélénium	mg/kg	1	2,9	2,9	N/A	N/A	N/A		--	--	<1.0	--	nd	--	--	nd	--
Zinc	mg/kg	200	360	360	N/A	N/A	N/A		nd	nd	<100	nd	nd	nd	nd	nd	nd

1: standard Pancanadien relatif aux hydrocarbures pétroliers dans le sol, et Recommandations canadiennes pour la qualité de l'environnement
2: sols gorssiers, dont la granulo est supérieur à 75 µm
3: pas de valeur

Tableau 3: Résultats des analyses chimiques des eaux souterraines

Paramètres	Unité	Résurgence dans l'eau de surface (Critères de la *Politique*, MDDELCC 2014)	CCME Critère d'eau douce	FE-1/ST1	FE-2/ST2	FE-3/ST3
00 HP C10-C50	--					
Hydrocarbures pétroliers C10 à C50	µg/L	**2800**	--	nd	nd	nd
IPP	NA	--	--	nd	nd	nd
HAM	--					
Benzène	µg/L	**590**	370	nd	nd	nd
Chlorobenzène	µg/L	**130**	1,3	nd	nd	nd
Dichloro-1,2 benzène	µg/L	**70**	0,7	nd	nd	nd
Dichloro-1,3 benzène	µg/L	**100**	150	nd	nd	nd
Dichloro-1,4 benzène	µg/L	**100**	26	nd	nd	nd
Éthylbenzène	µg/L	**160**	90	nd	nd	nd
Styrène	µg/L	**800**	72	nd	nd	nd
Toluène	µg/L	**200**	2	nd	nd	nd
Xylènes (o,m,p)	µg/L	**370**	-	nd	nd	nd
HAP	--	--	--	--	--	--
Acénaphtène	µg/L	**100**	5,8	--	nd	nd
Anthracène	µg/L	**--**	0,012	--	nd	nd
Benzo (a) anthracène	µg/L	**1,8**	0,018	--	nd	nd
Benzo (a) pyrène	µg/L	**1,8**	0,015	--	nd	nd
Benzo (b) fluoranthène	µg/L	**1,8**	-[3]	--	nd	nd
Benzo (b+j+k) fluoranthène	µg/L	**1,8**	-[3]	--	nd	nd
Benzo (j) fluoranthène	µg/L	**1,8**	-[3]	--	nd	nd
Benzo (k) fluoranthène	µg/L	**1,8**	-[3]	--	nd	nd
Chrysène	µg/L	**1,8**	-[3]	--	nd	nd
Dibenzo (a,h) anthracène	µg/L	**1,8**	0,04	--	nd	nd
Fluoranthène	µg/L	**14**	3	--	nd	nd
Fluorène	µg/L	**110**	-[3]	--	nd	nd
Indéno (1,2,3-cd) pyrène	µg/L	**1,8**	1,1	--	nd	nd
Naphtalène	µg/L	**100**	0,4	--	nd	nd
Phénanthrène	µg/L	**4,7**	0,025	--	nd	nd
Pyrène	µg/L	**1,8**	--	--	nd	nd
Métaux	--					
Aluminium dissous	µg/L	-	100	nd	nd	nd
Antimoine dissous	µg/L	**1100**	-[3]	nd	nd	nd
Argent dissous	µg/L	**0,62**	0,25	nd	nd	nd
Arsenic dissous	µg/L	**340**	5	nd	nd	nd
Baryum dissous	µg/L	**600**	-[3]	**1510**	**1670**	**3170**
Cadmium dissous	µg/L	**1,1**	1,00	nd	nd	nd
Chrome dissous	µg/L	**-[3]**	-[3]	0,9	2	6,5
Cobalt dissous	µg/L	**370**	-[3]	nd	nd	nd
Cuivre dissous	µg/L	**7,3**	4,0	nd	nd	nd
Manganèse dissous	µg/L	**2300**	-[3]	281	400	906
Mercure dissous (Hg)	µg/L	**0,013**	0,026	--	--	--
Molybdène dissous	µg/L	**29000**	73	nd	nd	nd
Nickel dissous	µg/L	**260**	25	nd	nd	nd
Plomb dissous	µg/L	**34**	1	nd	nd	0,2
Sélénium dissous	µg/L	**62**	-[3]	nd	nd	nd
Sodium dissous	µg/L	**-[3]**	1	-	-	-
Zinc dissous	µg/L	**67**	30	nd	nd	nd

APPENDIX 6 – Section 1: Certificates of Chemical Analyzes AGAT Soils – Certificate No. 16Q135034 and 16Q141781

Section 2: Chemical Analysis Certificates AGAT for Groundwater – Certificate No. 16Q137583, 16Q141781

AGAT Laboratories

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FAX (418)653-2335
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CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC
6155 RUE DES TOURNELLES
QUEBEC , QC G2J1P7
(418) 626-5211

ATTENTION TO: Mohammed Afoundo

PROJECT: 638589

AGAT WORK ORDER: 16Q135034

SOIL ANALYSIS REVIEWED BY: Francois Boutin, Chimiste

TRACE ORGANICS REVIEWED BY: Véronique Paré, chimiste

DATE REPORTED: 2017-05-30

VERSION*: 1

PAGES (INCLUDING COVER): 23

Should you require any information regarding this analysis please contact your client services representative at (418) 266-5511

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

13 Extractable Metals (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

							SAMPLE DESCRIPTION:	F-1 CF-2C	F-2 CF-2A	F-2 CF-4	F-3 CF-2C	PU-4/VR-4
							SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
							DATE SAMPLED:	2016-08-30	2016-08-30	2016-08-30	2016-08-31	2016-09-01
Parameter	Unit	G / S: A	G / S: B	G / S: C	G / S: D	RDL		7828869	7828871	7828872	7828874	7828877
Silver	mg/kg	2	20	40	200	0.5		<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Arsenic	mg/kg	6	30	50	250	5		<5[<A]	<5[<A]	6[A]	<5[<A]	8[A-B]
Barium	mg/kg	340	500	2000	10000	20		187[<A]	60[<A]	309[<A]	80[<A]	168[<A]
Cadmium	mg/kg	1.5	5	20	100	0.9		<0.9[<A]	<0.9[<A]	<0.9[<A]	<0.9[<A]	<0.9[<A]
Chromium	mg/kg	100	250	800	4000	45		<45[<A]	<45[<A]	<45[<A]	<45[<A]	<45[<A]
Cobalt	mg/kg	25	50	300	1500	15		<15[<A]	<15[<A]	<15[<A]	<15[<A]	18[<A]
Copper	mg/kg	50	100	500	2500	40		<40[<A]	<40[<A]	<40[<A]	<40[<A]	<40[<A]
Tin	mg/kg	5	50	300	1500	5		<5[<A]	<5[<A]	<5[<A]	<5[<A]	<5[<A]
Manganese	mg/kg	1000	1000	2200	11000	10		68[<A]	88[<A]	714[<A]	79[<A]	183[<A]
Molybdenum	mg/kg	2	10	40	200	2		<2[<A]	<2[<A]	<2[<A]	<2[<A]	2[A]
Nickel	mg/kg	50	100	500	2500	30		<30[<A]	<30[<A]	<30[<A]	<30[<A]	48[<A]
Lead	mg/kg	50	500	1000	5000	30		<30[<A]	<30[<A]	<30[<A]	<30[<A]	<30[<A]
Zinc	mg/kg	140	500	1500	7500	100		<100[<A]	<100[<A]	<100[<A]	<100[<A]	<100[<A]

Certified By:

AGAT Laboratories' procedure for signatures and signatories adheres strictly to the requirements of accreditation ISO 17025:2005 as required by CALA, SCC and MDDELCC where applicable. All electronic signatures on AGAT certificates are password protected and all signatories meet their regional and scope of accreditation requirements and are approved by CALA, SCC and MDDELCC.

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Certificate of Analysis

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

13 Extractable Metals (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

							SAMPLE DESCRIPTION:	PU-6/VR-1	PU-6/VR-3	PU-6/DUP-2	PU-7/VR-2	PU-7/VR-4
							SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
							DATE SAMPLED:	2016-09-01	2016-09-01	2016-09-01	2016-09-01	2016-09-01
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**		**7828878**	**7828880**	**7828881**	**7828883**	**7828884**
Silver	mg/kg	2	20	40	200	0.5		<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Arsenic	mg/kg	6	30	50	250	5		<5[<A]	<5[<A]	<5[<A]	<5[<A]	<5[<A]
Barium	mg/kg	340	500	2000	10000	20		28[<A]	125[<A]	26[<A]	<20[<A]	254[<A]
Cadmium	mg/kg	1.5	5	20	100	0.9		<0.9[<A]	<0.9[<A]	<0.9[<A]	<0.9[<A]	<0.9[<A]
Chromium	mg/kg	100	250	800	4000	45		<45[<A]	<45[<A]	<45[<A]	<45[<A]	<45[<A]
Cobalt	mg/kg	25	50	300	1500	15		<15[<A]	<15[<A]	<15[<A]	<15[<A]	<15[<A]
Copper	mg/kg	50	100	500	2500	40		<40[<A]	<40[<A]	<40[<A]	<40[<A]	<40[<A]
Tin	mg/kg	5	50	300	1500	5		<5[<A]	<5[<A]	<5[<A]	<5[<A]	<5[<A]
Manganese	mg/kg	1000	1000	2200	11000	10		90[<A]	106[<A]	82[<A]	49[<A]	74[<A]
Molybdenum	mg/kg	2	10	40	200	2		<2[<A]	3[A-B]	<2[<A]	<2[<A]	<2[<A]
Nickel	mg/kg	50	100	500	2500	30		<30[<A]	<30[<A]	<30[<A]	<30[<A]	30[<A]
Lead	mg/kg	50	500	1000	5000	30		<30[<A]	68[A-B]	<30[<A]	<30[<A]	<30[<A]
Zinc	mg/kg	140	500	1500	7500	100		<100[<A]	<100[<A]	<100[<A]	<100[<A]	<100[<A]

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Certificate of Analysis

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

13 Extractable Metals (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

					SAMPLE DESCRIPTION:		PU-8/VR-4
					SAMPLE TYPE:		Soil
					DATE SAMPLED:		2016-09-02
Parameter	Unit	G / S: A	G / S: B	G / S: C	G / S: D	RDL	7828886
Silver	mg/kg	2	20	40	200	0.5	<0.5[<A]
Arsenic	mg/kg	6	30	50	250	5	9[A-B]
Barium	mg/kg	340	500	2000	10000	20	208[<A]
Cadmium	mg/kg	1.5	5	20	100	0.9	<0.9[<A]
Chromium	mg/kg	100	250	800	4000	45	<45[<A]
Cobalt	mg/kg	25	50	300	1500	15	18[<A]
Copper	mg/kg	50	100	500	2500	40	<40[<A]
Tin	mg/kg	5	50	300	1500	5	<5[<A]
Manganese	mg/kg	1000	1000	2200	11000	10	685[<A]
Molybdenum	mg/kg	2	10	40	200	2	2[A]
Nickel	mg/kg	50	100	500	2500	30	43[<A]
Lead	mg/kg	50	500	1000	5000	30	<30[<A]
Zinc	mg/kg	140	500	1500	7500	100	<100[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to QC PTC 2016 A, B Refers to QC PTC 2016 B, C Refers to QC PTC 2016 C, D Refers to QC RESC (Annex 1)

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AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

14 Extractable Metals + Hg (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

							SAMPLE DESCRIPTION:	F-1 CF-1B	F-2 CF-1	F-3 CF-1	PU-4/VR-2	PU-4/DUP-1
							SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
							DATE SAMPLED:	2016-08-30	2016-08-30	2016-08-31	2016-09-01	2016-09-01
Parameter	Unit	G / S: A	G / S: B	G / S: C	G / S: D	RDL		7828867	7828870	7828873	7828875	7828876
Silver	mg/kg	2	20	40	200	0.5		<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]	<0.5[<A]
Arsenic	mg/kg	6	30	50	250	5		<5[<A]	<5[<A]	<5[<A]	5[<A]	5[<A]
Barium	mg/kg	340	500	2000	10000	20		24[<A]	34[<A]	60[<A]	106[<A]	111[<A]
Cadmium	mg/kg	1.5	5	20	100	0.9		<0.9[<A]	<0.9[<A]	<0.9[<A]	<0.9[<A]	<0.9[<A]
Chromium	mg/kg	100	250	800	4000	45		<45[<A]	<45[<A]	<45[<A]	<45[<A]	<45[<A]
Cobalt	mg/kg	25	50	300	1500	15		<15[<A]	<15[<A]	<15[<A]	<15[<A]	<15[<A]
Copper	mg/kg	50	100	500	2500	40		<40[<A]	<40[<A]	<40[<A]	<40[<A]	<40[<A]
Tin	mg/kg	5	50	300	1500	5		<5[<A]	<5[<A]	<5[<A]	<5[<A]	<5[<A]
Manganese	mg/kg	1000	1000	2200	11000	10		101[<A]	133[<A]	198[<A]	281[<A]	294[<A]
Mercury	mg/kg	0.2	2	10	50	0.2		<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Molybdenum	mg/kg	2	10	40	200	2		<2[<A]	<2[<A]	<2[<A]	<2[<A]	<2[<A]
Nickel	mg/kg	50	100	500	2500	30		<30[<A]	<30[<A]	<30[<A]	30[<A]	32[<A]
Lead	mg/kg	50	500	1000	5000	30		<30[<A]	<30[<A]	<30[<A]	<30[<A]	<30[<A]
Selenium	mg/kg	1	3	10	50	1.0		<1.0[<A]	<1.0[<A]	<1.0[<A]	<1.0[<A]	<1.0[<A]
Zinc	mg/kg	140	500	1500	7500	100		<100[<A]	<100[<A]	<100[<A]	<100[<A]	<100[<A]

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

14 Extractable Metals + Hg (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

							SAMPLE DESCRIPTION:	PU-6/VR-2	PU-7/VR-1	PU-8/VR-2A
							SAMPLE TYPE:	Soil	Soil	Soil
							DATE SAMPLED:	2016-09-01	2016-09-01	2016-09-02
Parameter	Unit	G / S: A	G / S: B	G / S: C	G / S: D	RDL		7828879	7828882	7828885
Silver	mg/kg	2	20	40	200	0.5		<0.5[<A]	<0.5[<A]	<0.5[<A]
Arsenic	mg/kg	6	30	50	250	5		<5[<A]	<5[<A]	<5[<A]
Barium	mg/kg	340	500	2000	10000	20		44[<A]	106[<A]	66[<A]
Cadmium	mg/kg	1.5	5	20	100	0.9		<0.9[<A]	<0.9[<A]	<0.9[<A]
Chromium	mg/kg	100	250	800	4000	45		51[<A]	50[<A]	<45[<A]
Cobalt	mg/kg	25	50	300	1500	15		<15[<A]	<15[<A]	<15[<A]
Copper	mg/kg	50	100	500	2500	40		<40[<A]	<40[<A]	<40[<A]
Tin	mg/kg	5	50	300	1500	5		<5[<A]	<5[<A]	<5[<A]
Manganese	mg/kg	1000	1000	2200	11000	10		111[<A]	211[<A]	136[<A]
Mercury	mg/kg	0.2	2	10	50	0.2		<0.2[<A]	<0.2[<A]	<0.2[<A]
Molybdenum	mg/kg	2	10	40	200	2		<2[<A]	<2[<A]	<2[<A]
Nickel	mg/kg	50	100	500	2500	30		<30[<A]	<30[<A]	<30[<A]
Lead	mg/kg	50	500	1000	5000	30		138[A-B]	<30[<A]	<30[<A]
Zinc	mg/kg	140	500	1500	7500	100		<100[<A]	<100[<A]	<100[<A]
Selenium	mg/kg	1	3	10	50	1.0		<1.0[<A]	<1.0[<A]	<1.0[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to QC PTC 2016 A, B Refers to QC PTC 2016 B, C Refers to QC PTC 2016 C, D Refers to QC RESC (Annex 1)

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AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

Monocyclic Aromatic Hydrocarbons (MAH) (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

						SAMPLE DESCRIPTION:	F-1 CF-1B	F-2 CF-1	F-3 CF-1	PU-4/VR-2	PU-6/VR-2
						SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2016-08-30	2016-08-30	2016-08-31	2016-09-01	2016-09-01
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**	**7828867**	**7828870**	**7828873**	**7828875**	**7828879**
Benzene	mg/kg	0.1	0.5	5	5	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Chlorobenzene	mg/kg	0.2	1	10	10	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Dichloro-1,2 benzene	mg/kg	0.2	1	10	10	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Dichloro-1,3 benzene	mg/kg	0.2	1	10	10	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Dichloro-1,4 benzene	mg/kg	0.2	1	10	10	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Ethylbenzene	mg/kg	0.2	5	50	50	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Styrene	mg/kg	0.2	5	50	50	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Toluene	mg/kg	0.2	3	30	30	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
Xylenes	mg/kg	0.2	5	50	50	0.2	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]	<0.2[<A]
% Moisture	%					0.2	5.5	5.1	6.3	8.9	12.9
Surrogate	**Unit**			**Acceptable Limits**							
Fluorobenzene	%			40-140			112	113	117	120	117

Certified By:

Véronique Paré

CHIMISTE
Véronique Paré
2000-217
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AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

Monocyclic Aromatic Hydrocarbons (MAH) (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

							SAMPLE DESCRIPTION:	PU-7/VR-1	PU-8/VR-2A
							SAMPLE TYPE:	Soil	Soil
							DATE SAMPLED:	2016-09-01	2016-09-02
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**		**7828882**	**7828885**
Benzene	mg/kg	0.1	0.5	5	5	0.1		<0.1[<A]	<0.1[<A]
Chlorobenzene	mg/kg	0.2	1	10	10	0.2		<0.2[<A]	<0.2[<A]
Dichloro-1,2 benzene	mg/kg	0.2	1	10	10	0.2		<0.2[<A]	<0.2[<A]
Dichloro-1,3 benzene	mg/kg	0.2	1	10	10	0.2		<0.2[<A]	<0.2[<A]
Dichloro-1,4 benzene	mg/kg	0.2	1	10	10	0.2		<0.2[<A]	<0.2[<A]
Ethylbenzene	mg/kg	0.2	5	50	50	0.2		<0.2[<A]	<0.2[<A]
Styrene	mg/kg	0.2	5	50	50	0.2		<0.2[<A]	<0.2[<A]
Toluene	mg/kg	0.2	3	30	30	0.2		<0.2[<A]	<0.2[<A]
Xylenes	mg/kg	0.2	5	50	50	0.2		<0.2[<A]	<0.2[<A]
% Moisture	%					0.2		5.5	12.4
Surrogate	**Unit**	**Acceptable Limits**							
Fluorobenzene	%	40-140						112	118

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to QC PTC (Criteria A), B Refers to QC PTC (Criteria B), C Refers to QC PTC (Criteria C), D Refers to QC RESC (Annex 1)

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AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

PAHs + Benzo (b,j,k) fluoranthene (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

							SAMPLE DESCRIPTION:	F-1 CF-1B	F-1 CF-2C	F-2 CF-1	F-2 CF-2A	F-2 CF-4
							SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
							DATE SAMPLED:	2016-08-30	2016-08-30	2016-08-30	2016-08-30	2016-08-30
Parameter	Unit	G / S: A	G / S: B	G / S: C	G / S: D	RDL		7828867	7828869	7828870	7828871	7828872
Acenaphtene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Acenaphtylene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Anthracene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(a)anthracene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(a)pyrene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(e)pyrene	mg/kg					0.1		<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	mg/kg	0.1	1	10	136	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(j)fluoranthene	mg/kg	0.1	1	10	136	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(k)fluoranthene	mg/kg	0.1	1	10	136	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo (b+j+k) fluoranthene	mg/kg	0.1	1	10		0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(c)phenanthrene	mg/kg	0.1	1	10	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(g,h,i)perylene	mg/kg	0.1	1	10	18	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Chrysene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,h)anthracene	mg/kg	0.1	1	10	82	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,i)pyrene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,h)pyrene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,l)pyrene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dimethyl-7,12 benzo(a)anthracene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Fluoranthene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Fluorene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-3 cholanthrene	mg/kg	0.1	1	10	150	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Naphtalene	mg/kg	0.1	5	50	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Phenanthrene	mg/kg	0.1	5	50	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Pyrene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-1 naphtalene	mg/kg	0.1	1	10	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-2 naphtalene	mg/kg	0.1	1	10	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dimethyl-1,3 naphtalene	mg/kg	0.1	1	10	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]

Certified By: Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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Certificate of Analysis

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

PAHs + Benzo (b,j,k) fluoranthene (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

						SAMPLE DESCRIPTION:	F-1 CF-1B	F-1 CF-2C	F-2 CF-1	F-2 CF-2A	F-2 CF-4
						SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2016-08-30	2016-08-30	2016-08-30	2016-08-30	2016-08-30
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**	**7828867**	**7828869**	**7828870**	**7828871**	**7828872**
Trimethyl-2,3,5 naphtalene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
% Moisture	%					0.2	5.5	19.3	5.1	33.0	3.5
Surrogate	**Unit**			**Acceptable Limits**							
Rec. Acenaphtene-D10	%			40-140			91	98	135	88	98
Rec. Benzo(a)anthracene-D12	%			40-140			91	98	139	93	100
Rec. Pyrene-D10	%			40-140			87	94	135	86	98

Certified By: Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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Certificate of Analysis

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

PAHs + Benzo (b,j,k) fluoranthene (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

						SAMPLE DESCRIPTION:	F-3 CF-1	F-3 CF-2C	PU-4/VR-2	PU-4/DUP-1	PU-4/VR-4
						SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2016-08-31	2016-08-31	2016-09-01	2016-09-01	2016-09-01
Parameter	Unit	G / S: A	G / S: B	G / S: C	G / S: D	RDL	7828873	7828874	7828875	7828876	7828877
Acenaphtene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Acenaphtylene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Anthracene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(a)anthracene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(a)pyrene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(e)pyrene	mg/kg					0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	mg/kg	0.1	1	10	136	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(j)fluoranthene	mg/kg	0.1	1	10	136	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(k)fluoranthene	mg/kg	0.1	1	10	136	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo (b+j+k) fluoranthene	mg/kg	0.1	1	10		0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(c)phenanthrene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(g,h,i)perylene	mg/kg	0.1	1	10	18	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Chrysene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,h)anthracene	mg/kg	0.1	1	10	82	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,i)pyrene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,h)pyrene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,l)pyrene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dimethyl-7,12 benzo(a)anthracene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Fluoranthene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Fluorene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-3 cholanthrene	mg/kg	0.1	1	10	150	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Naphtalene	mg/kg	0.1	5	50	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Phenanthrene	mg/kg	0.1	5	50	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Pyrene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-1 naphtalene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-2 naphtalene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dimethyl-1,3 naphtalene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]

Certified By: Véronique Paré

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Certificate of Analysis

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

PAHs + Benzo (b,j,k) fluoranthene (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

						SAMPLE DESCRIPTION:	F-3 CF-1	F-3 CF-2C	PU-4/VR-2	PU-4/DUP-1	PU-4/VR-4
						SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2016-08-31	2016-08-31	2016-09-01	2016-09-01	2016-09-01
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**	**7828873**	**7828874**	**7828875**	**7828876**	**7828877**
Trimethyl-2,3,5 naphtalene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
% Moisture	%					0.2	6.3	18.6	8.9	9.1	20.1
Surrogate	**Unit**	**Acceptable Limits**									
Rec. Acenaphtene-D10	%	40-140					97	97	102	100	94
Rec. Benzo(a)anthracene-D12	%	40-140					96	96	99	100	91
Rec. Pyrene-D10	%	40-140					94	93	97	99	87

Certified By:

Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

PAHs + Benzo (b,j,k) fluoranthene (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

						SAMPLE DESCRIPTION:	PU-6/VR-1	PU-6/VR-2	PU-6/VR-3	PU-6/DUP-2	PU-7/VR-1
						SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2016-09-01	2016-09-01	2016-09-01	2016-09-01	2016-09-01
Parameter	Unit	G / S: A	G / S: B	G / S: C	G / S: D	RDL	7828878	7828879	7828880	7828881	7828882
Acenaphtene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Acenaphtylene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Anthracene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(a)anthracene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(a)pyrene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(e)pyrene	mg/kg					0.1	<0.1	<0.1	0.1	<0.1	<0.1
Benzo(b)fluoranthene	mg/kg	0.1	1	10	136	0.1	<0.1[<A]	<0.1[<A]	0.2[A-B]	<0.1[<A]	<0.1[<A]
Benzo(j)fluoranthene	mg/kg	0.1	1	10	136	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(k)fluoranthene	mg/kg	0.1	1	10	136	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo (b+j+k) fluoranthene	mg/kg	0.1	1	10		0.1	<0.1[<A]	<0.1[<A]	0.2[A-B]	<0.1[<A]	<0.1[<A]
Benzo(c)phenanthrene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(g,h,i)perylene	mg/kg	0.1	1	10	18	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Chrysene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	0.2[A-B]	<0.1[<A]	<0.1[<A]
Dibenzo(a,h)anthracene	mg/kg	0.1	1	10	82	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,i)pyrene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,h)pyrene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,l)pyrene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dimethyl-7,12 benzo(a)anthracene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Fluoranthene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	0.2[A-B]	<0.1[<A]	<0.1[<A]
Fluorene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	1	10	34	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-3 cholanthrene	mg/kg	0.1	1	10	150	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Naphtalene	mg/kg	0.1	5	50	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Phenanthrene	mg/kg	0.1	5	50	56	0.1	<0.1[<A]	<0.1[<A]	0.2[A-B]	<0.1[<A]	<0.1[<A]
Pyrene	mg/kg	0.1	10	100	100	0.1	<0.1[<A]	<0.1[<A]	0.1[A]	<0.1[<A]	<0.1[<A]
Methyl-1 naphtalene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-2 naphtalene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dimethyl-1,3 naphtalene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]

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AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

PAHs + Benzo (b,j,k) fluoranthene (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

						SAMPLE DESCRIPTION:	PU-6/VR-1	PU-6/VR-2	PU-6/VR-3	PU-6/DUP-2	PU-7/VR-1
						SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2016-09-01	2016-09-01	2016-09-01	2016-09-01	2016-09-01
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**	**7828878**	**7828879**	**7828880**	**7828881**	**7828882**
Trimethyl-2,3,5 naphtalene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
% Moisture	%					0.2	2.8	12.9	69.6	2.4	5.5
Surrogate	**Unit**			**Acceptable Limits**							
Rec. Acenaphtene-D10	%			40-140			87	94	92	95	95
Rec. Benzo(a)anthracene-D12	%			40-140			79	95	86	103	95
Rec. Pyrene-D10	%			40-140			75	93	84	96	95

Certified By:

Véronique Paré

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AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

PAHs + Benzo (b,j,k) fluoranthene (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

							SAMPLE DESCRIPTION:	PU-7/VR-2	PU-7/VR-4	PU-8/VR-2A	PU-8/VR-4
							SAMPLE TYPE:	Soil	Soil	Soil	Soil
							DATE SAMPLED:	2016-09-01	2016-09-01	2016-09-02	2016-09-02
Parameter	Unit	G / S: A	G / S: B	G / S: C	G / S: D	RDL		7828883	7828884	7828885	7828886
Acenaphtene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Acenaphtylene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Anthracene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(a)anthracene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(a)pyrene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(e)pyrene	mg/kg					0.1		<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	mg/kg	0.1	1	10	136	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(j)fluoranthene	mg/kg	0.1	1	10	136	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(k)fluoranthene	mg/kg	0.1	1	10	136	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo (b+j+k) fluoranthene	mg/kg	0.1	1	10		0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(c)phenanthrene	mg/kg	0.1	1	10	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Benzo(g,h,i)perylene	mg/kg	0.1	1	10	18	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Chrysene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,h)anthracene	mg/kg	0.1	1	10	82	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,i)pyrene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,h)pyrene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dibenzo(a,l)pyrene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dimethyl-7,12 benzo(a)anthracene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Fluoranthene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Fluorene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	1	10	34	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-3 cholanthrene	mg/kg	0.1	1	10	150	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Naphtalene	mg/kg	0.1	5	50	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Phenanthrene	mg/kg	0.1	5	50	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Pyrene	mg/kg	0.1	10	100	100	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-1 naphtalene	mg/kg	0.1	1	10	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Methyl-2 naphtalene	mg/kg	0.1	1	10	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
Dimethyl-1,3 naphtalene	mg/kg	0.1	1	10	56	0.1		<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]

Certified By: Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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Certificate of Analysis

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

PAHs + Benzo (b,j,k) fluoranthene (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

						SAMPLE DESCRIPTION:	PU-7/VR-2	PU-7/VR-4	PU-8/VR-2A	PU-8/VR-4
						SAMPLE TYPE:	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2016-09-01	2016-09-01	2016-09-02	2016-09-02
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**	**7828883**	**7828884**	**7828885**	**7828886**
Trimethyl-2,3,5 naphtalene	mg/kg	0.1	1	10	56	0.1	<0.1[<A]	<0.1[<A]	<0.1[<A]	<0.1[<A]
% Moisture	%					0.2	3.4	21.2	12.4	20.9
Surrogate	**Unit**	**Acceptable Limits**								
Rec. Acenaphtene-D10	%	40-140					100	99	102	101
Rec. Benzo(a)anthracene-D12	%	40-140					96	93	96	92
Rec. Pyrene-D10	%	40-140					95	91	96	94

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to QC PTC 2016 A, B Refers to QC PTC 2016 B, C Refers to QC PTC 2016 C, D Refers to QC RESC (Annex 1)

Certified By: Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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Certificate of Analysis

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

Petroleum Hydrocarbons (C10-C50) Identification (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

						SAMPLE DESCRIPTION:	F-1 CF-1B	F-1 CF-2C	F-2 CF-1	F-2 CF-2A	F-2 CF-4
						SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2016-08-30	2016-08-30	2016-08-30	2016-08-30	2016-08-30
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**	**7828867**	**7828869**	**7828870**	**7828871**	**7828872**
Petroleum Hydrocarbons C10-C50	mg/kg	300	700	3500	10000	100	<100[<A]	<100[<A]	157[<A]	1620[B-C]	413[A-B]
Petroleum Product Identification	NA					NA	NA	NA	NA	Huile/Bitume	NI
% Moisture	%					0.2	5.5	19.3	5.1	33.0	3.5
Surrogate	**Unit**			**Acceptable Limits**							
Rec. Nonane	%			40-140			102	107	108	113	110

						SAMPLE DESCRIPTION:	F-3 CF-1	F-3 CF-2C	PU-4/VR-2	PU-4/DUP-1	PU-4/VR-4
						SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2016-08-31	2016-08-31	2016-09-01	2016-09-01	2016-09-01
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**	**7828873**	**7828874**	**7828875**	**7828876**	**7828877**
Petroleum Hydrocarbons C10-C50	mg/kg	300	700	3500	10000	100	298[<A]	155[<A]	293[<A]	306[A-B]	204[<A]
Petroleum Product Identification	NA					NA	NA	NA	NA	Diesel/Huile	NA
% Moisture	%					0.2	6.3	18.6	8.9	9.1	20.1
Surrogate	**Unit**			**Acceptable Limits**							
Rec. Nonane	%			40-140			108	107	105	108	105

						SAMPLE DESCRIPTION:	PU-6/VR-1	PU-6/VR-2	PU-6/VR-3	PU-6/DUP-2	PU-7/VR-1
						SAMPLE TYPE:	Soil	Soil	Soil	Soil	Soil
						DATE SAMPLED:	2016-09-01	2016-09-01	2016-09-01	2016-09-01	2016-09-01
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**	**7828878**	**7828879**	**7828880**	**7828881**	**7828882**
Petroleum Hydrocarbons C10-C50	mg/kg	300	700	3500	10000	100	<100[<A]	340[A-B]	197[<A]	109[<A]	148[<A]
Petroleum Product Identification	NA					NA	NA	Huile/Bitume	NA	NA	NA
% Moisture	%					0.2	2.8	12.9	69.6	2.4	5.5
Surrogate	**Unit**			**Acceptable Limits**							
Rec. Nonane	%			40-140			88	109	108	105	101

Certified By:

Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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Certificate of Analysis

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

Petroleum Hydrocarbons (C10-C50) Identification (Soil)

DATE RECEIVED: 2016-09-02

DATE REPORTED: 2017-05-30

							SAMPLE DESCRIPTION:	PU-7/VR-2	PU-7/VR-4	PU-8/VR-2A	PU-8/VR-4
							SAMPLE TYPE:	Soil	Soil	Soil	Soil
							DATE SAMPLED:	2016-09-01	2016-09-01	2016-09-02	2016-09-02
Parameter	**Unit**	**G / S: A**	**G / S: B**	**G / S: C**	**G / S: D**	**RDL**		**7828883**	**7828884**	**7828885**	**7828886**
Petroleum Hydrocarbons C10-C50	mg/kg	300	700	3500	10000	100		<100[<A]	183[<A]	379[A-B]	452[A-B]
Petroleum Product Identification	NA					NA		NA	NA	Diesel/Huile	Diesel/Huile
% Moisture	%					0.2		3.4	21.2	12.4	20.9
Surrogate	**Unit**	**Acceptable Limits**									
Rec. Nonane	%	40-140						101	112	113	114

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to QC PTC 2016 A, B Refers to QC PTC 2016 B, C Refers to QC PTC 2016 C, D Refers to QC RESC (Annex 1)

7828872 Non identified

Certified By: Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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Quality Assurance

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

ATTENTION TO: Mohammed Afoundo

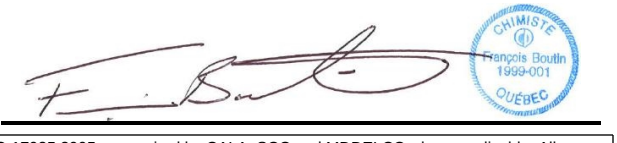
SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

Soil Analysis

RPT Date: 2017-05-30			DUPLICATE			REFERENCE MATERIAL				METHOD BLANK			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
14 Extractable Metals + Hg (Soil)															
Silver	7828875	7828875	<0.5	<0.5	NA	< 0.5	116%	80%	120%	112%	80%	120%	116%	70%	130%
Arsenic	7828875	7828875	5	6	NA	< 5	110%	80%	120%	110%	80%	120%	112%	70%	130%
Barium	7828875	7828875	106	109	3.0%	< 20	NA	80%	120%	102%	80%	120%	NA	70%	130%
Cadmium	7828875	7828875	<0.9	<0.9	NA	< 0.9	105%	80%	120%	103%	80%	120%	105%	70%	130%
Chromium	7828875	7828875	<45	<45	NA	< 45	119%	80%	120%	116%	80%	120%	116%	70%	130%
Cobalt	7828875	7828875	<15	<15	NA	< 15	101%	80%	120%	118%	80%	120%	119%	70%	130%
Copper	7828875	7828875	<40	<40	NA	< 40	100%	80%	120%	100%	80%	120%	102%	70%	130%
Tin	7828875	7828875	<5	<5	NA	< 5	99%	80%	120%	94%	80%	120%	101%	70%	130%
Manganese	7828875	7828875	281	294	4.5%	< 10	120%	80%	120%	94%	80%	120%	97%	70%	130%
Mercury	7828867	7828867	<0.2	<0.2	NA	< 0.2	100%	80%	120%	114%	80%	120%	108%	70%	130%
Molybdenum	7828875	7828875	<2	<2	NA	< 2	112%	80%	120%	102%	80%	120%	105%	70%	130%
Nickel	7828875	7828875	30	32	NA	< 30	105%	80%	120%	102%	80%	120%	103%	70%	130%
Lead	7828875	7828875	<30	<30	NA	< 30	110%	80%	120%	103%	80%	120%	106%	70%	130%
Selenium	7828875	7828875	<1.0	<1.0	NA	< 1.0	107%	80%	120%	109%	80%	120%	108%	70%	130%
Zinc	7828875	7828875	<100	<100	NA	< 100	107%	80%	120%	104%	80%	120%	104%	70%	130%
13 Extractable Metals (Soil)															
Silver	7828875	7828875	<0.5	<0.5	NA	< 0.5	116%	80%	120%	112%	80%	120%	116%	70%	130%
Arsenic	7828875	7828875	5	6	NA	< 5	110%	80%	120%	110%	80%	120%	112%	70%	130%
Barium	7828875	7828875	106	109	3.0%	< 20	74%	80%	120%	102%	80%	120%	NA	70%	130%
Cadmium	7828875	7828875	<0.9	<0.9	NA	< 0.9	105%	80%	120%	103%	80%	120%	105%	70%	130%
Chromium	7828875	7828875	<45	<45	NA	< 45	119%	80%	120%	116%	80%	120%	116%	70%	130%
Cobalt	7828875	7828875	<15	<15	NA	< 15	101%	80%	120%	118%	80%	120%	119%	70%	130%
Copper	7828875	7828875	<40	<40	NA	< 40	100%	80%	120%	100%	80%	120%	102%	70%	130%
Tin	7828875	7828875	<5	<5	NA	< 5	99%	80%	120%	94%	80%	120%	101%	70%	130%
Manganese	7828875	7828875	281	294	4.5%	< 10	120%	80%	120%	94%	80%	120%	97%	70%	130%
Molybdenum	7828875	7828875	<2	<2	NA	< 2	112%	80%	120%	102%	80%	120%	105%	70%	130%
Nickel	7828875	7828875	30	32	NA	< 30	105%	80%	120%	102%	80%	120%	103%	70%	130%
Lead	7828875	7828875	<30	<30	NA	< 30	110%	80%	120%	103%	80%	120%	106%	70%	130%
Zinc	7828875	7828875	<100	<100	NA	< 100	107%	80%	120%	104%	80%	120%	104%	70%	130%

Certified By:



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Quality Assurance

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC
AGAT WORK ORDER: 16Q135034
PROJECT: 638589
ATTENTION TO: Mohammed Afoundo
SAMPLED BY:J.M. Daigle
SAMPLING SITE:638589

Trace Organics Analysis

RPT Date: 2017-05-30			DUPLICATE			REFERENCE MATERIAL				METHOD BLANK			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
PAHs + Benzo (b,j,k) fluoranthene (Soil)															
Acenaphtene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	98%	70%	130%	NA	100%	100%	79%	60%	140%
Acenaphtylene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	90%	70%	130%	NA	100%	100%	78%	60%	140%
Anthracene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	98%	70%	130%	NA	100%	100%	94%	60%	140%
Benzo(a)anthracene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	106%	70%	130%	NA	100%	100%	101%	60%	140%
Benzo(a)pyrene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	93%	70%	130%	NA	100%	100%	95%	60%	140%
Benzo(e)pyrene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	101%	70%	130%	NA	100%	100%	97%	60%	140%
Benzo(b)fluoranthene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	100%	70%	130%	NA	100%	100%	93%	60%	140%
Benzo(j)fluoranthene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	100%	70%	130%	NA	100%	100%	102%	60%	140%
Benzo(k)fluoranthene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	110%	70%	130%	NA	100%	100%	102%	60%	140%
Benzo (b+j+k) fluoranthene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	103%	70%	130%	NA	100%	100%	99%	60%	140%
Benzo(c)phenanthrene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	98%	70%	130%	NA	100%	100%	94%	60%	140%
Benzo(g,h,i)perylene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	91%	70%	130%	NA	100%	100%	96%	60%	140%
Chrysene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	107%	70%	130%	NA	100%	100%	101%	60%	140%
Dibenzo(a,h)anthracene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	84%	70%	130%	NA	100%	100%	88%	60%	140%
Dibenzo(a,i)pyrene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	117%	70%	130%	NA	100%	100%	135%	60%	140%
Dibenzo(a,h)pyrene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	104%	70%	130%	NA	100%	100%	133%	60%	140%
Dibenzo(a,l)pyrene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	120%	70%	130%	NA	100%	100%	131%	60%	140%
Dimethyl-7,12 benzo(a)anthracene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	75%	70%	130%	NA	100%	100%	73%	60%	140%
Fluoranthene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	105%	70%	130%	NA	100%	100%	99%	60%	140%
Fluorene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	102%	70%	130%	NA	100%	100%	81%	60%	140%
Indeno(1,2,3-cd)pyrene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	80%	70%	130%	NA	100%	100%	99%	60%	140%
Methyl-3 cholanthrene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	88%	70%	130%	NA	100%	100%	111%	60%	140%
Naphtalene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	91%	70%	130%	NA	100%	100%	90%	60%	140%
Phenanthrene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	107%	70%	130%	NA	100%	100%	101%	60%	140%
Pyrene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	96%	70%	130%	NA	100%	100%	92%	60%	140%
Methyl-1 naphtalene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	95%	70%	130%	NA	100%	100%	82%	60%	140%
Methyl-2 naphtalene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	98%	70%	130%	NA	100%	100%	86%	60%	140%
Dimethyl-1,3 naphtalene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	98%	70%	130%	NA	100%	100%	81%	60%	140%
Trimethyl-2,3,5 naphtalene	1	7828882	< 0.1	< 0.1	0.0%	< 0.1	96%	70%	130%	NA	100%	100%	76%	60%	140%
Rec. Acenaphtene-D10	1	7828882	95	95	0.0%	96	96%	40%	140%	NA	100%	100%	97%	40%	140%
Rec. Benzo(a)anthracene-D12	1	7828882	95	103	8.1%	99	102%	40%	140%	NA	100%	100%	98%	40%	140%
Rec. Pyrene-D10	1	7828882	95	99	4.1%	95	96%	40%	140%	NA	100%	100%	95%	40%	140%
% Moisture	7828867	7828867	5.5	6.0	8.6%	< 0.2	100%	80%	120%	NA	100%	100%	NA	100%	100%
Petroleum Hydrocarbons (C10-C50) Identification (Soil)															
Petroleum Hydrocarbons C10-C50	1	7828882	148	134	NA	< 100	94%	70%	130%	NA	100%	100%	136%	60%	140%
Rec. Nonane	1	7828882	101	105	3.9%	107	105%	40%	140%	NA	100%	100%	107%	40%	140%
% Moisture	7828867	7828867	5.5	6.0	8.6%	< 0.2	100%	80%	120%	NA	100%	100%	NA	100%	100%
Monocyclic Aromatic Hydrocarbons (MAH) (Soil)															
Benzene	1	7828867	< 0.1	< 0.1	0.0%	< 0.1	102%	80%	120%	NA	100%	100%	107%	70%	130%
Chlorobenzene	1	7828867	< 0.2	< 0.2	0.0%	< 0.2	99%	80%	120%	NA	100%	100%	93%	70%	130%
Dichloro-1,2 benzene	1	7828867	< 0.2	< 0.2	0.0%	< 0.2	92%	80%	120%	NA	100%	100%	73%	70%	130%

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Quality Assurance

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC
AGAT WORK ORDER: 16Q135034
PROJECT: 638589
ATTENTION TO: Mohammed Afoundo
SAMPLED BY:J.M. Daigle
SAMPLING SITE:638589

Trace Organics Analysis (Continued)

RPT Date: 2017-05-30			DUPLICATE			REFERENCE MATERIAL				METHOD BLANK			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dichloro-1,3 benzene	1	7828867	< 0.2	< 0.2	0.0%	< 0.2	93%	80%	120%	NA	100%	100%	79%	70%	130%
Dichloro-1,4 benzene	1	7828867	< 0.2	< 0.2	0.0%	< 0.2	92%	80%	120%	NA	100%	100%	72%	70%	130%
Ethylbenzene	1	7828867	< 0.2	< 0.2	0.0%	< 0.2	102%	80%	120%	NA	100%	100%	98%	70%	130%
Styrene	1	7828867	< 0.2	< 0.2	0.0%	< 0.2	99%	80%	120%	NA	100%	100%	88%	70%	130%
Toluene	1	7828867	< 0.2	< 0.2	0.0%	< 0.2	101%	80%	120%	NA	100%	100%	104%	70%	130%
Xylenes	1	7828867	< 0.2	< 0.2	0.0%	< 0.2	96%	80%	120%	NA	100%	100%	91%	70%	130%
Fluorobenzene	1	7828867	112	114	1.8%	111	101%	40%	140%	NA	100%	100%	109%	40%	140%
% Moisture	7828867	7828867	5.5	6.0	8.6%	< 0.2	100%	80%	120%	NA	100%	100%	NA	100%	100%

Certified By: Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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Method Summary

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

PARAMETER	DATE PREPARED	DATE ANALYZED	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis					
Silver	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Arsenic	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Barium	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Cadmium	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Chromium	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Cobalt	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Copper	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Tin	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Manganese	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Molybdenum	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Nickel	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Lead	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Zinc	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Silver	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Arsenic	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Barium	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Cadmium	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Chromium	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Cobalt	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Copper	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Tin	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Manganese	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Mercury	2016-09-09	2016-09-09	MET-161-6107F	EPA 245.5	COLD VAPOR/AA
Molybdenum	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Nickel	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Lead	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Zinc	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS
Selenium	2016-09-09	2016-09-09	MET-161-6106F, 6108F	MA. 200 - Mét 1.2	ICP/MS

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Method Summary

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

AGAT WORK ORDER: 16Q135034

PROJECT: 638589

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle

SAMPLING SITE:638589

PARAMETER	DATE PREPARED	DATE ANALYZED	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis					
Benzene	2016-09-08	2016-09-08	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Chlorobenzene	2016-09-08	2016-09-08	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Dichloro-1,2 benzene	2016-09-08	2016-09-08	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Dichloro-1,3 benzene	2016-09-08	2016-09-08	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Dichloro-1,4 benzene	2016-09-08	2016-09-08	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Ethylbenzene	2016-09-08	2016-09-08	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Styrene	2016-09-08	2016-09-08	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Toluene	2016-09-08	2016-09-08	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Xylenes	2016-09-08	2016-09-08	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Fluorobenzene	2016-09-08	2016-09-08	VOL-160-5002F	MA. 400 - COV. 2.0	GC/MS
% Moisture	2016-09-08	2016-09-09	INOR-161-6006F	MA. 100 - S.T. 1.0	SCALE
Acenaphtene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Acenaphtylene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Anthracene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo(a)anthracene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo(a)pyrene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo(e)pyrene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo(b)fluoranthene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo(j)fluoranthene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo(k)fluoranthene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo (b+j+k) fluoranthene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo(c)phenanthrene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo(g,h,i)perylene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Chrysene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Dibenzo(a,h)anthracene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Dibenzo(a,i)pyrene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Dibenzo(a,h)pyrene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Dibenzo(a,l)pyrene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Dimethyl-7,12 benzo(a)anthracene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Fluoranthene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Fluorene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Indeno(1,2,3-cd)pyrene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Methyl-3 cholanthrene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Naphtalene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Phenanthrene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Pyrene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Methyl-1 naphtalene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Methyl-2 naphtalene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Dimethyl-1,3 naphtalene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Trimethyl-2,3,5 naphtalene	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Rec. Acenaphtene-D10	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Rec. Benzo(a)anthracene-D12	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Rec. Pyrene-D10	2016-09-09	2016-09-09	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
% Moisture	2016-09-08	2016-09-09	INOR-161-6006F	MA. 100 - S.T. 1.0	SCALE
Petroleum Hydrocarbons C10-C50	2016-09-09	2016-09-09	ORG-160-5100F	MA 400 - HYD. 1.1	GC/FID
Rec. Nonane	2016-09-09	2016-09-09	ORG-160-5100F	MA. 400 - HYD. 1.1	GC/FID
Petroleum Product Identification	2016-09-09	2016-09-09	ORG-160-5101F	MA. 408 – IdePet 1.0	GC/FID
% Moisture	2016-09-08	2016-09-09	INOR-161-6006F	MA. 100 - S.T. 1.0	SCALE

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CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC
6155 RUE DES TOURNELLES
QUEBEC , QC G2J1P7
(418) 626-5211

ATTENTION TO: Mohammed Afoundo

PROJECT: 638589

AGAT WORK ORDER: 16Q137583

TRACE ORGANICS REVIEWED BY: Véronique Paré, chimiste

WATER ANALYSIS REVIEWED BY: Frédéric Drouin, chimiste

DATE REPORTED: 2017-05-30

VERSION*: 1

PAGES (INCLUDING COVER): 8

Should you require any information regarding this analysis please contact your client services representative at (418) 266-5511

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 16Q137583

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:638589

Monocyclic Aromatic Hydrocarbons (MAH) (Water)

DATE RECEIVED: 2016-09-13

DATE REPORTED: 2017-05-30

		SAMPLE DESCRIPTION:		FE-1/ST1	FE-2/ST2	FE-3/ST3
		SAMPLE TYPE:		Gr. Water	Gr. Water	Gr. Water
		DATE SAMPLED:		2016-09-13	2016-09-13	2016-09-13
Parameter	Unit	G / S	RDL	7844752	7844754	7844755
Benzene	µg/L		0.3	<0.3	<0.3	<0.3
Chlorobenzene	µg/L		1.0	<1.0	<1.0	<1.0
Dichloro-1,2 benzene	µg/L		1.0	<1.0	<1.0	<1.0
Dichloro-1,3 benzene	µg/L		1.0	<1.0	<1.0	<1.0
Dichloro-1,4 benzene	µg/L		1.0	<1.0	<1.0	<1.0
Ethylbenzene	µg/L		0.3	<0.3	<0.3	<0.3
Styrene	µg/L		1.0	<1.0	<1.0	<1.0
Toluene	µg/L		1.0	<1.0	<1.0	<1.0
Xylenes (o,m,p)	µg/L		1.0	<1.0	<1.0	<1.0
Surrogate	Unit	Acceptable Limits				
Rec. Fluorobenzene	%	40-140		79	73	72

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:638589

Petroleum hydrocarbons (C10-C50) Identfication (Water)

DATE RECEIVED: 2016-09-13

DATE REPORTED: 2017-05-30

		SAMPLE DESCRIPTION:		FE-1/ST1	FE-2/ST2	FE-3/ST3
		SAMPLE TYPE:		Gr. Water	Gr. Water	Gr. Water
		DATE SAMPLED:		2016-09-13	2016-09-13	2016-09-13
Parameter	Unit	G / S	RDL	7844752	7844754	7844755
Petroleum Hydrocarbons C10-C50	µg/L	3500	100	<100	<100	<100
Petroleum Product Identification	NA		NA	NA	NA	NA

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to QC PTC (Res.)

Certified By:

Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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AGAT WORK ORDER: 16Q137583

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:638589

16 Dissolved Metals (Water)

DATE RECEIVED: 2016-09-13

DATE REPORTED: 2017-05-30

SAMPLE DESCRIPTION:				FE-1/ST1	FE-2/ST2		FE-3/ST3
SAMPLE TYPE:				Gr. Water	Gr. Water		Gr. Water
DATE SAMPLED:				2016-09-13	2016-09-13		2016-09-13
Parameter	Unit	G / S	RDL	7844752	7844754	RDL	7844755
Dissolved Aluminium	µg/L		10	<10	<10	10	<10
Dissolved Antimony	µg/L		1	<1	<1	1	<1
Dissolved Silver	µg/L		0.1	<0.1	<0.1	0.1	<0.1
Dissolved Arsenic	µg/L		0.3	<0.3	<0.3	0.3	<0.3
Dissolved Barium	µg/L		10	1510	1670	10	3170
Dissolved Cadmium	µg/L		0.1	<0.1	<0.1	0.1	<0.1
Dissolved Chromium	µg/L		0.5	0.9	2.0	0.5	6.5
Dissolved Cobalt	µg/L		0.5	<0.5	<0.5	0.5	<0.5
Dissolved Copper	µg/L		1.0	<1.0	<1.0	1.0	<1.0
Dissolved Manganese	µg/L		1	281	400	1	906
Dissolved Molybdenum	µg/L		1	<1	<1	1	<1
Dissolved Nickel	µg/L		1	<1	<1	1	<1
Dissolved Lead	µg/L		0.1	<0.1	<0.1	0.1	0.2
Dissolved sodium	µg/L		1000	23100	60900	10000	254000
Dissolved selenium	µg/L		1	<1	<1	1	<1
Dissolved Zinc	µg/L		3	<3	<3	3	<3

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certificate of Analysis

AGAT WORK ORDER: 16Q137583

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:638589

Dissolved Mercury (Water)

DATE RECEIVED: 2016-09-13

DATE REPORTED: 2017-05-30

		SAMPLE DESCRIPTION:		FE-1/ST1	FE-2/ST2	FE-3/ST3
		SAMPLE TYPE:		Gr. Water	Gr. Water	Gr. Water
		DATE SAMPLED:		2016-09-13	2016-09-13	2016-09-13
Parameter	Unit	G / S	RDL	7844752	7844754	7844755
Dissolved Mercury	µg/L		0.1	<0.1	<0.1	<0.1

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

CHIMISTE Frédéric Drouin 2010-177 QUÉBEC

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Quality Assurance

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

AGAT WORK ORDER: 16Q137583

PROJECT: 638589

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:638589

Trace Organics Analysis

RPT Date: 2017-05-30			DUPLICATE			REFERENCE MATERIAL				METHOD BLANK			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Petroleum hydrocarbons (C10-C50) Identfication (Water)															
Petroleum Hydrocarbons C10-C50	1	NA	NA	NA	0.0%	< 100	91%	70%	130%	NA	100%	100%	NA	60%	140%
Comments: Positive blank was subtracted from samples.															
Monocyclic Aromatic Hydrocarbons (MAH) (Water)															
Benzene	1	NA	NA	NA	0.0%	< 0.3	97%	80%	120%	NA	100%	100%	NA	70%	130%
Chlorobenzene	1	NA	NA	NA	0.0%	< 1.0	97%	80%	120%	NA	100%	100%	NA	70%	130%
Dichloro-1,2 benzene	1	NA	NA	NA	0.0%	< 1.0	99%	80%	120%	NA	100%	100%	NA	70%	130%
Dichloro-1,3 benzene	1	NA	NA	NA	0.0%	< 1.0	105%	80%	120%	NA	100%	100%	NA	70%	130%
Dichloro-1,4 benzene	1	NA	NA	NA	0.0%	< 1.0	100%	80%	120%	NA	100%	100%	NA	70%	130%
Ethylbenzene	1	NA	NA	NA	0.0%	< 0.3	97%	80%	120%	NA	100%	100%	NA	70%	130%
Styrene	1	NA	NA	NA	0.0%	< 1.0	101%	80%	120%	NA	100%	100%	NA	70%	130%
Toluene	1	NA	NA	NA	0.0%	< 1.0	100%	80%	120%	NA	100%	100%	NA	70%	130%
Xylenes (o,m,p)	1	NA	NA	NA	0.0%	< 1.0	103%	80%	120%	NA	100%	100%	NA	70%	130%
Rec. Fluorobenzene	1	NA	NA	NA	0.0%	87	89%	40%	140%	NA	100%	100%	NA	40%	140%

Certified By:

Véronique Paré

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Quality Assurance

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

AGAT WORK ORDER: 16Q137583

PROJECT: 638589

ATTENTION TO: Mohammed Afoundo

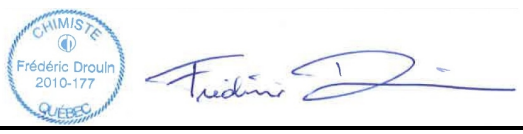
SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:638589

Water Analysis

RPT Date: 2017-05-30			DUPLICATE			REFERENCE MATERIAL				METHOD BLANK			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dissolved Mercury (Water)															
Dissolved Mercury	7843270		<0.1	<0.1	NA	< 0.1	89%	80%	120%	118%	80%	120%	118%	70%	130%
16 Dissolved Metals (Water)															
Dissolved Aluminium	7860679		<10	<10	NA	< 10	92%	80%	120%	88%	80%	120%	NA	70%	130%
Dissolved Antimony	7860679		<1	<1	NA	< 1	91%	80%	120%	95%	80%	120%	NA	70%	130%
Dissolved Silver	7860679		<0.1	<0.1	NA	< 0.1	NA	80%	120%	91%	80%	120%	112%	70%	130%
Dissolved Arsenic	7860679		0.5	0.5	NA	< 0.3	85%	80%	120%	86%	80%	120%	NA	70%	130%
Dissolved Barium	7860679		139	138	1.3%	< 1	83%	80%	120%	95%	80%	120%	NA	70%	130%
Dissolved Cadmium	7860679		<0.1	<0.1	NA	< 0.1	93%	80%	120%	97%	80%	120%	NA	70%	130%
Dissolved Chromium	7860679		2.3	2.1	NA	< 0.5	89%	80%	120%	90%	80%	120%	NA	70%	130%
Dissolved Cobalt	7860679		0.9	0.9	NA	< 0.5	95%	80%	120%	91%	80%	120%	NA	70%	130%
Dissolved Copper	7860679		<1.0	<1.0	NA	< 1.0	93%	80%	120%	92%	80%	120%	128%	70%	130%
Dissolved Manganese	7860679		270	268	0.9%	< 1	92%	80%	120%	94%	80%	120%	NA	70%	130%
Dissolved Molybdenum	7860679		5	5	7.6%	< 1	83%	80%	120%	90%	80%	120%	NA	70%	130%
Dissolved Nickel	7860679		<1	<1	NA	< 1	91%	80%	120%	91%	80%	120%	128%	70%	130%
Dissolved Lead	7860679		<0.1	<0.1	NA	< 0.1	95%	80%	120%	93%	80%	120%	NA	70%	130%
Dissolved sodium	7860679		10200	10000	1.8%	< 100	81%	80%	120%	83%	80%	120%	NA	70%	130%
Dissolved selenium	7860679		<1	<1	NA	< 1	95%	80%	120%	99%	80%	120%	NA	70%	130%
Dissolved Zinc	7860679		4	3	NA	< 3	92%	80%	120%	93%	80%	120%	129%	70%	130%

Certified By:



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Method Summary

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

AGAT WORK ORDER: 16Q137583

PROJECT: 638589

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:638589

PARAMETER	DATE PREPARED	DATE ANALYZED	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis					
Benzene	2016-09-15	2016-09-15	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Chlorobenzene	2016-09-15	2016-09-15	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Dichloro-1,2 benzene	2016-09-15	2016-09-15	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Dichloro-1,3 benzene	2016-09-15	2016-09-15	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Dichloro-1,4 benzene	2016-09-15	2016-09-15	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Ethylbenzene	2016-09-15	2016-09-15	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Styrene	2016-09-15	2016-09-15	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Toluene	2016-09-15	2016-09-15	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Xylenes (o,m,p)	2016-09-15	2016-09-15	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Rec. Fluorobenzene	2016-09-15	2016-09-15	VOL-160-5002F	MA. 400 - COV. 2.0	(P&T)GC/MS
Petroleum Hydrocarbons C10-C50	2016-09-16	2016-09-16	ORG-160-5100F	MA. 400 - HYD. 1.1	GC/FID
Petroleum Product Identification	2016-09-16	2016-09-16	ORG-160-5101F	MA. 408 – IdePet 1.0	GC/FID
Water Analysis					
Dissolved Aluminium	2016-09-22	2016-09-22	MET-161-6106F, unaccredited MDDELCC	MA. 200 - Mét 1.2	ICP/MS
Dissolved Antimony	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Silver	2016-09-22	2016-09-22	MET-161-6106F, unaccredited MDDELCC	MA. 200 - Mét 1.2	ICP/MS
Dissolved Arsenic	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Barium	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Cadmium	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Chromium	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Cobalt	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Copper	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Manganese	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Molybdenum	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Nickel	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Lead	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved sodium	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved selenium	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Zinc	2016-09-22	2016-09-22	MET-161-6106F	MA. 200 - Mét 1.2	ICP/MS
Dissolved Mercury	2016-09-16	2016-09-16	MET-161-6107F	MA. 200 Hg 1.0 ; EPA 245.5	COLD VAPOR/AA

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CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC
6155 RUE DES TOURNELLES
QUEBEC , QC G2J1P7
(418) 626-5211

ATTENTION TO: Mohammed Afoundo

PROJECT: 638589

AGAT WORK ORDER: 16Q141781

TRACE ORGANICS REVIEWED BY: Véronique Paré, chimiste

DATE REPORTED: 2017-05-30

VERSION*: 1

PAGES (INCLUDING COVER): 6

Should you require any information regarding this analysis please contact your client services representative at (418) 266-5511

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 16Q141781

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:

PAHs + Separated Benzo (b,j,k) fluoranthene (Water)

DATE RECEIVED: 2016-09-26

DATE REPORTED: 2017-05-30

				FE-2/ST2	FE-3/ST3
		SAMPLE DESCRIPTION:		{7844754}	{7844755}
		SAMPLE TYPE:		Gr. Water	Gr. Water
		DATE SAMPLED:		2016-09-13	2016-09-13
Parameter	Unit	G / S	RDL	7878802	7878811
Acenaphtene	µg/L		0.1	<0.1	<0.1
Anthracene	µg/L		0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L		0.1	<0.1	<0.1
Benzo(a)pyrene	µg/L		0.01	<0.01	<0.01
Benzo (b) fluoranthene	µg/L		0.1	<0.1	<0.1
Benzo (j) fluoranthene	µg/L		0.1	<0.1	<0.1
Benzo (k) fluoranthene	µg/L		0.1	<0.1	<0.1
Benzo (b+j+k) fluoranthene	µg/L		0.1	<0.1	<0.1
Chrysene	µg/L		0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L		0.1	<0.1	<0.1
Fluoranthene	µg/L		0.1	<0.1	<0.1
Fluorene	µg/L		0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	µg/L		0.1	<0.1	<0.1
Naphthalene	µg/L		0.1	<0.1	<0.1
Phenanthrene	µg/L		0.1	<0.1	<0.1
Pyrene	µg/L		0.1	<0.1	<0.1
*Sum of PAHs	µg/L		0.1	<0.1	<0.1
Surrogate	Unit	Acceptable Limits			
Rec. Acenaphtene-D10	%	40-140		80	77
Rec. Benzo(a)anthracene-D12	%	40-140		87	81
Rec. Pyrene-D10	%	40-140		85	82

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7878802-7878811 *Sum of PAHs: benzo(a)anthracene, benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-c,d)pyrene. Resurgence in surface water - Intervention guide - Protection des sols et réhabilitation des terrains contaminés, Annex 7

Certified By:

Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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Certificate of Analysis

AGAT WORK ORDER: 16Q141781
PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC
SAMPLED BY:J.M. Daigle, Afoundo M.

ATTENTION TO: Mohammed Afoundo
SAMPLING SITE:

Petroleum Hydrocarbons TPH CCME F2-F4 (Soil)

DATE RECEIVED: 2016-09-26

DATE REPORTED: 2017-05-30

							F-2 CF-2A		PU-4/DUP-1	PU-6/VR-2	PU-8/VR-2A
					SAMPLE DESCRIPTION:		{7828871}		{7828876}	{7828879}	{7828885}
					SAMPLE TYPE:		Soil		Soil	Soil	Soil
					DATE SAMPLED:		2016-09-01		2016-09-01	2016-09-01	2016-09-02
Parameter	Unit	G / S: A	G / S: B	G / S: C	G / S: D	RDL	7878812	RDL	7878813	7878814	7878815
C>10-C16 (F2)	mg/kg					50.0	<50.0	10.0	14.9	<10.0	<10.0
C>16-C34 (F3)	mg/kg					50.0	618	10.0	163	167	164
C>34-C50 (F4)	mg/kg					50.0	2220	10.0	79.9	269	70.4
Heavy Hydrocarbons by gravimetry (F4G-sg)	mg/kg					300	6290	300	NA	816	NA
% Moisture	%					0.2	32.2	0.2	9.0	12.8	9.7
Surrogate	Unit			Acceptable Limits							
Rec. Nonane (F2-F4)	%			40-140			113	1	92	52	91

							PU-8/VR-4
					SAMPLE DESCRIPTION:		{7828886}
					SAMPLE TYPE:		Soil
					DATE SAMPLED:		2016-09-02
Parameter	Unit	G / S: A	G / S: B	G / S: C	G / S: D	RDL	7878816
C>10-C16 (F2)	mg/kg					10.0	20.2
C>16-C34 (F3)	mg/kg					10.0	290
C>34-C50 (F4)	mg/kg					10.0	117
Heavy Hydrocarbons by gravimetry (F4G-sg)	mg/kg					300	NA
% Moisture	%					0.2	21.2
Surrogate	Unit			Acceptable Limits			
Rec. Nonane (F2-F4)	%			40-140			91

Certified By:

Véronique Paré

CHIMISTE Véronique Paré 2000-217 QUÉBEC

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Certificate of Analysis

AGAT WORK ORDER: 16Q141781

PROJECT: 638589

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:

Petroleum Hydrocarbons TPH CCME F2-F4 (Soil)

DATE RECEIVED: 2016-09-26

DATE REPORTED: 2017-05-30

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to QC PTC (Criteria A), B Refers to QC PTC (Criteria B), C Refers to QC PTC (Criteria C), D Refers to QC RESC (Annex 1)

7878812 The LDR have been augmented because of a dilution to the sample. Results are express on a dry basic. Fraction F2, F3 and F4 are quantify in function of medium answer factor of alcanes nC10, nC16 and nC34. The answer factor of the alcane nC50 don't vary for more than 10% from each other. The linearity domain restpect a maximal variation of 15%. The base line of the chromatogramm come back before the retention time of the alcane nC50. If not, the analysis of the fraction F4G is done. The fraction F4G présents the heavy hydrocarbon by gravimetry after a silicium gel treatment. The result of the heavy hydrocarbons can't be add to the results of hydrocarbons C6 to C50. Results of the quality controls are available in the section quality control of the analysis certificate. The conservation delay for the extraction and the analysis have been respected.

7878813-7878816 Results are express on a dry basic. Fraction F2, F3 and F4 are quantify in function of medium answer factor of alcanes nC10, nC16 and nC34. The answer factor of the alcane nC50 don't vary for more than 10% from each other. The linearity domain restpect a maximal variation of 15%. The base line of the chromatogramm come back before the retention time of the alcane nC50. If not, the analysis of the fraction F4G is done. The fraction F4G présents the heavy hydrocarbon by gravimetry after a silicium gel treatment. The result of the heavy hydrocarbons can't be add to the results of hydrocarbons C6 to C50. Results of the quality controls are available in the section quality control of the analysis certificate. The conservation delay for the extraction and the analysis have been respected.

Certified By: Véronique Paré

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Quality Assurance

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

AGAT WORK ORDER: 16Q141781

PROJECT: 638589

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:

Trace Organics Analysis

RPT Date: 2017-05-30			DUPLICATE			REFERENCE MATERIAL				METHOD BLANK			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
PAHs + Separated Benzo (b,j,k) fluoranthene (Water)															
Acenaphtene	1	NA	NA	NA	0.0%	< 0.1	94%	70%	130%	NA	100%	100%	NA	60%	140%
Anthracene	1	NA	NA	NA	0.0%	< 0.1	94%	70%	130%	NA	100%	100%	NA	60%	140%
Benzo(a)anthracene	1	NA	NA	NA	0.0%	< 0.1	109%	70%	130%	NA	100%	100%	NA	60%	140%
Benzo(a)pyrene	1	NA	NA	NA	0.0%	< 0.01	103%	70%	130%	NA	100%	100%	NA	60%	140%
Benzo (b) fluoranthene	1	NA	NA	NA	0.0%	< 0.1	106%	70%	130%	NA	100%	100%	NA	60%	140%
Benzo (j) fluoranthene	1	NA	NA	NA	0.0%	< 0.1	108%	70%	130%	NA	100%	100%	NA	60%	140%
Benzo (k) fluoranthene	1	NA	NA	NA	0.0%	< 0.1	112%	70%	130%	NA	100%	100%	NA	60%	140%
Benzo (b+j+k) fluoranthene	1	NA	NA	NA	0.0%	< 0.1	109%	70%	130%	NA	100%	100%	NA	60%	140%
Chrysene	1	NA	NA	NA	0.0%	< 0.1	108%	70%	130%	NA	100%	100%	NA	60%	140%
Dibenzo(a,h)anthracene	1	NA	NA	NA	0.0%	< 0.1	103%	70%	130%	NA	100%	100%	NA	60%	140%
Fluoranthene	1	NA	NA	NA	0.0%	< 0.1	103%	70%	130%	NA	100%	100%	NA	60%	140%
Fluorene	1	NA	NA	NA	0.0%	< 0.1	97%	70%	130%	NA	100%	100%	NA	60%	140%
Indeno(1,2,3-cd)pyrene	1	NA	NA	NA	0.0%	< 0.1	107%	70%	130%	NA	100%	100%	NA	60%	140%
Naphthalene	1	NA	NA	NA	0.0%	< 0.1	85%	70%	130%	NA	100%	100%	NA	60%	140%
Phenanthrene	1	NA	NA	NA	0.0%	< 0.1	104%	70%	130%	NA	100%	100%	NA	60%	140%
Pyrene	1	NA	NA	NA	0.0%	< 0.1	96%	70%	130%	NA	100%	100%	NA	60%	140%
*Sum of PAHs	1	NA	NA	NA	0.0%	< 0.1	106%	70%	130%	NA	100%	100%	NA	60%	140%
Rec. Acenaphtene-D10	1	NA	NA	NA	0.0%	71	73%	40%	140%	NA	100%	100%	NA	40%	140%
Rec. Benzo(a)anthracene-D12	1	NA	NA	NA	0.0%	84	83%	40%	140%	NA	100%	100%	NA	40%	140%
Rec. Pyrene-D10	1	NA	NA	NA	0.0%	81	81%	40%	140%	NA	100%	100%	NA	40%	140%
Petroleum Hydrocarbons TPH CCME F2-F4 (Soil)															
C>10-C16 (F2)	1	NA	NA	NA	0.0%	< 10.0	82%	70%	130%	NA	100%	100%	NA	60%	140%
C>16-C34 (F3)	1	NA	NA	NA	0.0%	< 10.0	84%	70%	130%	NA	100%	100%	NA	60%	140%
C>34-C50 (F4)	1	NA	NA	NA	0.0%	< 10.0	82%	70%	130%	NA	100%	100%	NA	60%	140%
Heavy Hydrocarbons by gravimetry (F4G-sg)	1	NA	NA	NA	0.0%	< 300	72%	70%	130%	NA	100%	100%	NA	100%	100%
Rec. Nonane (F2-F4)	1	NA	NA	NA	0.0%	77	87%	40%	140%	NA	100%	100%	NA	40%	140%
% Moisture	7877849		5.0	5.0	0.6%	< 0.2	100%	80%	120%	NA	100%	100%	NA	100%	100%

Comments:
The analysis of TPH CCME F2-3-4 petroleum hydrocarbons in soil is not controlled by the MDDELCC accreditation program.

Certified By:

Véronique Paré

CHIMISTE
Véronique Paré
2000-217
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Method Summary

CLIENT NAME: SNC-LAVALIN GEM QUEBEC INC

AGAT WORK ORDER: 16Q141781

PROJECT: 638589

ATTENTION TO: Mohammed Afoundo

SAMPLED BY:J.M. Daigle, Afoundo M.

SAMPLING SITE:

PARAMETER	DATE PREPARED	DATE ANALYZED	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis					
Acenaphtene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Anthracene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo(a)anthracene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo(a)pyrene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo (b) fluoranthene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo (j) fluoranthene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo (k) fluoranthene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Benzo (b+j+k) fluoranthene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Chrysene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Dibenzo(a,h)anthracene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Fluoranthene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Fluorene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Indeno(1,2,3-cd)pyrene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Naphthalene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Phenanthrene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Pyrene	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
*Sum of PAHs	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Rec. Acenaphtene-D10	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Rec. Benzo(a)anthracene-D12	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
Rec. Pyrene-D10	2016-09-27	2016-09-27	ORG-160-5102F	MA. 400 - HAP 1.1	GC/MS
C>10-C16 (F2)	2016-09-27	2016-09-27	ORG-160-5110F	CCME Method	GC/FID
C>16-C34 (F3)	2016-09-27	2016-09-27	ORG-160-5110F	CCME Method	GC/FID
C>34-C50 (F4)	2016-09-27	2016-09-27	ORG-160-5110F	CCME Method	GC/FID
Heavy Hydrocarbons by gravimetry (F4G-sg)	2016-09-27	2016-09-28	ORG-160-5110F	CCME Method	GRAVIMETRY
Rec. Nonane (F2-F4)	2016-09-27	2016-09-27	ORG-160-5110F	CCME Method	GC/FID
% Moisture	2016-09-27	2016-09-28	INOR-161-6006F	MA. 100 - S.T. 1.0	SCALE

APPENDIX 7 – National Classification System for Contaminated Sites. Guidance Document

Système national de classification des lieux contaminés du CCME (2008, 2010 v 1.2)
Liste de vérification pour la présélection

	Question	Réponse (oui / non)	Commentaire
1.	Y a-t-il présence possible dans le lieu de **matières radioactives**, d'une **contamination bactérienne** ou de **dangers biologiques**.	Non	Si oui, ne pas aller plus loin dans le SNCLC. Communiquer immédiatement avec l'organisme de réglementation compétent.
2.	Il n'y a **aucun dépassement** (connu ou soupçonné) **de la contamination**? La détermination des dépassements se fait d'après 1) les recommandations du CCME pour la qualité de l'environnment, 2) les normes ou recommandations provinciales équivalentes, s'il n'existe pas de recommandations du CCME au sujet d'une substance chimique dans le milieu évalué ou 3) les valeurs toxicologiques de référence publiées dans la documentation à l'égard des produits chimiques non visés par le CCME ni par les normes ou recommandations provinciales.	Non	Si oui (s'il n'y a aucun dépassement), ne pas aller plus loin dans le SNCLC.
3.	Le lieu n'a fait l'objet d'aucune **étude environnementale de site** ou les **études effectuées sont incomplètes**?	Non	Si oui, ne pas aller plus loin dans le SNCLC.
4.	Y a-t-il des preuves directes et significatives d'**effets sur les humains** dans le lieu, ou hors du lieu si les contaminants ont migré?	Non	Si oui, ranger automatiquement le lieu dans la classe 1, classe prioritaire pour la réhabilitation ou pour la gestion des risques, quelle que soit la cote totale obtenue (si on choisit de la calculer, p. ex. pour comparer avec d'autres lieux de classe 1).
5.	Y a-t-il des preuves directes et significatives d'**effets sur les récepteurs écologiques** dans le lieu, ou hors du lieu si les contaminants ont migré?	Non	Certains effets faibles sur les récepteurs écologiques sont jugés acceptables, en particulier dans les sites commerciaux et industriels. Toutefois, si les effets écologiques sont graves, le lieu peut être rangé dans la classe 1, quelle que soit la cote numérique totale obtenue par le SNCLC. Pour l'application du SNCLC, les effets jugés graves englobent les effets observés sur la survie, la croissance ou la reproduction qui pourraient menacer la viabilité d'une population de récepteurs écologiques dans le lieu. D'autres effets négatifs graves peuvent être déterminés d'après le jugement professionnel et en concertation avec l'administration compétente.
6.	Y a-t-il des indicateurs d'**effets négatifs graves dans la zone d'exposition** (la zone où les récepteurs peuvent entrer en contact avec les contaminants)? Par exemple : -liquides non aqueux ou minces films superficiels d'hydrocarbures; -biote très perturbé ou inexistant; -matériaux à la surface du sol ou sédiments ayant de fortes concentrations soupçonnées de contaminants, par exemple résidus miniers, grenailles de sablage, scories et goudron de houille.	Non	Si oui, ranger automatiquement le lieu dans la classe 1, classe prioritaire pour la réhabilitation ou la gestion des risques, quelle que soit la cote totale obtenue (si on choisit de la calculer, p. ex. pour comparer avec d'autres lieux de classe 1).
7.	Les concentrations mesurées de substances volatiles ou d'explosifs présentent-elles un **danger d'explosion**?	Non	Si oui, ranger automatiquement le site dans la classe 1, classe prioritaire pour la réhabilitation ou la gestion des risques. Ne pas continuer tant que les risques pour la sécurité n'ont pas été maîtrisés. Consulter les guides de votre administration sur la santé et la sécurité au travail ou la législation sur les dangers d'explosion et la mesure des limites inférieures d'explosivité.

Si aucun des cas qui précèdent ne s'applique, procéder à la cotation au moyen du SNCLC.

Système national de classification des lieux contaminés du CCME (2008, 2010 v 1.2)
Résumé de l'état du lieu

Lieu :	**Lieu d'essai**	
Adresse municipale : *(ou autre description de l'emplacement)*	1537, Route 138, Donnacona (Québec) G3M 1C9	
Nom commun du lieu : *(le cas échéant)*	Établissement Donnacona	
Propriétaire ou gardien du lieu : *(organisme et personne-ressource)*	Travaux publics et Services gouvernementaux Canada	
Description officielle *ou* description par mesurage et délimitation:		
Superficie approximative :		
N$^{o(s)}$ d'identification de la parcelle :		
Centre du lieu : *(donner la latitude/longitude ou les coordonnées MTU)*	Latitude : Longitude :	__46__ degrés __41__ min _14,2___ sec _71___ degrés _41___ min __20,4__ sec
	Coordonnées MTU :	Ordonnée _____46.687610 N_____ Abscisse -71.689278 O
Utilisation du terrain :	Actuelle :	une partie du site pénitencier de Donnacona, il est présentement utilisé comme lieu d'entreposage de matériaux et de machineries. Plusieurs conteneurs, abris et matériaux sont
	Proposée :	.D'après les informations obtenues, le projet consiste en la construction d'un champ de tir incluant un abri des pas de tir et collecteur de balles, d'un bâtiment de formation, d'un
Plan du lieu	**Un plan DOIT être joint pour délimiter le lieu. Le plan doit être tracé à l'échelle et indiquer les limites du lieu en fonction de points de référence bien définis et/ou d'une description officielle. Il faudrait aussi tracer les limites de la contamination sur ce plan.**	
Brève description du lieu :	une partie du site pénitencier de Donnacona, il est présentement utilisé comme lieu d'entreposage de matériaux et de machineries. Plusieurs conteneurs, abris et matériaux sont observés sur le terrain..D'après les informations obtenues, le projet consiste en la construction d'un champ de tir incluant un abri des pas de tir et collecteur de balles, d'un bâtiment de formation, d'un stationnement, d'une voie d'accès, d'une boucle de virage et des cellules d'exercices	
Milieux touchés et contaminants potentiellement préoccupants (CPP) :	Sols	

Inscrire la lettre qui décrit le mieux le niveau d'information disponible pour le lieu à évaluer :

Cote alphabétique du lieu **D**

Si la cote alphabétique est F, ne pas continuer. Il faut disposer au minimum d'une évaluation environnementale de site de phase I ou l'équivalent.

Cotation exécutée par :	Mohammed Afoundo
Date d'exécution :	2016-0930

Système national de classification des lieux contaminés du CCME (2008, 2010 v 1.2)
Guide de l'utilisateur – Instructions

1) Prendre connaissance du survol qui suit. Le Système national de classification des lieux contaminés (SNCLC) révisé du CCME consiste en une liste de vérification pour la présélection, une description du lieu et un sommaire de cotation, ainsi que trois feuilles de travail, avec feuilles d'instructions correspondantes, à remplir par l'utilisateur : Caractéristiques des contaminants, Potentiel de migration et Exposition. Pour faciliter l'impression, la méthode d'évaluation à appliquer pour chaque cotation dans les feuilles de travail est donnée sous un onglet distinct (Instructions). De la documentation est aussi fournie pour aider à l'évaluation. Voici une brève description de chaque feuille :

Liste de vérification pour la présélection - La liste sert à déterminer si le lieu peut être rangé dans la classe 1 (à réhabiliter immédiatement), s'il faut recueillir plus de renseignements avant de le classer ou si le lieu présente d'autres dangers dont il faut s'occuper avant de pouvoir le classer à l'aide du SNCLC révisé.

Résumé de l'état du lieu - Feuille qui résume les renseignements sur le lieu. Elle indique aussi le niveau d'information (cote alphabétique) dont on dispose pour coter le lieu selon le SNCLC. Les renseignements sur les contaminants préoccupants connus et soupçonnés et sur les milieux touchés sont aussi résumés dans cette feuille.

Feuille de travail sur les caractéristiques des contaminants avec instructions - L'utilisateur est incité à fournir les renseignements sur les contaminants potentiellement préoccupants (CPP) trouvés dans le lieu.

Feuille de travail sur le potentiel de migration avec instructions - L'utilisateur est incité à fournir des renseignements sur les processus physiques de transport par lesquels les contaminants peuvent migrer hors du lieu ou se déplacer à l'intérieur du lieu. Le potentiel de migration englobe de nombreuses voies d'exposition, sans s'y limiter. La définition du potentiel de migration n'exige pas la détermination de récepteurs bien définis.

Feuille de travail sur l'exposition avec instructions - L'utilisateur est incité à fournir des renseignements sur les voies d'exposition et les récepteurs qui peuvent se trouver dans le lieu.

Sommaire de cotation - Cette feuille donne la cote totale du lieu par l'addition des cotes obtenues dans les trois feuilles de travail et indique le classement auquel cette cote correspond. La feuille fournit aussi une estimation de la certitude de la cote (pourcentage de certitude).

Documentation - Renseignements supplémentaires qu'il peut être utile de consulter pour faire l'évaluation.
- Classement du risque des contaminants
- Exemples de substances persistantes
- Exemples de substances dans les diverses classes chimiques
- Propriétés des composés chimiques
- Intervalle des coefficients de conductivité hydraulique et de perméabilité

Les titres et rubriques des feuilles de travail sont les suivants.

I. Caractéristiques des contaminants

1. Milieux de séjour
2. Danger chimique
3. Facteur de dépassement des contaminants
4. Quantité de contaminants
5. Facteurs modificatifs

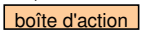
II. Potentiel de migration

1. Mouvement des eaux souterraines
2. Mouvement des eaux de surface
3. Sols
4. Vapeurs
5. Mouvement des sédiments
6. Facteurs modificatifs

III. Exposition

1. Récepteurs humains
   - A. Exposition connue
   - B. Exposition potentielle
     - a. Utilisation du terrain
     - b. Accessibilité
     - c. Voie d'exposition
2. Facteurs modifiant l'exposition humaine
3. Récepteurs écologiques
   - A. Exposition connue
   - B. Exposition potentielle
     - a. Milieu terrestre
     - b. Milieu aquatique
4. Facteurs modifiant l'exposition des récepteurs écologiques
   - a. Espèces en péril
   - b. Aspects esthétiques
5. Autres récepteurs
   - a. Pergélisol

2) Il s'agit d'un formulaire électronique que doit remplir l'utilisateur. Selon les réponses fournies, le système calcule une cote pour le lieu contaminé visé. Le plus souvent, l'utilisateur doit faire son choix entre deux éléments ou plus qui sont présentés dans une liste déroulante. Pour avoir accès à la liste déroulante, il faut placer le curseur de la souris du côté droit de la « boîte d'action ». S'il y a une liste déroulante, une flèche apparaît sur laquelle il faut cliquer pour avoir accès aux choix. Lorsqu'il y a une boîte d'action, l'utilisateur doit faire un choix. Toutes les boîtes d'action ont un fond ambré.



3) Au moment de coter chaque facteur, il est fortement recommandé de donner une justification (une colonne a été prévue à cette fin dans les feuilles de travail I, II et III). Voici des renseignements qui peuvent être utiles pour justifier les cotes attribuées : énoncé des hypothèses, description des informations propres au lieu et renvoi à toute source de données (p. ex. visite du lieu, entrevues, rapport d'évaluation du site ou autres documents consultés).

4) La cote alphabétique se rattache au niveau d'information dont on dispose pour le lieu (tel que défini par l'utilisateur) et donne une indication de la complétude des informations d'après le niveau d'étude et de réhabilitation dont le lieu a fait l'objet. Les diverses cotes sont décrites ci-dessous.

Cote alphabétique :	*Descriptions :*
F	***Pré-EES de phase I*** – Aucune étude environnementale n'a été faite ou on ne dispose que d'une évaluation environnementale de site (EES) de phase I partielle ou incomplète. Il est déconseillé de poursuivre l'application du SNCLC par manque de données. Dans ce cas, il est généralement nécessaire d'effectuer une EES de phase I ou d'autres études du lieu afin de compléter la cotation du SNCLC.
E	***EES de phase I*** – Une étude documentaire préliminaire a été effectuée, dont la collecte non intrusive de données, pour déterminer s'il est possible que le lieu soit contaminé et pour produire des informations afin de diriger toutes études intrusives. La collecte des données peut comprendre l'examen des renseignements dont on dispose sur l'état actuel et l'historique du lieu, une inspection sur place et des entrevues du personnel connaissant bien le lieu. [Remarque : Cette étape est similaire à celle de « Phase I : Évaluation des connaissances sur le site » dans le Document d'orientation sur la gestion des lieux contaminés au Canada (CCME, 1997).]
D	***EES de phase II succincte*** – Une étude intrusive et une évaluation initiales du terrain ont été effectuées, centrées en général sur les sources possibles de contamination, pour déterminer si la contamination déroge aux recommandations ou aux critères de sélection pertinents et pour définir grossièrement les conditions des sols et des eaux souterraines. Des échantillons ont été prélevés et analysés en vue de déceler, de caractériser et de quantifier les contaminants dans l'air, le sol, l'eau souterraine, l'eau de surface ou les matériaux de construction. [Remarque : Cette étape est similaire à celle de « Phase II : Programme de reconnaissance » dans le Document d'orientation sur la gestion des lieux contaminés au Canada (CCME, 1997).]
C	***EES de phase II détaillée*** – Des études intrusives approfondies ont été menées pour caractériser et délimiter la contamination, obtenir des renseignements détaillés sur l'état des sols et des eaux souterraines, déterminer les voies d'exposition et produire d'autres informations nécessaires à l'élaboration d'un plan de réhabilitation. [Remarque : Cette étape est similaire à celle de « Phase III : Programme détaillé des études et des tests » dans le Document d'orientation sur la gestion des lieux contaminés au Canada (CCME, 1997).]
B	***Évaluation des risques avec ou sans plan de réhabilitation ou stratégie de gestion des risques*** – Une évaluation des risque a été réalisée et, si le risque a été jugé inacceptable, on a conçu un plan de réhabilitation propre au lieu pour atténuer les incidences environnementales et sanitaires s'y rattachant ou on a élaboré une stratégie de gestion des risques.
A	***Échantillonnage de confirmation*** – On a effectué des travaux de réhabilitation, contrôlé les résultats et/ou vérifié la conformité, et l'échantillonnage de confirmation montre si la contamination a été supprimée ou correctement stabilisée et si les objectifs de réhabilitation ou de gestion des risques ont été atteints.

5) Quelques termes qui reviennent souvent dans les feuilles demandent à être définis :

Connu - Qualifie les cotes qui sont attribuées sur la foi d'observations scientifiques et/ou techniques documentées.

Potentiel - Qualifie les cotes qui sont attribuées lorsqu'on a peut-être des soupçons, mais pas de confirmation.

Potentiel permis - Si, dans une catégorie donnée, l'utilisateur fournit les cotes « connu » et « potentiel », le système inscrit normalement par défaut la cote « connu ». Si une cote « connu » est inscrite, la cote « potentiel permis » égale zéro. Il pourra y avoir des exceptions dans la catégorie « Facteurs modificatifs » de chaque feuille de travail, où il y a souvent plusieurs questions indépendantes. Ainsi, les cotes « connu » et « potentiel » peuvent contribuer à la cote totale des facteurs modificatifs.

Brut - Qualifie les totaux des cotes qui n'ont pas été ramenés à la cote maximale totale pour la catégorie donnée. Dans la plupart des cas, la cote brute totale possible sera supérieure au maximum permis.

Remarque : Pour certaines questions dans les feuilles de travail, l'option retenue détermine l'attribution d'une cote « connu » ou « potentiel ». Dans ces cas, si l'option « Ne sais pas » est retenue, la cote est automatiquement indiquée comme « potentiel », alors que toutes les autres options dans la liste fournissent une cote « connu ».

6) Pourcentage de certitude : Le rapport entre les réponses « connu » et « potentiel » montre la certitude, ou confiance, qui s'attache à la cote résultante et au classement. Le SNCLC définit ce rapport comme étant le « pourcentage de certitude ». Le pourcentage de certitude est calculé à partir du nombre de sections dont les cotes sont fondées sur des éléments « connus » divisé par le nombre total de sections. Un pourcentage élevé indique que le lieu est bien connu et donc que la confiance dans son classement est plus grande, tandis qu'un pourcentage faible appelle à considérer le classement avec prudence.

7) Catégories de classification des lieux : Il ne s'agit pas de classer les lieux les uns par rapport aux autres, mais de les évaluer d'après leurs caractéristiques propres afin de les ranger dans la classe qui convient à leur priorité d'intervention (classe 1, 2, 3 ou N) ou dans la classe INS (renseignements insuffisants) si les renseignements sont insuffisants et qu'il faut en obtenir d'autres pour classer le lieu. Les catégories sont les suivantes :

Classe 1 - Priorité d'intervention élevée (cote totale du SNCLC supérieure à 70)

Les renseignements disponibles indiquent la nécessité d'intervenir (caractérisation détaillée du lieu, gestion des risques, réhabilitation, etc.) pour répondre aux préoccupations. En principe, les lieux de classe 1 sont une source de grandes préoccupations à l'égard de plusieurs facteurs. Des effets mesurés ou observés sont documentés.

Classe 2 - Priorité d'intervention moyenne (cote totale du SNCLC entre 50 et 69,9)

Les renseignements disponibles indiquent une grande possibilité d'effet négatif, sans que le risque pour la santé humaine et pour l'environnement ne soit généralement imminent. En principe, il n'y a pas d'indication directe d'une contamination hors du lieu. Cependant, la possibilité que les contaminants migrent hors du lieu est élevée et une quelconque intervention est donc probablement nécessaire.

Classe 3 - Priorité d'intervention faible (cote totale du SNCLC entre 37 et 49,9)

Les renseignements disponibles indiquent que le lieu ne soulève pas actuellement de grande préoccupation. Cela dit, il convient éventuellement de pousser l'étude pour confirmer le classement. Une quelconque intervention peut être nécessaire.

Classe N - Priorité d'intervention nulle (cote totale SNCLC inférieure à 37)

Les renseignements disponibles indiquent qu'un effet environnemental important ou une menace importante pour la santé humaine sont peu probables. Il est vraisemblablement inutile d'intervenir, à moins que de nouveaux renseignements révèlent un problème plus grave, auquel cas il faudrait réévaluer le lieu.

Classe INS - Renseignements insuffisants (> 15 % des réponses sont « Ne sais pas »)

Il n'y a pas assez de renseignements pour classer le lieu. Il faut combler cette lacune.

8) Outils en complément du SNCLC

L'indice de qualité des sols (IQSo) du CCME est un outil complémentaire qui est centré sur l'évaluation du danger relatif, par la comparaison des concentrations de contaminants avec les recommandations de qualité des sols qui s'y rapportent. L'IQSo fait intervenir trois facteurs dans ses calculs, soit : 1) l'étendue (% de contaminants dont les concentrations ne sont pas conformes aux recommandations applicables), 2) la fréquence (% des résultats d'analyses des contaminants qui ne sont pas conformes aux recommandations applicables) et 3) l'amplitude (l'écart entre les résultats d'analyses non conformes et les valeurs recommandées pour chacun des contaminants). L'indice de qualité des sols peut servir à comparer divers lieux touchés par le même genre de contamination et à vérifier si les exigences gouvernementales sont respectées après la réhabilitation d'un lieu particulier.

Le SNCLC n'a pas été élaboré pour évaluer des lieux ayant un élément marin ou aquatique important et ne s'y prête donc pas bien. Les conditions d'environnement des sites marins et aquatiques se mesurent le mieux dans les sédiments, car ceux-ci constituent des réservoirs à long terme de produits chimiques pour le milieu aquatique et pour les organismes qui vivent dans les sédiments ou qui sont en contact direct avec eux. L'indice de qualité des sédiments (IQSe) du CCME offre un moyen pratique de résumer les données de qualité des sédiments et peut apporter un complément au SNCLC. L'IQSe fournit un cadre mathématique pour l'évaluation de la qualité des sédiments par la comparaison des concentrations de contaminants avec les recommandations de qualité des sédiments s'y rapportant.

Système national de classification du CCME (2008, 2010 v 1.2)

(I) Caractéristiques des contaminants

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
1. Milieux de séjour (remplace État physique)				
Dans lesquels des milieux de séjour suivant, y a-t-il (ou soupçonne-t-on fortement qu'il y a), un ou plusieurs dépassements des recommandations du CCME? **oui** = dépassement connu ou fortement soupçonné **non** = aucun dépassement connu ou fortement soupçonné			La cote globale est calculée en additionnant les cotes obtenues pour chaque milieu de séjour (affichant un ou plusieurs dépassements par rapport à la recommandation la plus prudente du CCME concernant le milieu ou l'utilisation du terrain). Les tableaux sommaires des Recommandations canadiennes pour la qualité de l'environnement concernant les sols, les eaux (vie aquatique, eaux souterraines non potables et usages agricoles de l'eau) et les sédiments peuvent être consultés à partir du site Web du CCME à l'adresse http://www.ccme.ca/publications/cegg_rcqe.fr.html?category_id=124. À l'égard des eaux souterraines comme source d'eau potable, on peut consulter les Recommandations pour la qualité de l'eau potable au Canada (pour comparaison avec les données de surveillance des eaux souterraines) sur le site Web de Santé Canada à l'adresse http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guide-ras_rasam/index_f.html	L'augmentation du nombre de milieux de séjour contenant des substances chimiques en excès signifie souvent que le risque potentiel est plus grand en raison de l'augmentation du nombre de voies d'expositions possibles.
A. Sols	Oui			
Oui Non Ne sais pas				
B. Eaux souterraines	Non			
Oui Non Ne sais pas				
C. Eaux de surface	Non			
Oui Non Ne sais pas				
D. Sédiments	Non			
Oui Non Ne sais pas				
Cote - « connu »	2			
Cote - « potentiel »	---			
2. Danger chimique				
Quel est le degré de danger chimique du contaminant dans la liste de classement du danger proposée par le Plan d'action des sites contaminés fédéraux (PASCF)? Élevé Moyen Faible Ne sais pas	Ne sais pas		Le degré de danger chimique devrait être choisi d'après le contaminant le plus dangereux dont la présence dans le lieu est connue ou soupçonnée. Le degré de danger a été défini par le Plan d'action des sites contaminés fédéraux (PASCF), et une liste des substances et du danger qui les accompagne (faible, moyen et élevé) est fournie dans une feuille séparée du fichier. *Voir la feuille Documentation pour le classement du danger des contaminants.*	Le danger défini selon le SNCLC révisé se rapporte aux propriétés physiques d'une substance chimique qui peuvent être dommageables. Ces propriétés sont le pouvoir toxique, la propension à la bioamplification, la persistance dans l'environnement, etc. Malgré qu'il y ait un certain recoupement entre le danger et le facteur de dépassement dont il est question plus loin, il est impossible d'établir le facteur de dépassement de nombreuses substances dont le danger chimique est défini, mais qui ne font pas l'objet d'une recommandation du CCME. La caractéristique « danger chimique » est définie pour éviter de négliger une mesure du potentiel toxique.
Cote - « connu »	---			
Cote - « potentiel »	4			

(I) Caractéristiques des contaminants

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
3. Facteur de dépassement des contaminants				
Quel est le rapport entre la concentration mesurée du contaminant et la recommandation du CCME qui s'applique (ou autres « normes »)? LNA mobiles Élevé (> 100x) Moyen (10x à 100x) Faible (1x à 10x) Ne sais pas	Faible (1x à 10x		Le « dépassement » est classé en comparant les concentrations du contaminant avec les recommandations pour la qualité de l'environnement du CCME les plus prudentes qui s'appliquent au milieu visé et à l'utilisation du terrain. **Le classement devrait se fonder sur le contaminant dont la concentration dépasse le plus les recommandations du CCME**. Le danger présenté par un contaminant est classé élevé, moyen ou faible, comme suit : Élevé = Au moins une concentration mesurée dépasse de plus de 100 fois les recommandations applicables du CCME. Moyen = Au moins une concentration mesurée dépasse d'entre 10 et 99,99 fois les recommandations applicables du CCME. Faible = Au moins une concentration mesurée dépasse d'entre 1 et 9,99 fois les recommandations applicables du CCME. LNA mobiles = Le contaminant est un liquide non aqueux (c.-à-d. qu'en raison de sa faible solubilité, il ne se mélange pas à l'eau), et que le degré de saturation est suffisamment élevé (supérieur à la saturation résiduelle en LNA) qu'il est très possible que le contaminant se déplace vers le bas ou latéralement. Les autres normes peuvent être les concentrations de fond locales ou les valeurs toxicologiques de réference publiées. À défaut, on peut utiliser les résultats des essais de toxicité sur des échantillons prélevés au site. Cette option ne s'applique qu'aux contaminants qui ne se bioaccumulent pas dans le réseau alimentaire, car des essais de toxicité n'indiqueraient pas les effets possibles à des niveaux trophiques supérieurs. Élevé = Létalité observée. Moyen = Aucune létalité, mais des effets sublétaux observés. Faible = Aucun effet létal ni sublétal observé.	En présence de fortes concentrations d'une matière qui ne fait pas l'objet d'une recommandation du CCME, il faut se baser sur les critères environnementaux de la province ou de l'USEPA. Le quotient de danger (parfois qualifié de quotient d'évaluation préliminaire dans les évaluations de risques) est le rapport de la concentration mesurée à la concentration qui constitue présumément le seuil de toxicité. Le facteur de dépassement des contaminants (FDC) se calcule ici de façon analogue. Une concentration supérieure à la recommandation applicable du CCME (FDC=>1) indique un risque possible. Les LNA mobiles obtiennent la cote correspondante la plus forte (8), parce qu'ils sont fortement concentrés et que la zone qu'ils contaminent est très susceptible d'augmenter.
Cote - « connu »	2			
Cote - « potentiel »	---			
4. Quantité de contaminants (connue ou fortement soupçonnée)				
Quelle est la quantité connue ou fortement soupçonnée de l'ensemble des contaminants? > 10 hectares (ha) ou 5 000 m^3 2 à 10 ha ou 1 000 à 5 000 m^3 < 2 ha ou 1 000 m^3 Ne sais pas	2 ha ou 1 000 r		Mesurer ou estimer la zone contaminée totale ou la quantité totale de contaminants (c.-à-d. tous les contaminants dont la présence au site est connue ou fortement soupçonnée). La « zone de contamination » est définie comme la superficie ou le volume des milieux contaminés (sols, sédiments, eaux souterraines, eaux de surface) où les critères environnementaux ne sont pas respectés.	Plus la quantité d'une substance potentiellement toxique est importante, plus la fréquence d'exposition et la probabilité de migration risquent d'être élevées; par conséquent, il faut attribuer une cote plus élevée à la substance présente en grande quantité.
Cote - « connu »	2			
Cote - « potentiel »	---			

Système national de classification du CCME (2008, 2010 v 1.2)

(I) Caractéristiques des contaminants

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
5. Facteurs modificatifs				
D'après son comportement dans l'environnement, la substance chimique entre-t-elle dans la classe des substances persistantes? Oui Non Ne sais pas	Ne sais pas		Comme les substances chimiques persistantes (p. ex. BPC, pesticides chlorés) ne se dégradent pas ou mettent du temps à se dégrader, elles peuvent avoir des effets à long terme. Pour l'application de la *Loi canadienne sur la protection de l'environnement* (LCPE), est persistante la substance qui présente au moins une des particularités suivantes : a) dans l'air, selon le cas : (i) sa demi-vie est égale ou supérieure à 2 jours, (ii) elle est susceptible d'être transportée dans l'atmosphère jusqu'à des régions éloignées de sa source; b) dans l'eau, sa demi-vie est égale ou supérieure à 182 jours; c) dans les sédiments, sa demi-vie est égale ou supérieure à 365 jours; d) dans le sol, sa demi-vie est égale ou supérieure à 182 jours. La liste n'englobe pas les métaux ou les métalloïdes qui, dans leur forme élémentaire, ne se dégradent pas. Les métaux et les métalloïdes forment toutefois dans l'environnement des espèces chimiques dont beaucoup ne sont pas facilement biodisponibles.	*Des exemples de substances persistantes sont données dans la feuille Documentation.*
Y a-t-il des contaminants qui risquent-ils d'endommager les ouvrages de services publics ou les infrastructures, maintenant ou dans l'avenir, vu leur emplacement? Oui Non Ne sais pas	Non			Certains contaminants peuvent entrer en réaction ou être absorbés dans les ouvrages souterrains de services publics et les infrastructures. Ainsi, les solvants organiques peuvent dégrader certains plastiques, et les sels peuvent corroder les métaux.
Combien de classes de contaminants présentent des substances qui dépassent les recommandations du CCME? une deux à quatre cinq ou plus Ne sais pas	une		Aux fins du SNCLC révisé, les substances chimiques suivantes représentent des « classes » chimiques distinctes : substances inorganiques (y compris les métaux), hydrocarbures pétroliers volatils, hydrocarbures pétroliers extractibles légers, hydrocarbures pétroliers extractibles lourds, HAP, substances phénoliques, hydrocarbures chlorés, halométhanes, phtalates, pesticides.	*Voir la feuille Documentation pour obtenir une liste d'exemples de substances comprises dans les diverses classes chimiques.*
Cote - « connu »	0			
Cote - « potentiel »	1			

Total - Caractéristiques des contaminants

Cote brute totale - « connu »	6
Cote brute totale - « potentiel »	5
Cote brute totale combinée	11
Cote totale (cote brute combinée / 40 * 33)	**9,1**

Système national de classification du CCME (2008, 2010 v 1.2)

(II) Potentiel de migration (évaluation des voies de migration des contaminants)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
1. Mouvement des eaux souterraines				
A. Dépassements connus des concentrations de contaminants potentiellement préoccupants (CPP) et voie opérante d'exposition par migration dans l'eau souterraine à l'intérieur et/ou au-delà des limites du terrain.				
i) Dans les **zones d'eaux souterraines potables**, 1) concentrations qui dépassent les concentrations de fond et (1X) les Recommandations pour la qualité de l'eau potable au Canada (RQEPC) ou 2) contact connu des contaminants avec l'eau souterraine (preuves tangibles d'une contamination de l'eau souterraine.) Dans les **zones d'eaux souterraines non potables** (habituellement des milieux urbains desservis par des réseaux municipaux), 1) concentrations qui dépassent (1X) les recommandations applicables aux eaux non potables ou les recommandations génériques modifiées (qui excluent la voie d'exposition par ingestion d'eau de boisson) ou 2) contact connu des contaminants avec l'eau souterraine (preuves tangibles d'effets sur l'eau souterraine).	12		Étudier les données chimiques et évaluer la qualité de l'eau souterraine. La méthode d'évaluation se concentre sur 1) l'eau souterraine potable et non potable et 2) le régime d'écoulement de l'eau souterraine et la possibilité qu'il ouvre une voie d'exposition vers des récepteurs connus ou potentiels. L'aquifère se définit comme une unité géologique qui produit de l'eau souterraine en quantité utilisable et présentant les qualités d'une eau potable. L'aquifère sert à l'approvisionnement en eau potable ou pourra éventuellement servir à cette fin. Les zones d'eaux souterraines non potables sont des zones qui disposent d'une autre source d'approvisionnement en eau potable (le plus souvent en région urbaine). L'évaluation des zones d'eau non potable se fait au cas par cas.	Le SNCLC de 1992 considérait la migration hors du lieu comme un problème réglementaire. L'évaluation de l'exposition et la classification des dangers devraient être envisagées indépendamment des limites du terrain. Quelqu'un d'expérience doit fournir une description détaillée des sources étudiées pour déterminer la présence ou l'absence d'une source d'approvisionnement en eaux souterraines à proximité du lieu contaminé. Les renseignements fournis doivent être consignés dans la feuille de travail du SNCLC pour la classification des lieux, avec les noms et numéros de téléphone des personnes-ressources et les courriels et/ou rapports et cartes de référence et les autres ressources comme les liens Internet. Si l'eau souterraine potable fait aussi résurgence dans un plan d'eau de surface à proximité, il faut envisager d'appliquer les recommandations les plus exigentes en matière d'eau potable et de protection de la vie aquatique.
ii) Même chose qu'en i) sauf que la contamination n'est pas connue mais fortement soupçonnée (observations indirectes).	9		Les preuves tangibles comprennent la présence de films superficiels, la contamination en phase liquide ou des sols saturés de contaminants. Les suintements et les points de résurgence sont considérés comme faisant partie de la voie d'exposition par l'eau souterraine.	**Bibliograhie choisie** Zones d'eaux potables Recommandations pour la qualité de l'eau potable au Canada : www.hc-sc.qc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guide-res_recom/index_f.html
iii) Les RQEPC sont respectées à l'égard des **zones d'eaux potables**. Les critères pour les eaux non potables ou les critères génériques modifiés (qui excluent la voie d'exposition par ingestion d'eau de boisson) sont respectés à l'égard des **zones d'eaux non potables**. **ou** Il n'y a pas de voie d'exposition par les eaux souterraines (c.-à-d. soit il n'y a pas d'aquifère – voir la définition à droite – dans le lieu, soit il existe une couche isolante suffisante entre l'aquifère et les contaminants, et, dans un rayon de 5 km du lieu il n'y a pas de milieu récepteur aquatique et l'eau souterraine ne fait pas résurgence).	0		Dans les milieux arctiques, la potabilité et l'évaluation de la couche active saisonnière (au-dessus du pergélisol) comme voie d'exposition par l'eau souterraine seront examinées en fonction des caractéristiques propres à chaque lieu.	Zones d'eaux non potables Recommandations canadiennes pour la qualité des eaux : protection de la vie aquatique, CCME, 1999. www.ccme.ca Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada). Rapport présenté à Environnement Canada, le 4 janvier 2002.
	0			
Cote	0			
REMARQUE : Si une cote est attribuée ici pour des dépassements connus de CPP, sauter la partie B (Migration potentielle par les eaux souterraines) et aller à la section 2 (Mouvement des eaux de surface).				

Système national de classification du CCME (2008, 2010 v 1.2)

(II) Potentiel de migration (évaluation des voies de migration des contaminants)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
B. Migration potentielle par les eaux souterraines				
a. Mobilité relative Élevée Modérée Faible Négligeable Ne sais pas	Ne sais pas		Matières organiques Kco (L/kg) / Métaux à mobilité accrue dans les milieux acides / Métaux à mobilité accrue dans les milieux alcalins K_{co} < 500 (c.-à-d. log K_{co} < 2,7) — pH < 5 — pH > 8,5 K_{co} = 500 à 5 000 (c.-à-d. K_{co} = 2,7 à 3,7) — pH = 5 à 6 — pH = 7,5 à 8.5 K_{co} = 5 000 à 100 000 (c.-à-d. log K_{co} = 3,7 à 5) — pH > 6 — pH < 7,5 K_{co} > 100 000 (c.-à-d. log K_{co} > 5)	Référence : US EPA Soil Screening Guidance (Part 5 - Table 39). Voir la feuille Documentation. Si la cote zéro est attribuée à la mobilité relative, il est tout de même recommandé d'effectuer l'évaluation et la cotation dans les sections qui suivent concernant la possibilité d'exposition via les eaux souterraines. Même si le coefficient de partage carbone organique-eau (K_{co}) d'un contaminant indique qu'il sera plutôt immobile, il est possible que si le contaminant se retrouve dans un mélange complexe sa mobilité soit accrue sous les effets de cosolvants. Par conséquent, on ne peut se fier uniquement au K_{co} pour mesurer la mobilité. L'évaluation d'autres facteurs, comme le confinement, l'épaisseur de la couche de confinement, les conductivités hydrauliques et le taux d'infiltration des précipitations est encore utile pour prévoir le potentiel de migration dans les eaux souterraines, même si, d'après sa chimie, le contaminant devrait avoir une mobilité négligeable.
Cote	2			
b. Présence d'un ouvrage de confinement souterrain? Aucun confinement Confinement partiel Confinement total Ne sais pas	Ne sais pas		Étudier les divers ouvrages ou processus naturels d'atténuation présents dans le lieu et déterminer s'il y a confinement total ou partiel. Le confinement total est défini comme un ouvrage artificiel ou des processus naturels d'atténuation dont l'efficacité est vérifiée par une surveillance et qui permettent de capter entièrement et/ou de traiter les contaminants. Toutes les substances chimiques préoccupantes doivent être confinées de sorte à obtenir la cote de « confinement total ». La cotation des processus d'atténuation naturels doit être étayée par des données suffisantes et des rapports de surveillance confirmant l'état stationnaire et les processus d'atténuation. S'il n'y a pas de confinement ou si les processus d'atténuation naturels sont insuffisants, il faut attribuer une cote élevée dans cette catégorie. Si le confinement est incomplet ou incertain, attribuer la cote moyenne. Dans les milieux arctiques, le pergélisol sera évalué, comme il convient, d'après des évaluations détaillées et d'après l'efficacité et la fiabilité du confinement ou de la maîtrise de la migration des contaminants.	Quelqu'un d'expérience doit fournir une description détaillée des sources consultées pour déterminer le confinement à la source dans le lieu contaminé. Les renseignements doivent être consignés dans la feuille de travail du SNCLC sur la classification des lieux, avec les noms et numéros de téléphone des personnes-ressources, les courriels et/ou les cartes de référence, rapports géotechniques ou études de l'atténuation naturelle, ainsi que les autres sources comme les liens Internet. **Bibliographie choisie** : United States Environmental Protection Agency (USEPA) 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128. Environnement Canada – Région de l'Ontario – Atténuation naturelle – Bulletin d'assistance technique (BAT) numéros 19-21.
Cote	1,5			
c. Épaisseur de la couche de confinement au-dessus de l'aquifère préoccupant ou de la voie d'exposition via les eaux souterraines 3 m ou moins (y compris couche de confinement absente ou discontinue) 3 à 10 m > 10 m Ne sais pas	Ne sais pas		Le terme « couche de confinement » renvoie à un matériau géologique dont la perméabilité ou la conductivité hydraulique est faible ou nulle (comme l'argile non fracturée); l'eau ne traverse pas cette couche ou y circule de façon extrêmement lente. Mesurer l'épaisseur et l'étendue des matériaux qui feront obstacle à la migration des contaminants dans les eaux souterraines. L'évaluation dans cette catégorie se fonde : 1) soit sur la présence et l'épaisseur des matériaux de subsurface saturés qui font obstacle à la migration verticale des contaminants vers les aquifères inférieurs qui servent ou peuvent servir de sources d'eau potable 2) soit sur la présence et l'épaisseur des matériaux de subsurface insaturés qui font obstacle à la migration verticale des contaminants entre l'emplacement de la source et la zone saturée (p. ex. aquifère à nappe libre, première unité hydrostratigraphique ou autre voie de passage de l'eau souterraine).	
Cote	0,5			
d. Conductivité hydraulique de la couche de confinement >10^{-4} cm/s ou absence de couche de confinement 10^{-4} à 10^{-6} cm/s <10^{-6} cm/s Ne sais pas	Ne sais pas		Déterminer la nature des matériaux géologiques et estimer la conductivité hydraulique en se fondant sur les documents publiés (ou utiliser la figure « Intervalle des valeurs de conductivité hydraulique et de perméabilité » dans la feuille Documentation). Attribuer une cote faible aux argiles non fracturées, une cote moyenne aux limons et une cote élevée aux sables et aux graviers. L'évaluation dans cette catégorie se fonde sur : 1) la présence et la conductivité hydraulique (« K ») de matériaux de subsurface saturés qui font obstacle à la migration verticale des contaminants vers les unités aquifères inférieures qui servent ou peuvent servir de sources d'eau potable ou de voie de migration de l'eau souterraine 2) la présence et la perméabilité (« k ») de matériaux de subsurface insaturés qui font obstacle à la migration verticale des contaminants entre l'emplacement de la source et la zone saturée (aquifère libre, première unité hydrostratigraphique ou autre voie de passage de l'eau souterraine).	
Cote	0,5			

(II) Potentiel de migration (évaluation des voies de migration des contaminants)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
e. Taux d'infiltration des précipitations (Facteur de précipitation annuelle x facteur de perméabilité relative du sol de surface) Élevé Modéré Faible Très faible Nul Ne sais pas	Ne sais pas		<u>Précipitations</u> Consulter les relevés des précipitations (qui incluent la neige) d'Environnement Canada pour les régions visées. Diviser la précipitation annuelle par 1 000 et arrondir à la dizaine (p. ex. 667 mm = cote de 0,7). <u>Perméabilité</u> Pour la perméabilité relative du sol de surface (c.-à-d. l'infiltration), supposer : gravier (1), sable (0,6), loam (0,3) et argile ou surface pavée (0). Pour obtenir la cote du taux d'infiltration des précipitations, multiplier le facteur d'infiltration par le facteur de précipitation.	
Cote	0,4			
f. Conductivité hydraulique de l'aquifère >10^{-2} cm/s 10^{-2} à 10^{-4} cm/s <10^{-4} cm/s Ne sais pas	Ne sais pas		Déterminer la nature des matériaux géologiques et estimer la conductivité hydraulique de tous les aquifères préoccupants en se fondant sur les documents publiés (consulter la figure « Intervalle des valeurs de conductivité hydraulique et de perméabilité » dans la feuille Documentation).	
Cote	1			
Total - Migration potentielle par les eaux souterraines	5,9	Remarque : S'il y a déjà une cote « connu », la cote « potentiel » est refusée.		
Cote « potentiel »permise	---			
Total - Migration par les eaux souterraines	**0**			
2. Mouvement des eaux de surface				
A. Migration démontrée des contaminants potentiellement préoccupants (CPP) dans les eaux de surface à des concentrations supérieures aux concentrations de fond				
Concentrations connues dans les eaux de surface : i) Concentrations qui dépassent les concentrations de fond et les Recommandations canadiennes pour la qualité des eaux (RCQE) du CCME en vue de la protection de la vie aquatique, de l'irrigation, de l'abreuvement des animaux d'élevage et/ou des activités récréatives, selon l'utilisation du site (>1 X). ou Contacts connus entre les contaminants et l'eau de surface d'après des observations sur place. ou En l'absence de RCQE, des analyses spécifiques effectuées sur place ont montré que les substances chimiques sont toxiques (p. ex. tests de toxicité ou autres tests d'indicateurs d'exposition).	12		Recueillir tous les renseignements disponibles sur la qualité des eaux de surface près du lieu. Évaluer les données en fonction des Recommandations canadiennes pour la qualité des eaux (choisir les recommandations pertinentes selon l'utilisation locale des eaux, p. ex. utilisation à des fins récréatives, irrigation, vie aquatique, abreuvement des animaux d'élevage). La méthode d'évaluation est centrée sur le régime d'écoulement des eaux de surface et sur la possibilité qu'il ouvre une voie d'exposition. La contamination est présente en surface (sur le sol) et risque d'avoir des répercussions sur les plans d'eau de surface. Les eaux de surface sont des masses d'eau qui soutiennent une des utilisations suivantes : activités récréatives, irrigation, abreuvement du bétail, vie aquatique.	Remarques générales : Quelqu'un d'expérience doit fournir une description détaillée des sources étudiées pour classer le plan d'eau de surface située à proximité du lieu contaminé. Les renseignements doivent être consignés dans la feuille de travail du SNCLC sur la classification des lieux, avec les noms et numéros de téléphone des personnes-ressources, les courriels et/ou les cartes de référence et les rapports et les autres sources comme les liens Internet. **Bibliographie choisie** : CCME. 1999. Recommandations canadiennes pour la qualité des eaux : protection de la vie aquatique. www.ccme.ca CCME. 1999. Recommandations canadiennes pour la qualité des eaux : protection des utilisations de l'eau à des fins agricoles (irrigation et abreuvement du bétail). www.ccme.ca Santé et Bien-être Canada. 1992. Recommandations au sujet de la qualité des eaux utilisées à des fins récréatives au Canada.
ii) Même chose qu'en i) sauf que la contamination n'est pas connue mais <u>fortement soupçonnée</u> (observations indirectes).	8			
iii) Concentrations qui respectent les RCQE ou absence de voie d'exposition via les eaux de surface (les eaux de surface les plus proches sont à > 5 km).	0			
Cote	0 0			
REMARQUE : Si une cote est attribuée ici pour la migration démontrée par les eaux de surface, sauter la partie B (Migration potentielle de CPP par les eaux de surface) et aller à la section 3 (Sols superficiels).				

Système national de classification du CCME (2008, 2010 v 1.2)

(II) Potentiel de migration (évaluation des voies de migration des contaminants)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
B. Migration potentielle de CPP par les eaux de surface				
a. Présence d'un ouvrage de confinement Aucun confinement Confinement partiel Confinement total Ne sais pas	Ne sais pas		Examiner les ouvrages en place, faire le lien avec l'état du lieu et de la proximité des eaux de surface et déterminer s'il y a confinement total : attribuer une cote faible s'il y a confinement total (p. ex. recouvrement, bermes, digues), une cote moyenne s'il y a confinement partiel (obstacles naturels, arbres, fossés, étangs de sédimentation) et une cote élevée s'il n'y a aucun obstacle entre le lieu et les eaux de surface avoisinantes. Le confinement total doit inclure le captage de toutes les substances chimiques.	
Cote	3			
b. Proximité d'eaux de surface 0 à <100 m 100 - 300 m >300 m Ne sais pas	Ne sais pas		Étudier les cartes géographiques et les données de relevé existantes pour déterminer à quelle distance se trouvent les plans d'eau de surface les plus proches.	
Cote	2			
c. Topographie Contaminants à la surface du sol et pente forte Contaminants au niv. du sol ou au-dessous et pente forte Contaminants en surface et pente moyenne Contaminants au niv. du sol ou au-dessous et pente moyenne Contaminants en surface et pente faible Contaminants au niv. du sol ou au-dessous et pente faible Ne sais pas	Ne sais pas		Examiner les documents techniques sur la topographie du lieu et le relief avoisinant. Pente forte = > 50 % Pente intermédiaire = entre 5 et 50 % Pente faible = < 5 % Remarque : Type d'aménagement des remblais (fossé, en surface, etc.).	
Cote	1			
d. Potentiel de ruissellement Élevé (cote de ruissellement pluvial > 0,6) Modéré (cote de ruissellement pluvial < 0,6) Faible (0,2 < cote de ruissellement pluvial < 0,4) Très faible (0 < cote de ruissellement pluvial < 0,2) Nul (cote de ruissellement pluvial = 0) Ne sais pas	Ne sais pas		<u>Précipitations</u> Consulter les relevés des précipitations d'Environnement Canada pour les régions visées. Diviser la précipitation par 1 000 et arrondir à la dizaine (p. ex. 667 mm = cote de 0,7). L'ancienne définition de « précipitation annuelle » n'englobait pas les précipitations sous forme de neige. Cette modification mineure a été apportée. La deuxième modification a consisté à inclure la perméabilité des matériaux de surface parmi les facteurs d'évaluation. <u>Perméabilité</u> Pour l'infiltration, supposer : gravier (0), sable (0,3), loam (0,6) et argile et surface pavée (1). Pour obtenir la cote de ruissellement, multipler le facteur d'infiltration par le facteur de précipitation.	Bibliographie choisie : Lien à la page Web d'Environnement Canada : <u>www.msc.ec.gc.ca</u> Conversion de la neige en pluie : appliquer un rapport de 15 (neige) pour 1 (eau).
Cote	0,4			
e. Potentiel d'inondation 1 fois en 2 ans 1 fois en 10 ans 1 fois en 50 ans Pas dans une plaine inondable Ne sais pas	Ne sais pas		Examiner les données publiées, comme les cartes des plaines inondables ou le potentiel d'inondation (p. ex. ruissellement printanier ou des montagnes) et les dossiers des offices de protection de la nature, pour évaluer le potentiel d'inondation par les cours d'eau situé à proximité, en amont et en aval. Attribuer une cote de zéro si le lieu ne se trouve pas dans une plaine inondable.	
Cote	0,5			
Total - Migration potentielle par les eaux de surface	6,9			
Cote « potentiel » permise	---	Remarque : S'il y a déjà une cote « connu », la cote « potentiel » est refusée.		
Total - Migration par les eaux de surface	**0**			

Système national de classification du CCME (2008, 2010 v 1.2)

(II) Potentiel de migration (évaluation des voies de migration des contaminants)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
3. Sols de surface (exposition possible par l'inhalation de poussières, le contact cutané ou l'ingestion)				
A. Présence démontrée de contaminants potentiellement préoccupants (CPP) dans les sols de surface (couche supérieure de 1,5 m)				
Les concentrations de CPP mesurées dans les sols superficiels dépassent les recommandations pour la qualité des sols du CCME. Le dépassement des recommandations est fortement soupçonné. Les concentrations de CPP dans les sols de surface ne dépassent pas les valeurs recommandées pour la qualité des sols par le CCME ou il n'y a pas de CPP (roche). Cote	12 9 0 12 12		Recueillir tous les renseignements disponibles sur la qualité des sols de surface (couche supérieure de 1,5 m) dans le lieu. Évaluer les données disponibles en fonction des Recommandations canadiennes pour la qualité des sols. Choisir les recommandations qui conviennent d'après l'utilisation actuelle (ou projetée) du terrain (agricole, résidentielle/parc, commerciale ou industrielle) et la texture du sol (grossière ou fine), le cas échéant.	**Bibliographie choisie** : CCME. 1999. Recommandations canadiennes pour la qualité des sols : environnement et santé humaine. www.ccme.ca
REMARQUE : Si une cote est attribuée ici pour la présence démontrée dans les sols de surface, sauter la partie B (Migration potentielle par les sols de surface) et aller à la section 4 (Vapeurs).				
B. Migration potentielle par les sols de surface (couche supérieure de 1,5 m)				
a. Les sols en question sont-ils recouverts? Exposés Végétalisés Aménagés Pavés Ne sais pas Cote	Ne sais pas 4		Consulter les rapports techniques ou les rapports d'évaluation des risques portant sur le lieu. On peut aussi examiner les photographies ou se rendre au lieu. Les sols de surface aménagés doivent avoir une couche arable d'au moins 0,5 m.	Le SNCLC révisé ne tient pas compte de la présence possible de contaminants dans la neige transportée par le vent, d'abord parce qu'il est difficile d'évaluer ce qui constitue une concentration inacceptable et ensuite parce qu'il est plus facile d'atténuer les effets de déversement dans la neige ou la glace tant qu'il gèle.
b. Durant quelle proportion de l'année le lieu reste-t-il couvert de neige? 0 à 10 % de l'année 10 à 30 % de l'année Plus de 30 % de l'année Ne sais pas Cote	Ne sais pas 3		Consulter les renseignements climatiques concernant le lieu. La gradation couvre les sols qui sont toujours mouillés ou recouverts de neige (et donc moins susceptibles de produire des poussières) jusqu'aux sols qui sont généralement secs et non recouverts de neige (et donc susceptibles de produire des poussières).	
Total - Migration potentielle par les sols superficiels	7			
Cote « potentiel » permise	---	**Remarque : S'il y a déjà une cote « connu », la cote « potentiel » est refusée.**		
Total - Migration par les sols	**12**			

Système national de classification du CCME (2008, 2010 v 1.2)

(II) Potentiel de migration (évaluation des voies de migration des contaminants)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
4. Vapeurs				
A. Présence démontrée de contaminants potentiellement préoccupants (CPP) dans les vapeurs				
On a mesuré dans les vapeurs (intérieures et extérieures) des concentrations dépassant les concentrations fondées sur le risque. Le dépassement est fortement soupçonné (d'après les observations et/ou la modélisation). On n'a pas mesuré de vapeurs sur place ni trouvé d'hydrocarbures volatils dans les sols ou les eaux souterraines du lieu. Cote	12 9 0 0 0		Consulter les études antérieures, notamment les évaluations des risques pour la santé humaine pour savoir si des vapeurs ont déjà été détectées.	
REMARQUE : Si une cote est attribuée ici pour la présence démontrée de CPP dans les vapeurs, sauter la partie B (Présence potentielle de CPP dans les vapeurs) et aller à la section 5 (Mouvements des sédiments).				
B. Présence potentielle de CPP dans les vapeurs				
a. Volatilité relative d'après la constante de la loi de Henry, H' (sans dimension) Élevée (H > 1,0E-1) Modérée (H = 1,0E-1 à 1,0E-3) Faible (H < 1,0E-3) Substance non volatile Ne sais pas Cote	Substance non volatile 0		Référence : US EPA Soil Screening Guidance (Part 5 - Table 36). *Document fourni dans la feuille Documentation.*	Si la constante de la loi de Henry appliquée à une substance indique que celle-ci n'est pas volatile et qu'on attribue une cote de zéro ici à l'égard de la volatilité relative, une cote de zéro sera automatiquement attribuée en réponse aux trois questions dans cette section sur la présence possible de CPP. Sauter à la section 5.
b. Quelle est la granulométrie du sol? Fine Grossière Ne sais pas Cote	Fine 0		Revoir les données sur la perméabilité des sols dans les rapports techniques. Plus les sols sont perméables, plus les vapeurs peuvent se déplacer. Les sols à texture fine sont ceux dont plus de 50 % (en poids) des éléments ont un diamètre moyen inférieur à 75 µm (D50 < 75 µm). Les sols à texture grossière sont ceux dont plus de 50 % (en poids) des éléments ont un diamètre moyen supérieur à 75 µm (D50 > 75 µm).	
c. La profondeur jusqu'à la source est-elle inférieure à 10 m? Oui Non Ne sais pas Cote	Non 0		Revoir les profondeurs de l'eau souterraine par rapport à la surface du lieu.	
d. Y a-t-il des voies de migration privilégiées? Oui Non Ne sais pas Cote	Non 0		Se rendre au lieu par temps sec en été et/ou étudier les photographies disponibles. S'il y a un substrat rocheux, les fractures constitueraient vraisemblablement des voies de migration privilégiées.	Les voies de migrations privilégiées renvoient aux zones où la migration des vapeurs est le plus susceptible de se produire, en raison d'une moindre résistance à l'écoulement dans les matériaux environnants. Par exemple, les canalisations souterraines comme les égouts et les gaines des services publics, les drains ou les installations septiques peuvent devenir des voies privilégiées. Dans les bâtiments, certaines caractéristiques peuvent aussi favoriser la migration : sols en terre battue, joints de dilatation, fissures dans les murs ou perforations des fondations pour le passage des canalisations de services publics, les puisards et les drains.
Total - Migration potentielle par les vapeurs Cote « potentiel » permise	0 ---	Remarque : S'il y a déjà une cote « connu », la cote « potentiel » est refusée.		
Total - Migration par les vapeurs	**0**			

Système national de classification du CCME (2008, 2010 v 1.2)

(II) Potentiel de migration (évaluation des voies de migration des contaminants)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
5. Mouvement des sédiments				
A. Migration démontrée de sédiments renfermant des contaminants potentiellement préoccupants (CPP)				
Il y a des indications que des sédiments déposés à l'origine dans le lieu (dépassant les valeurs recommandées par le CCME pour la qualité des sédiments) auraient migré.	12		Étudier les rapports d'évaluation des sédiments. Toute preuve de migration des contaminants par les sédiments doit être signalée par quelqu'un ayant de l'expérience dans le domaine.	Cette migration n'est habituellement pas considérée comme très préoccupante dans les milieux lacustres et marins, mais pourrait l'être dans les rivières, où le transport en aval est parfois important.
Migration fortement soupçonnée (d'après des observations et/ou la modélisation)	9			
Les sédiments ont été confinés, et rien n'indique qu'ils migreront. **ou** Il n'y a pas de voie d'exposition par les sédiments (c.-à-d. il n'y a pas de milieu aquatique récepteur, et donc pas de sédiments, dans un rayon de 5 km).	0			
	0			
Cote	0			
REMARQUE : Si une cote est attribuée ici pour la migration démontrée des sédiments, sauter la partie B (Migration potentielle des sédiments) et aller à la section 6 (Facteurs modificatifs).				
B. Migration potentielle par les sédiments				
a. Les sédiments dont les concentrations de CPP dépassent les valeurs recommandées sont-ils recouverts de sédiments dont les concentrations respectent les recommandations (« sédiments propres »)?	Non		Revoir les évaluations des sédiments. S'il y a eu carottage, les résultats peuvent indiquer que des sédiments contaminés dans le passé ont été recouverts par des sédiments « propres » plus récents. Aux fins de la présente évaluation, il faut que les carottes prélevées affichent de faibles concentrations près de la surface, les concentrations augmentant avec la profondeur des sédiments.	
Oui Non Ne sais pas	4			
b. Dans les habitats lacustres et marins, les sédiments contaminés se trouvent-ils dans les eaux peu profondes et sont-ils donc susceptibles de subir l'action des marées et des vagues ou du remous des hélices?	Non		Revoir les évaluations des sédiments. Si les sédiments au site se trouvent dans une rivière, répondre « non » à cette question.	
Oui Non Ne sais pas	0			
c. Dans les rivières, les sédiments contaminés se trouvent-ils dans des zones sujettes à l'affouillement?	Non		Revoir les évaluations des sédiments. Il importe que l'évaluation soit réalisée en fonction des débits du pire scénario (débits annuels élevés). En cas de débits annuels élevés, les zones qui sont habituellement des zones de sédimentation deviennent des zones d'affouillement. Si les sédiments au site se trouvent dans un lac ou un habitat marin, répondre « non » à cette question.	
Oui Non Ne sais pas	0			
Total - Migration potentielle par les sédiments	4			
Cote « potentiel » permise	---	Remarque : S'il y a déjà une cote « connu », la cote « potentiel » est refusée.		
Total - Migration par les sédiments	**0**			
6. Facteurs modificatifs				
Y a-t-il des canalisations souterraines de services publics dans la zone touchée par la contamination?	Oui		Consulter les rapports techniques. Les ouvrages souterrains de services publics peuvent servir de voie de migration aux contaminants.	
Oui Non Ne sais pas				
Connu	4			
Potentiel	0			

Total - Potentiel de migration

Total brut « connu »	16	
Total brut « potentiel »	0,0	Remarque : Si les cotes « connu » et « potentiel » sont fournies, le système inscrit « connu » par défaut. La cote « potentiel » totale peut donc ne pas correspondre à la somme des cotes « potentiel » particulières.
Total brut combiné	16,0	
Total (max. 33)	**8,3**	

Système national de classification du CCME (2008, 2010 v 1.2)

(III) Exposition (mise en évidence de la présence d'une voie d'exposition et de récepteurs)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
1. Exposition humaine				
A. Exposition humaine connue				
Effet négatif documenté ou forte exposition quantifiée qui a entraîné ou entraînera un effet négatif, un préjudice ou une atteinte à la sécurité des humains à cause de la contamination du lieu. (Lieu de classe 1*)	22		*Si des effets négatifs sur les humains sont documentés, le lieu devrait automatiquement être rangé dans la classe 1 (intervention requise). Il est inutile d'appliquer le SNCLC dans ce cas. Toutefois, une cote de "22" est attribuée dans l'éventualité où on voudrait obtenir une cotation numérique pour le lieu (p. ex. pour le comparer à d'autres sites de classe 1).	Parmi les effets négatifs connus figurent ceux qui sont attribuables aux sources locales et traditionnelles d'alimentation. Les effets négatifs attribuables au transfert des contaminants aux humains et/ou aux animaux via la chaîne alimentaire peuvent être classés dans cette catégorie. Toutefois, il faut faire la démonstration d'un lien direct entre la source d'aliments contaminés et l'ingestion (transfert) des contaminants par les humains. Les effets négatifs connexes pour l'environnement sont cotés séparément plus loin dans cette feuille de travail.
Même chose que ci-dessus, sauf que l'exposition est « fortement soupçonnée » (observations ou preuves indirectes).	10		Le classement dans cette catégorie peut être basé sur les résultats des évaluations des risques. On s'intéresse aux études qui indiquent des quotients de danger > 1 dans le cas de substances chimiques non cancérogènes et un risque supplémentaire de cancer à l'égard des substances chimiques cancérogènes qui dépasse la valeur acceptable définie par les autorités (dans la plupart des cas, > 10^{-5} ou > 10^{-6}). Les effets connus peuvent aussi être évalués au moyen d'analyses sanguines (p. ex. plombémie > 10 mg/dL) ou d'autres analyses de santé.	Quelqu'un d'expérience doit fournir une description détaillée des sources étudiées pour évaluer et déterminer l'exposition quantifiée ou l'effet négatif au voisinage du lieu contaminé. **Bibliographie choisie** : Santé Canada – L'évaluation du risque pour les lieux contaminés fédéraux au Canada – Partie I (L'évaluation quantitative préliminaire des risques (ÉQPR) pour la santé humaine) et Partie II (les valeurs toxicologiques de référence (VTR) de Santé Canada). http://www.hc-sc.gc.ca/ewh-semt/pubs/contamsite/index_f.html. United States Environmental Protection Agency, Integrated Risk Information System (IRIS) – http://toxnet.nml.nih.gov
Aucune exposition ni aucun effet quantifiés ou soupçonnés chez les humains.	0			
	0			
Cote	0		Le classement dans cette catégorie peut être basé sur les résultats des évaluations des risques. On s'intéresse aux études qui indiquent des quotients de danger inférieurs à 0,2 dans le cas des substances chimiques non cancérogènes et un risque supplémentaire de cancer à vie dans le cas des substances chimiques cancérogènes qui respecte la valeur acceptable définie par les autorités (dans la plupart des cas, moins que 10^{-6} ou que 10^{-5}).	
REMARQUE : Si une cote est attribuée ici pour Exposition connue, sauter la partie B (Exposition humaine potentielle) et aller à la section 2 (Facteurs modifiant l'exposition humaine).				
B. Exposition humaine potentielle				
a) Utilisation du terrain (indication des scénarios possibles d'exposition humaine) Agricole Résidentielle / Parc Commerciale Industrielle Ne sais pas			Étudier les cartes de zonage et d'utilisation des terres sur les superficies indiquées. Si l'utilisation proposée est plus « sensible » que l'utilisation actuelle, évaluer le facteur en supposant que l'utilisation proposée est en vigueur. L'utilisation agricole se rapporte aux activités qui mettent en jeu la capacité de production du terrain ou de l'établissement (p. ex. une serre) et sont de nature agricole ou aux activités d'alimentation et d'hébergement d'animaux d'élevage. Les terrains à vocation résidentielle ou de parc servent à l'habitation permanente, temporaire ou saisonnière (utilisation résidentielle) et à des activités récréatives qui font appel à la capacité naturelle ou aménagée par l'homme du terrain de soutenir ces activités (parc). Les utilisations commerciale et industrielle se rattachent aux activités d'achat, de vente ou d'échange de marchandises ou de services (utilisation commerciale), ainsi qu'à la production, la fabrication ou l'entreposage de matériaux (utilisation industrielle).	Voici le principal facteur « récepteur » utilisé pour coter les lieux. Une cote élevée suppose une exposition forte et/ou l'exposition de récepteurs humains sensibles (p. ex. des enfants).
	Rés. / Parc			
Cote	2			
b) Degré d'accessibilité à la partie contaminée du lieu (indication de la possibilité d'entrer en contact avec des contaminants) Obstacles limités pour empêcher l'accès au lieu; contaminants non recouverts. Accès moyen ou absence d'obstacles; contaminants couverts. Endroits éloignés où les contaminants ne sont pas recouverts. Accès contrôlé ou endroit éloigné; contaminants recouverts. Ne sais pas			Étudier l'emplacement, les ouvrages et les contaminants au lieu et déterminer si des obstacles s'interposent entre le lieu et les humains. Attribuer une cote faible à un lieu (couvert) entouré d'une clôture ou à un endroit éloigné, et une cote élevée à un lieu sans couverture, ni clôture ni obstacle naturel ou zone tampon.	
	Moy. access., couverts			
Cote	1			
c) Absorption possible de sols, eaux, sédiments ou aliments contaminés pour les voies d'exposition opérantes ou potentiellement opérantes, telles qu'indiquées dans la feuille de travail II (Potentiel de migration). i) contact direct Prévoit-on un contact cutané avec des eaux de surface, eaux souterraines, sédiments ou sols contaminés? Oui Non Ne sais pas			S'il y a des sols ou des eaux souterraines potables qui dépassent les valeurs recommandées par le CCME, on suppose qu'il y a contact cutané. L'exposition à des eaux de surface, des eaux souterraines non potables ou à des sédiments qui dépassent les valeurs recommandées par le CCME varie selon le lieu. Choisir « Oui » si on prévoit une exposition cutanée à des eaux de surface, des eaux souterraines non potables ou à des sédiments. Par exemple, on ne prévoirait pas un contact cutané avec des sédiments dans un port en activité. Seuls les sols de la couche supérieure (1,5 m) sont définis comme des sols de surface par le CCME (2006). Lorsque les sols contaminés sont situés à une profondeur supérieure à 1,5 m, le contact direct n'est pas considéré comme une voie d'exposition opérante.	L'exposition par la peau est généralement considérée comme une voie d'exposition mineure. Toutefois, pour certains contaminants organiques, l'exposition cutanée peut être une composante très importante de l'exposition globale. L'exposition cutanée peut se produire lorsqu'on nage dans des eaux contaminées, lorsqu'on fait sa toilette avec des eaux de surface ou souterraines contaminées, lorsqu'on creuse dans de la terre contaminée, etc.
	Ne sais pas			
Cote	1,5			

(III) Exposition (mise en évidence de la présence d'une voie d'exposition et de récepteurs)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
ii) inhalation (de poussières, de vapeurs)				L'exposition par les poumons (inhalation) peut s'avérer une voie d'exposition très importante. On peut inhaler des particules (poussières) et des gaz (vapeurs). Les vapeurs peuvent poser un problème dans les bâtiments érigés sur d'anciens sites industriels ou dans les bâtiments sous lesquels des contaminants volatils ont migré et où des vapeurs risquent de s'introduire.
Vapeurs - Y a-t-il dans le lieu des bâtiments habitables situés à moins de 30 m des sols ou eaux souterraines contaminés par des composés volatils, tel que déterminé dans la feuille de travail II (Potentiel de migration)?			S'il y a des bâtiments habitables au site à moins de 30 m de sols ou d'eaux souterraines dont les concentrations de composés chimiques volatils dépassent les recommandations, il peut y avoir un risque pour la santé humaine (Santé Canada, 2004). Revoir les études portant sur le lieu pour déterminer où ont été prélevés les échantillons de sol (dont les concentrations de substances volatiles dépassent les valeurs prescrites) par rapport aux bâtiments. Consulter la feuille de travail (II) Potentiel de migration, 4B.a), *Présence potentielle de CPP dans les vapeurs,* pour trouver une définition de la volatilité.	Il s'agit d'évaluer la possible exposition humaine à des vapeurs provenant des sols du lieu. Plus le récepteur se trouve proche d'une source de substances chimiques volatiles dans le sol, plus l'exposition est probable. Par ailleurs, les sols à texture grossière laissent passer les vapeurs beaucoup plus facilement que les matériaux à texture fine comme les argiles et les limons.
Oui				
Non				
Ne sais pas	Non			Remarques générales : Quelqu'un d'expérience doit fournir une description détaillée des sources étudiées afin de déterminer s'il y a ou non migration de vapeurs et/ou production de poussières au voisinage du lieu contaminé. Les renseignements doivent être consignés dans la feuille de travail du SNCLC pour la classification des lieux, avec les noms et numéros de téléphone des personnes-ressources, les courriels et/ou les cartes de référence et les rapports et d'autres ressources comme les liens Internet.
Cote	0			
Poussières - S'il y a des sols de surface (couche supérieure de 1,5 m) contaminés, indiquer s'il s'agit de sols à granulométrie fine ou grossière. Si on sait que les sols superficiels ne sont pas contaminés, attribuer une cote de zéro.			Voir les données sur la granulométrie des sols du lieu. Les sols (dont les concentrations dépassent les valeurs recommandées par le CCME pour la qualité des sols) constitués surtout de matériaux fins (dont la granulométrie médiane est de 75 microns, tel que défini par le CCME [2006]) sont plus susceptibles de produire des poussières.	**Bibliographie choisie** : Conseil canadien des ministres de l'Environnement (CCME). 2006. Protocole d'élaboration de recommandations pour la qualité des sols en fonction de l'environnement et de la santé humaine. PN 1333. www.ccme.ca Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA). Présenté à Santé Canada, Burnaby (BC).
Fine				
Grossière				
Sols superficiels non contaminés ou absents (roche)				
Granulométrie inconnue (Ne sais pas)				
Cote	Non contaminés			
	0			
Total - Inhalation	0			
iii) Ingestion (d'aliments, d'eaux et de sols [par des enfants], y compris les aliments traditionnels)			Revoir les données disponibles sur le lieu pour déterminer si l'eau potable (eaux souterraines, eaux de surface, approvisionnements privés, commerciaux ou municipaux) contient ou est soupçonnée de contenir des concentrations de contaminants supérieures aux Recommandations pour la qualité de l'eau potable au Canada. Si l'on sait que les réserves d'eau potable sont contaminées, il faut prendre des mesures sans tarder (p. ex. assurer une autre source d'eau potable pour réduire ou éliminer l'exposition). L'évaluation d'une probabilité élevée de dépassement des valeurs recommandées pour l'approvisionnement en eau potable à l'avenir peut se fonder sur les aires de captage des puits d'eau potable, sur le temps de déplacement des contaminants et sur la modélisation informatique de l'écoulement et du transport des contaminants.	**Bibliographie choisie :** Recommandations pour la qualité de l'eau potable au Canada : www.hc-sc.gc.ca/hecs-sesc/water/publications/drinking_water_quality_guidelines/toc.htm L'eau potable peut être une voie d'exposition extrêmement importante chez les humains. Si les eaux souterraines ou les eaux de surface du lieu ne sont pas utilisées comme eau de boisson, on peut considérer cette voie d'exposition comme inopérante. Tenir compte des aliments provenant des espèces sauvages (comme le saumon, le gibier, le caribou) et des produits agricoles, si le lieu contaminé se trouve dans des terrains à vocation agricole ou à proximité.
Eau potable : Choisir la cote en fonction de la proximité d'une réserve d'eau potable, pour indiquer la probabilité de contamination (actuelle et future).				
0 à 100 m				
100 à 300 m				
300 m à 1 km				
1 à 5 km				
Aucune présence d'eau potable				
Ne sais pas	Aucune présence d'eau po			
Cote	0			
Une autre source d'approvisionnement en eau est-elle facilement accessible?				
Oui				
Non				
Ne sais pas	Non			
Cote	1			
L'ingestion de sols contaminés par des humains est-elle possible?			Si les sols contaminés sont situés dans la couche supérieure (1,5 m), on suppose que l'ingestion des sols est une voie d'exposition opérante. Une exposition à des sols situés sous la couche supérieure est possible, mais moins probable, et sa durée plus courte. Voir les rapports d'évaluation des risques pour la santé humaine concernant le lieu en question.	
Oui				
Non				
Ne sais pas	Non			
Cote	0			
Les aliments consommés par les humains (plantes, animaux domestiques ou espèces sauvages) proviennent-ils du lieu contaminé ou des environs?			Consulter les rapports d'évaluation des risques pour la santé humaine (ou d'autres rapports) pour déterminer si les gens de l'endroit mangent beaucoup d'aliments traditionnels provenant du lieu. Les animaux chassés doivent-ils passer beaucoup de temps au lieu (p. ex. il arrive que les gros mammifères ne passent que très peu de temps dans un petit lieu contaminé)? Les rapports d'évaluation des risques pour la santé humaine concernant le lieu en question donnent aussi des renseignements sur la bioaccumulation possible des CPP en cause.	
Oui				
Non				
Ne sais pas	Non			
Cote	0			

Système national de classification du CCME (2008, 2010 v 1.2)

(III) Exposition (mise en évidence de la présence d'une voie d'exposition et de récepteurs)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
Total - Ingestion	1			
Cote « potentiel » total - Exposition humaine	5,5	Remarque : S'il existe une cote « connu », la cote « potentiel » est refusée.		
Cote « potentiel » permise	---			

(III) Exposition (mise en évidence de la présence d'une voie d'exposition et de récepteurs)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
2. Facteurs modifiant l'exposition humaine				
a) Forte dépendance des gens de l'endroit à l'égard des ressources naturelles pour leur survie (aliments, eau, abri, etc.)	Non			
Oui				
Non				
Ne sais pas				
Connu	0			
Potentiel	---			
Cote brute totale « connu » - Exposition humaine	0			
Contaminants au niv. du sol ou au-dessous et pente forte	0			
Cote brute totale - Exposition humaine	0			
Contaminants au niv. du sol ou au-dessous et pente faible	**0,0**			
3. Récepteurs écologiques				
A. Exposition connue des récepteurs écologiques				
Effet négatif documenté ou forte exposition quantifiée qui a entraîné ou entraînera un effet négatif, un préjudice ou une atteinte à la sécurité des organismes terrestres ou aquatiques à cause de la contamination du lieu.	18		Un niveau faible d'effets sur les récepteurs écologiques est jugé acceptable, en particulier dans des terrains commerciaux et industriels. Toutefois, si les effets écologiques sont jugés graves, le lieu pourrait être rangé dans la classe 1 (c.-à-d. une priorité de réhabilitation ou de gestion des risques) quelle que soit la cote totale numérique du SNCLC. Aux fins de l'application du SNCLC, les effets considérés comme graves englobent les effets observés sur la survie, la croissance ou la reproduction qui peuvent menacer la viabilité d'une population de récepteurs écologiques au lieu. D'autres indications d'effets négatifs graves peuvent être déterminées selon le jugement professionnel et de concert avec l'administration compétente. Si les effets écologiques sont jugés graves et que le lieu est automatiquement rangé dans la classe 1, il est inutile d'appliquer le SNCLC. Toutefois, une cote de "18" est fournie dans l'éventualité où on voudrait obtenir une cotation numérique (p. ex. pour comparer le lieu à d'autres sites de classe 1).	CCME, 1999 : Recommandations pour la qualité de l'eau en vue de la protection de la vie aquatique. www.ccme.ca CCME, 1999 : Recommandations pour la qualité de l'eau en vue de protéger les utilisations de l'eau à des fins agricoles. www.ccme.ca Sensitive receptors- review: Canadian Council on Ecological Areas/Conseil canadien des aires écologiques; www.ccea.org. Les effets écologiques devraient être évalués au niveau d'une population ou d'une communauté et non au niveau des individus. Par exemple, des effets au niveau de la population pourraient englober la réduction de la reproduction, de la croissance ou de la survie au sein d'une espèce. Les effets au niveau de la communauté pourraient comprend la réduction de la diversité de l'espèce ou de son abondance relative. D'autres renseignements sur les paramètres de l'évaluation écologique sont donnés dans le Cadre pour l'évaluation du risque écotoxicologique : Orientation générale (CCME, 1996).
Même chose que ci-dessus, sauf que l'exposition est « fortement soupçonnée » (observations ou preuves indirectes).	12		Le classement dans cette catégorie peut être basé sur les résultats des évaluations des risques. On s'intéresse aux études qui indiquent des quotients de danger > 1. On peut aussi évaluer les impacts connus en se fondant sur l'analyse du poids de la preuve faisant appel à une combinaison d'observations sur les lieux, de dosage des tissus, d'analyse de la toxicité et d'appréciation quantitative des communautés. La cotation des effets négatifs sur chaque espèce rare ou en voie de disparition se fait au cas par cas en se fondant sur des données scientifiques exhaustives.	Remarques : Quelqu'un d'expérience doit fournir une description détaillée des sources étudiées pour classer les récepteurs écologiques au voisinage du lieu contaminé. Les renseignements doivent être consignés dans la feuille de travail du SNCLC pour la classification des lieux, avec les noms et numéros de téléphone des personnes-ressources, les courriels et/ou les cartes de référence et rapports et d'autres ressources comme les liens Internet.
Aucun impact ni aucune exposition quantifiés ou soupçonnés chez les organismes terrestres et aquatiques.	0		Le classement dans cette catégorie peut être basé sur les résultats des évaluations des risques. On s'intéresse aux études qui ont indiqué des quotients de danger < 1 sans aucun autre signe observable ou mesurable d'effets. On peut aussi se fonder sur d'autres sources de données n'indiquant pas d'effets nocifs, comme des observations sur place, des dosage des tissus, des analyses de la toxicité et des appréciations quantitatives des communautés.	
	0			
Cote	0			
REMARQUE : Si une cote est attribuée ici pour l'exposition connue, sauter la partie B (Exposition potentielle des récepteurs écologiques) et aller à la section 4 (Facteurs modifiant l'exposition des récepteurs écologiques).				

(III) Exposition (mise en évidence de la présence d'une voie d'exposition et de récepteurs)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
B. Exposition potentielle des récepteurs écologiques (pour la partie contaminée du lieu)				
a) Milieu terrestre			Étudier les cartes de zonage et d'utilisation des terres. Si l'utilisation proposée du terrain est plus « sensible » que l'utilisation actuelle, évaluer ce facteur en supposant que l'utilisation proposée est en vigueur (indiquer dans la feuille de travail que l'utilisation future est celle dont il est tenu compte). L'utilisation agricole se rapporte aux activités qui mettent en jeu la capacité de production du terrain ou de l'établissement (p. ex. une serre) et sont de nature agricole ou aux activités d'alimentation et d'hébergement d'animaux d'élevage. Les milieux sauvages sont groupés avec les terrains agricoles en raison de la similitude des récepteurs qu'on s'attend à y trouver (p. ex. mammifères herbivores et oiseaux) et du besoin analogue d'un degré élevé de protection pour assurer le fonctionnement écologique. Les terrains à vocation résidentielle ou de parc servent à l'habitation permanente, temporaire ou saisonnière (utilisation résidentielle) et à des activités récréatives qui font appel à la capacité naturelle ou aménagée par l'homme du terrain de soutenir ces activités (parc). Les utilisations commerciale et industrielle se rattachent aux activités d'achat, de vente ou d'échange de marchandises ou de services (utilisation commerciale), ainsi qu'à la production, la fabrication ou l'entreposage de matériaux (utilisation industrielle).	
i) Utilisation du terrain				
Agricole (ou milieux sauvages)				
Résidentielle/Parc				
Commerciale				
Industrielle				
Ne sais pas				
	Résidentielle/Parc			
Cote	2			
ii) Possibilité d'absorption			Si les sols contaminés sont situés dans la couche supérieure de 1,5 m, on suppose que le contact direct des sols avec les plantes et les invertébrés du sol constitue une voie d'exposition. L'exposition aux sols se trouvant à une profondeur supérieure à 1,5 m est possible, mais moins probable.	
Contact direct - Les plantes et/ou les invertébrés du sol risquent-ils d'être exposés à des sols contaminés dans le lieu?				
Oui				
Non				
Ne sais pas				
	Non			
Cote	0			
iii) Ingestion (animaux sauvages ou domestiques qui ingèrent des aliments, sols ou eaux contaminés)				
Les animaux terrestres risquent-ils d'ingérer de l'eau contaminée dans le lieu?			Consulter une évaluation du risque écotoxicologique pour le site. S'il y a des eaux de surface contaminées, supposer que les organismes terrestres vont en ingérer.	
Oui				
Non				
Ne sais pas	Non			
Cote	0			
Les animaux terrestres risquent-ils d'ingérer des sols contaminés dans le lieu?			Consulter un rapport d'évaluation du risque écotoxicologique. La plupart des animaux vont ingérer des sédiments en mangeant des matières végétales ou des invertébrés du sol.	
Oui				
Non				
Ne sais pas	Non			
Cote	0			
Les contaminants identifiés peuvent-ils se bioaccumuler?			La bioaccumulation d'un contaminant dans les aliments est jugée possible si : 1) le coefficient de partage octanol-eau (log K_{ow}) du contaminant est supérieur à 4 (selon la feuille de travail sur les caractéristiques des contaminants) et sa concentration dans le sol dépasse les recommandations les plus prudentes du CCME pour la qualité des sols à l'égard de l'utilisation prévue du terrain ou 2) la concentration du contaminant relevée dans les échantillons de tissus dépasse les Recommandations canadiennes pour les résidus dans les tissus.	
Oui				
Non				
Ne sais pas	Non			
Cote	0			
Proximité d'une zone écologique sensible			On considère qu'en deçà de 300 m d'un site, il y a risque de contamination. Par conséquent, un récepteur écologique situé dans ce rayon du lieu doit faire l'objet d'évaluations plus poussées. On considère également que tout récepteur écologique situé à plus de 5 km n'a pas à être évalué. Étudier les cartes et les documents des offices de protection de la nature et consulter notamment le site du Conseil canadien des aires écologiques : www.ccea.org [en anglais seulement].	Les récepteurs écologiques comprennent : les espèces locales, régionales ou provinciales d'intérêt ou importantes, les milieux arctiques (selon le lieu), les réserves naturelles, les habitats d'espèces en voie de disparition, les forêts sensibles, les forêts ou parcs naturels.
0 à 300 m				
300 m à 1 km				
1 à 5 km				
> 5 km				
Ne sais pas				
	> 5 km			
Cote	0,5			
Cote brute totale « potentiel » - Milieu terrestre	2,5	Remarque : S'il existe une cote « connu », la cote « potentiel » est refusée.		
Cote totale « potentiel » permise - Milieu terrestre	---			

(III) Exposition (mise en évidence de la présence d'une voie d'exposition et de récepteurs)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
b) Milieu aquatique			Les « milieux aquatiques sensibles » comprennent ceux dans les aires de récolte des poissons et des mollusques et crustacés, les parcs marins, les réserves écologiques et les voies migratoires de poissons, ou à proximité de ces endroits. Ils comprennent aussi les zones d'importance écologique, comme les aires d'alimentation et de fraye des poissons ou les zones abritant des espèces rares ou en voie de disparition. Les « milieux aquatiques typiques » comprennent les zones autres que celles énumérées ci-dessus.	
i) Classification des milieux aquatiques Sensible Typique Sans objet (absence de milieu aquatique) Ne sais pas				
Sans objet (absence de milieu a				
Cote	0			
ii) Possibilité d'absorption Les concentrations de contaminants relevées dans les eaux souterraines qui font résurgence dans les eaux de surface dépassent-elles les valeurs recommandées par le CCME pour la qualité des eaux (protection de la vie aquatique) au point de contact? Oui Non Ne sais pas			Il y a trois façons d'estimer la concentration en contaminants des eaux souterraines au point de contact avec un milieu récepteur aquatique : 1) par la comparaison des concentrations relevées dans les eaux souterraines près du rivage avec les recommandations du CCME pour la qualité des eaux (il s'agit d'une comparaison prudente, car la concentration en contaminants des eaux souterraines diminue souvent entre les puits situés près du rivage et le point de rejet); 2) par la modélisation des eaux souterraines pour estimer leur concentration immédiatement avant le rejet; 3) par l'installation d'échantillonneurs d'eau dans les sédiments de la zone d'affleurement des eaux souterraines.	
Non				
Cote	0			
Proximité d'une importante ressource d'eau de surface 0 à 300 m 300 m à 1 km 1 à 5 km > 5 km Ne sais pas				Les récepteurs écologiques comprennent : les espèces locales, régionales ou provinciales d'intérêt ou d'importance, les milieux humides et tourbières sensibles et d'autres milieux aquatiques.
> 5 km			On considère qu'en deçà de 300 m d'un site, il y a risque de contamination. Par conséquent, un récepteur écologique ou une importante ressource d'eau de surface situés dans ce rayon du lieu doivent faire l'objet d'évaluations plus poussées. On considère par ailleurs que tout récepteur écologique situé à plus de 5 km n'a pas à être évalué. Étudier les cartes et les documents des offices de protection de la nature, et consulter notamment le site du Conseil canadien des aires écologiques : www.ccea.org [en anglais seulement].	
Cote	0,5			
			La bioaccumulation d'un contaminant dans les aliments est possible si : 1) Le coefficient de partage octanol-eau (log K_{oe}) du contaminant est supérieur à 4 (selon la feuille de travail sur les caractéristiques des contaminants) et sa concentration dans les sédiments dépasse les valeurs des Recommandations provisoires pour la qualité des sédiments (RPQS) du CCME. 2) La concentration du contaminant relevée dans les échantillons de tissus dépasse les Recommandations canadiennes pour les résidus dans les tissus.	*Voir la feuille Documentation concernant le log K_{oe}.*
Les espèces (poissons fourrage, invertébrés ou plantes) dont se nourrissent les poissons prédateurs ou d'autres consommateurs d'espèces sauvages, comme les mammifères et les oiseaux, sont-elles susceptibles d'accumuler les contaminants dans leurs tissus? Oui Non (ou sans objet) Ne sais pas				
Non				
Cote	0			
Cote brute totale « potentiel » - Milieu aquatique	0,5	Remarque : S'il existe une cote « connu », la cote « potentiel » est refusée.		
Cote totale « potentiel » permise - Milieu aquatique	---			

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(III) Exposition (mise en évidence de la présence d'une voie d'exposition et de récepteurs)

Lieu d'essai

Définition	Cote	Justification de la cote (indiquer les hypothèses, les rapports ou les informations propres au lieu et fournir des références)	Méthode d'évaluation	Notes
4. Facteurs modifiant l'exposition des récepteurs écologiques				
a) Présence connue d'une espèce en péril			Consulter un rapport d'évaluation du risque écotoxicologique. Si l'information n'est pas disponible, utiliser des bases de données en ligne comme Eco Explorer. Le personnel régional, provincial (ministère de l'Environnement) ou fédéral (Pêches et Océans Canada ou Environnement Canada) devrait pouvoir donner des conseils.	Une espèce en péril est une espèce sauvage disparue du pays, en voie de disparition, menacée ou préoccupante. Pour obtenir la liste des espèces en péril, consulter l'annexe 1 de la *Loi sur les espèces en péril* du gouvernement fédéral (http://www.sararegistry.gc.ca/species/schedules_f.cfm?id=1). De nombreux gouvernements provinciaux peuvent fournir des listes d'espèces en péril applicables à la région. Par exemple, en Colombie-Britannique, consulter : BCMWLAP. 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection. http://srmwww.gov.bc.ca/atrisk/red-blue.htm
Une espèce en péril risque-t-elle de se trouver dans le lieu?				
Oui				
Non				
Ne sais pas	Non			
Cote	0 ---			
b) Effets esthétiques potentiels (p. ex. enrichissement d'un lac ou altération de la saveur d'un aliment)				
Y a-t-il des signes d'impact esthétique dans les plans d'eau récepteurs?	Non		La documentation peut comprendre des rapports d'étude environnementale, des articles de journaux, des pétitions ou d'autres dossiers.	Pour cet élément, l'utilisateur devra fournir certains renseignements, notamment les noms, adresses, numéros de téléphone et adresses courriel des personnes-ressources. Les preuves de changement doivent être documentées; prière de joindre un exemplaire du rapport contenant les renseignements utiles.
Oui				
Non	0			
Ne sais pas	---			
Y a-t-il des signes d'impact olfactif (odeur désagréable)?	Non		Parmi les exemples d'altérations olfactives peuvent figurer l'odeur d'un CPP ou l'augmentation de la vitesse de décomposition d'un habitat aquatique.	
Oui				
Non	0			
Ne sais pas	---			
Y a-t-il des signes d'augmentation de la croissance des plantes dans le lac ou le plan d'eau?	Non		L'augmentation manifeste de la croissance des plantes dans un milieu aquatique peut signaler un enrichissement. Les nutriments (p. ex. l'azote ou le phosphore) libérés dans un milieu aquatique peuvent agir comme engrais.	
Oui				
Non	0			
Ne sais pas	---			
Y a-t-il des signes que la chair de poisson ou la viande qui proviennent du lieu ou à proximité ont une odeur ou un goût différents?	Non		Certains contaminants peuvent entraîner un changement manifeste dans l'odeur ou le goût des aliments récoltés sur place.	
Oui	0			
Non	---			
Ne sais pas				
Total « connu » - Facteurs modifiant l'exposition des récepteurs écologiques	**0**			
Total « potentiel » - Facteurs modifiant l'exposition des récepteurs écologiques	**---**			
Cote brute totale « connu » - Récepteurs écologiques	0			
Cote brute totale « potentiel » - Récepteurs écologiques	0			
Total brut - Récepteurs écologiques	0			
Total - Récepteurs écologiques (max. 18)	**0,0**			
5. Autres récepteurs possibles de contaminants				
a) Exposition du pergélisol (entraînant des problèmes d'érosion et de structure)				Les plantes et les lichens forment une couche isolante naturelle qui aide à empêcher la fonte du pergélisol en été. Parfois aussi, les plantes et les lichens absorbent moins le rayonnement solaire. Le rayonnement solaire est transformé en chaleur, ce qui peut faire fondre la couche de pergélisol.
Y a-t-il au site des aménagements (routes, bâtiments) dont l'intégrité structurelle dépend du pergélisol?	Non		Consulter les rapports techniques et examiner les plans ou les photos aériennes du lieu. Lorsque le pergélisol fond, la stabilité du sol diminue, entraînant une érosion. Les aménagements humains, comme les routes et les bâtiments, sont souvent tributaires de la stabilité que procure le pergélisol.	
Oui				
Non	0			
Ne sais pas	---			
Y a-t-il une voie de migration susceptible de transporter des sols libérés par le pergélisol dégradé vers un milieu aquatique avoisinant?	Non		Lorsque le pergélisol fond, le sol dessous perd sa stabilité. L'érosion éolienne ou le ruissellement peuvent transporter des sols vers les milieux aquatiques situés à proximité. L'augmentation de la charge en sol dans une rivière peut entraîner une hausse des matières dissoutes totales et une diminution correspondante de la qualité de l'habitat aquatique. De plus, l'érosion peut transporter les contaminants provenant des sols dans les milieux aquatiques.	
Oui				
Non	0			
Ne sais pas	---			
Total « connu » - Autres récepteurs possibles	**0**			
Total « potentiel » - Autres récepteurs possibles	**0**			

Total - Exposition

Cote brute totale « connu » - Exposition humaine et écologique	0	
Cote brute totale « potentiel » - Exposition humaine et écologique	0	Ne comprend que la cote « potentiel » permise. Si une cote « connu » a été attribuée dans une catégorie donnée, la cote « potentiel » n'est pas incluse.
Cote brute totale	0	
Total - Exposition (max. 34)	**0,0**	

Système national de classification du CCME (2008, 2010 v 1.2)
Sommaire de cotation

Les cotes de chaque feuille de travail sont récapitulées dans ce sommaire.
Se reporter au sommaire après avoir rempli au complet les autres feuilles du SNCLC.

I. Caractéristiques des contaminants	Connu	Potentiel
1. Milieux de séjour	2	---
2. Danger chimique	---	4
3. Facteur de dépassement des contaminants	2	---
4. Quantité de contaminants	2	---
5. Facteurs modificatifs	0	1
Cote brute totale	6	5
Cote brute totale (Connu + potentiel)	11	
Cote totale rajustée (cote brute totale / 40 * 33)	**9,1**	(max. 33)

II. Potentiel de migration	Connu	Potentiel
1. Mouvement des eaux souterraines	0	---
2. Mouvement des eaux de surface	0	---
3. Sols	12	---
4. Vapeurs	0	---
5. Mouvement des sédiments	0	---
6. Facteurs modificatifs	4	0
Cote brute totale	16	0
Cote brute totale (Connu + potentiel)	16	
Cote totale rajustée (cote brute totale / 64 * 33)	**8,3**	(max. 33)

III. Exposition	Connu	Potentiel
1. Récepteurs humains		
A. Exposition connue	0	
B. Exposition potentielle		
a. Utilisation du terrain		---
b. Accessibilité		---
c. Voie d'exposition		
i. Contact direct		---
ii. Inhalation		---
iii. Ingestion		---
2. Facteurs modifiant l'exposition humaine	0	---
Cote brute totale - Exposition humaine	0	0
Cote brute totale - Exposition humaine (Connu + potentiel)	0	
Cote totale rajustée - Exposition humaine	0,0	(max. 22)
3. Récepteurs écologiques		
A. Exposition connue	0	
B. Exposition potentielle		
a. Milieu terrestre		---
b. Milieu aquatique		---
4. Facteurs modifiant l'exposition des récepteurs écologiques	0	---
Cote brute totale - Exposition des récepteurs écologiques	0	0
Cote brute totale - Exposition des récepteurs écologiques (Connu + potentiel)	0	
Cote totale rajustée - Exposition des récepteurs écologiques (cote brute totale / 38 * 16)	0,0	(max. 16)
5. Autres récepteurs	0	0
Cote totale – Autres récepteurs (Connu + Potentiel)	0	
Cote totale - Exposition (humaine + écologique + autres)	0,0	
Cote totale rajustée - Exposition (cote totale / 46 * 34)	0,0	(max. 34)

Cote du lieu

Lieu d'essai

Cote alphabétique	**D**
Pourcentage de certitude	**94%**
% des réponses qui sont « Ne sais pas »	**-38%**
Cote totale selon le SNCLC	**17,3**
Classe du lieu	**N**

Catégories de classification des lieux* :

Classe 1 - Priorité d'intervention élevée (cote totale du SNCLC > 70)

Classe 2 - Priorité d'intervention moyenne (cote totale du SNCLC 50 - 69,9)

Classe 3 - Priorité d'intervention faible (cote totale du SNCLC 37 - 49,9)

Classe N - Priorité d'intervention nulle (cote totale du SNCLC < 37)

Classe INS - Renseignements insuffisants (> 15 % des réponses sont « Ne sais pas »)

*Remarque : « intervention » ici ne signifie pas nécessairement réhabilitation, mais peut aussi renvoyer à l'évaluation des risques, à la gestion des risques ou à la caractérisation détaillée du lieu et à la collecte de données.

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Classement du danger des contaminants

(D'après le projet de classement du danger élaboré pour le Système de classification des sites contaminés du PASCF)

Renseignements utiles pour remplir la feuille I (Caractéristiques des contaminants), section 2 (Danger chimique).

Paramètre chimique	Danger	LCPE	Cancérogénicité	Remarques
acétaldéhyde	E	*	CPH	
acétone	F			
acide (méthyl-2-chloro-4-phénoxy)acétique	M			
acide nitrilotriacétique	E		CPH	
acroléine	E	*		
acrylonitrile	E	*	CPH	
alachlore	M			
alcool allylique	E			
aldicarbe	E			
aldrine	E			
aluminium	F			
ammoniac	F	*		
antimoine	E			
argent	F			
arséniate de plomb	E			
arsenic	E	*		
atrazine	M			
azinphos-méthyl	E			
baryum	F			
bendiocarbe	E			
benzène	E	*	CCH	BTEX
benzènes chlorés				
monochlorobenzène	M			
dichlorobenzène, 1,2- (*o*-DCB)	M			
dichlorobenzène, 1,3- (*m*-DCB)	M			
dichlorobenzène, 1,4- (*p*-DCB)	E			
trichlorobenzène, 1,2,3-	M			
trichlorobenzène, 1,2,4-	M			
trichlorobenzène, 1,3,5-	M			
tétrachlorobenzène, 1,2,3,4-	M			
tétrachlorobenzène, 1,2,3,5-	M			
tétrachlorobenzène, 1,2,4,5-	M			
pentachlorobenzène	M			
hexachlorobenzène	E			
benzidine	E	*	CCH	
béryllium	E		CCH	
biphényle, 1,1-	M			
biphényles polybromés (BPB)	E	*		
biphényles polychlorés (BPC)	E			
bis(butylène-2)tétrahydro-2,3,4,5 furfural-2	E			
bore	F			
bromacil	M			
bromate	M			
bromochlorodifluorométhane	M	*		HM
bromochlorométhane	E	*		HM
bromodichlorométhane	E			HM
bromoforme (tribromométhane)	E		CPH	HM
bromométhane (bromure de méthyle)	M	*		HM
bromotrifluorométhane	M	*		HM

Paramètre chimique	Danger	LCPE	Cancérogénicité	Remarques
bromoxynil	E			
butadiène, 1,3-	E	*	CCH	
cadmium	E	*	CCH	
carbofurane	M			
captafol	M			
chloramine	M	*		
chloroaniline, *p*-	E			
chlorobenzène (monochlorobenzène)	M			
chlorobenzilate	M			
chlorodiméforme	M			
chloroforme	E		CPH	HM
chlorométhane	M			HM
(4-chlorophényl)cyclopropylméthanone, *O*-[(4-nitrophényl)méthyl]oxime	E			
chlorophénol, 2-	M			CP
chlorothalonil	E			
chlorpyrifos	E			
chlorure	F			
chlorure de didécyldiméthylammonium	E			
chlorure de tributyltétradécylphosphonium	E	*		
chlorure de vinyle (chloroéthène)	E	*	CCH	EEC
chrome (total)	M	*		
chrome (III)	F	*		
chrome (VI)	E	*	CCH	
cobalt	F			
créosote	M	*		Voir les HAP
crocidolite	F			
cuivre	F			
cyanazine	M			
cyanure (libre)	E			
DDD	E			
DDE	E			
DDT	E		CPH	
deltaméthrine	M			
diazinon	M			
dibenzofurane	E	*		DF
dibromoéthane, 1,2- (bromure d'éthylène)	E		CPH	
dibromoéthène (bromure d'éthylène)	E		CPH	
1,2-dibromo-3-chloropropane	E		CPH	
dibromochlorométhane	M	*		HM
dibromotétrafluoroéthane	M			
dicamba	E			
dichlorobenzène, 1,2- (*o*-DCB)	M			BC
dichlorobenzène, 1,3- (*m*-DCB)	M			BC
dichlorobenzène, 1,4- (*p*-DCB)	E			BC
dichlorobenzidine, 3,3'-	E		CPH	
dichloroéthane, 1,1-	E			EAC
dichloroéthane, 1,2-	E		CPH	EAC
dichloroéthène, 1,1-	E			EEC
dichloroéthène, c*is*-1,2-	M			EEC
dichloroéthène, *trans*-1,2-	M			EEC
dichlorométhane (chlorure de méthylène)	E		CPH	HM
dichlorophénol, 2,4-	M			CP
dichloropropane, 1,2-	E			
dichloropropène, 1,3-	E		CPH	
diclofop-méthyl	E			
dieldrine	E			
diméthoate	E			

Paramètre chimique	Danger	LCPE	Cancérogénicité	Remarques
dinitrophénol, 2,4-	M			
dinitrotoluène, 2,4-	E			
dinoseb	E			
dioxane, 1,4-	E		CPH	
dioxines et furanes	E			
diquat	M			
diuron	M			
endosulfane	E			
endrine	E			
époxyde d'heptachlore	E			
étain	F			
éthanes chlorés				
dichloroéthane, 1,1-	M			
dichloroéthane, 1,2- (dichlorure d'éthylène)	E		CPH	
trichloroéthane, 1,1,1-	E	*		
trichloroéthane, 1,1,2-	M			
tétrachloroéthane, 1,1,1,2-	M			
tétrachloroéthane, 1,1,2,2-	M			
éthènes chlorés				
monochloroéthène (chloroéthène, chlorure de vinyle)	E	*	CCH	
dichloroéthène, 1,1-	E			
dichloroéthène, 1,2- (*cis*- ou *trans*-)	M			
trichloroéthène	E	*		
tétrachloroéthène	E	*		
éthoxylate de nonylphénol	E	*		
éthylbenzène	M			BTEX
éthylèneglycol	F			GL
fer	F			
fluoroacétamide	M			
fluorure	F	*		
glycols				
éthylèneglycol (éthane-1,2-diol)	F			
diéthylèneglycol (2,2'-oxydiéthanol)	F			
propylèneglycol (propane-1,2-diol)	F			
glyphosate	M			
goudron de houille	E		CCH	Voir les HAP
halométhanes				
bromochlorodifluorométhane	M	*		
bromochlorométhane	M	*		
bromodichlorométhane	E		CPH	
bromométhane (bromure de méthyle)	M			
bromotrifluorométhane	M	*		
chloroforme	M		CPH	HM
chlorométhane	M			
dibromochlorométhane	M			
dichlorométhane (chlorure de méthylène)	E		CPH	
tetrachlorométhane (tétrachlorure de carbone)	E			
tribromométhane (bromoforme)	E			
trihalométhanes (THM)	M			
heptachlore	E			
herbicides de type phénoxy	M			
hexachlorobenzène	E		CPH	
hexachlorobutadiène	E			

Paramètre chimique	Danger	LCPE	Cancérogénicité	Remarques
hexachlorocyclohexane, *gamma-*	E		CPH	
hexachloroéthane	E		CPH	
hydrobromofluorocarbures (HBFC)	M	*		
hydrocarbures aromatiques polycycliques	E	*	CPH	
acénaphthène	M			
acénaphtylène	M			
acridine	E			
anthracène	M			
benzo[*a*]anthracène	E		CPH	
benzo[*a*]pyrène	E		CPH	
benzo[*b*]fluoranthène	E		CPH	
benzo[*g*,*h*,*i*]pérylène	E			
benzo[*k*]fluoranthène	E		CPH	
chrysène	M			
dibenzo[*a*,*h*]anthracène	E		CPH	
fluoranthène	M			
fluorène	M			
indéno[1,2,3-*c*,*d*]pyrène	E		CPH	
méthylnaphtalène	M			
naphtalène	M			
phénanthrène	M			
pyrène	M			
quinoléine	E			
				Classement fondé sur la fraction des constituants toxiques et mobiles du produit. Les composés légers, comme le benzène, sont plus toxiques et mobiles.
hydrocarbures pétroliers				
hydrocarbures pétroliers (essence)	E			
hydrocarbures pétroliers (kérosene, y compris les	E			
hydrocarbures pétroliers (diesel, y compris le mazout de chauffage)	M			
hydrocarbures pétroliers (pétroles lourds)	F			
hydrocarbures pétroliers (CCME F1)	E			
hydrocarbures pétroliers (CCME F2)	M			
hydrocarbures pétroliers (CCME F3)	F			
hydrocarbures pétroliers (CCME F4)	F			
hydrochlorofluorocarbures (HCFC)	M	*		
hydroxyde de tricyclohexylétain	E			
3-iodo-2-propynyl butylcarbamate	E			
leptophos	E			
lindane	E			
linuron	E			
lithium	F			
malathion	M			
manganèse	F			
mercure	E	*		
méthamidophos	E			
méthoxylchlore	E			
méthyléthylcétone	F			
méthylisobutylcétone	F			
méthylmercure	E			
méthylparathion	E			
métolachlore	M			
métribuzine	E			
molybdène	F			
monochloramine	M			
monocrotophos	E			

Paramètre chimique	Danger	LCPE	Cancérogénicité	Remarques
nickel	E	*		LCPE - inhalation
nitrate	F			
nitrite	M			
organoétains				
tributylétain	E			
tricyclohexylétain	E			
triphénylétain	E			
oxyde de bis(chlorométhane)	E	*	CCH	
oxyde de bis(2-chloroéthyle)	E		CCH	
oxyde de bis(2-chloroisopropyle)	E			
oxyde de chlorométhyle et d'éthyle	M	*		
oxyde d'éthène	E		CCH	
oxyde de méthyle et de *tert*-butyle	M			
oxydiéthanol, 2,2' (diétylène glycol)	F			GL
paraquat (sous forme de dichlorure)	E			
parathion	E			
pentachlorobenzène	M			BC
pentachlorophénol (PCP)	E			CP
phénol	F			
phénols chlorés		*		
monochlorophénols	M			
chlorophénol, 2-	M			
dichlorophénols				
dichlorophénol, 2,4-	M			
trichlorophénols				
trichlorophénol, 2,4,5-	E			
trichlorophénol, 2,4,6-	E		CPH	
tétrachlorophénols				
tétrachlorophénol, 2,3,4,6-	E			
pentachlorophénol (PCP)	E			
phorate	E			
phosphamidon	E			
phtalates				
phtalate de bis(2-éthylhexyle)	E	*		
phtalate de diéthyle	E			
phtalate de diméthyle	E			
phtalate de dioctyle	E			
plomb	E	*		neurotoxines / tératogènes
plomb tétraéthyle	E			
plomb tétraméthyle	E	*		
propylèneglycol	F			GL
radium	E			
radon	E			
sélénium	M			
simazine	M			
sodium	F			
strontium 90	E			
strychnine	E			
styrène	E			
sulfate	F			
sulfure	F			

Paramètre chimique	Danger	LCPE	Cancérogénicité	Remarques
2,3,7,8-tétrachlorodibenzo-*p*-dioxine (TCDD)	E	*		DF
tébuthiuron	E			
terphényles polychlorés	E	*		
tétrachloroéthène	E	*		EEC
tétrachlorobenzène, 1,2,3,4-	E			BC
tétrachlorobenzène, 1,2,3,5-	E			BC
tétrachlorobenzène, 1,2,4,5-	E			BC
tétrachloroéthane, 1,1,1,2-	M			EAC
tétrachloroéthane, 1,1,2,2-	M			EAC
tétrachlorophénol, 2,3,4,6-	E			CP
tétrachlorure de carbone (tétrachlorométhane)	E		CPH	HM
thallium	M			
thiophène	M			
toluène	M			BTEX
toxaphène	E			
triallate	M			
tribromométhane (bromoforme)	E			HM
trichlorobenzéne, 1,2,3-	E			BC
trichlorobenzène, 1,2,4-	E			BC
trichlorobenzène, 1,3,5-	E			BC
trichloroéthane, 1,1,1-	E	*		EAC
trichloroéthane, 1,1,2-	M			EAC
trichloroéthène (TCE)	E	*		EEC
trichlorométhane (THM)	M			
trichlorophénol, 2,4,5-	E			CP
trichlorophénol, 2,4,6-	E		CPH	CP
trifluraline	E			
tris(2,3-dibromopropyl)phosphate	E			
tritium	F			
uranium (non radioactif) / (radioactif)	M/H			
vanadium	M			
xylènes	M			BTEX
xylénol, 2,4(2,4-diméthylphénol)	F			
zinc	F			

E = danger élevé
M = danger moyen
F = danger faible
Le classement des dangers se fonde sur un certain nombre de facteurs, dont les effets possibles sur la santé humaine et l'environnement.
CPH = cancérogène potentiel chez l'humain
CCH = cancérogène confirmé chez l'humain

BTEX = benzène, toluène, éthylbenzène et xylènes
BC = benzènes chlorés
EAC = éthanes chlorés
EEC = éthènes chlorés
CP = chlorophénols
DF = dioxines et furanes
GL = glycols
HM = halométhanes
HAP = hydrocarbures aromatiques polycycliques
PH = phtalates

Système national de classification du CCME (2008, 2010 v 1.2)
Documentation (renseignements pour aider à la cotation)

Exemples de substances persistantes

Renseignements utiles pour remplir la feuille I (Caractéristiques des contaminants), section 5 (Facteurs modificatifs)

aldrine
benzo[*a*]pyrène
chlordane
DDT
DDE
dieldrine
hexachlorobenzène
méthylmercure
mirex
octachlorostyrène
BPC
PCDD/PCDF (dioxines et furanes)
toxaphène
alkylplomb

Exemples de substances dans les diverses classes chimiques

Renseignements utiles pour remplir la feuille I (Caractéristiques des contaminants), section 5 (Facteurs modificatifs).

Classe chimique	Exemples *
substances inorganiques (y compris les métaux)	arsenic, baryum, cadmium, chrome hexavalent, cuivre, cyanure, fluorure, plomb, mercure, nickel, sélénium, soufre, zinc; saumures ou sels
hydrocarbures pétroliers volatils	benzène, toluène, éthylbenzène, xylènes, HCP F1
hydrocarbures pétroliers extractibles légers	HCP F2
hydrocarbures pétroliers extractibles lourds	HCP F3
HAP	benzo[*a*]anthracène, benzo[*b*]fluoranthène, benzo[*k*]fluoranthène, benzo[*a*]pyrène, dibenz[*a*,*h*]anthracène, indéno[1,2,3-*c*,*d*]pyrène, naphtalène, phénanthrène, pyrène
substances phénoliques	phénol, pentachlorophénol, chlorophénols, phénols non chlorés (p. ex. 2,4-dinitrophénol, crésol)
hydrocarbures chlorés	BPC, tétrachloroéthène, trichloroéthène, dioxines et furanes, trichlorobenzène, tétrachlorobenzène, pentachlorobenzène, hexachlorobenzène
halométhanes	tétrachlorure de carbone, chloroforme, dichlorométhane
phtalates	phtalate de diisononyle, phtalate de diisodécyle, phtalate de bis(2-éthylhexyle)
pesticides	DDT, hexachlorocyclohexane

* Remarque : Il y a plus de substances dans les diverses classes que celles énumérées dans le tableau. Non exhaustif, celui-ci fournit simplement des exemples de substances qu'on trouve habituellement.

Propriétés des composés chimiques
(d'après les critères d'évaluation initiale des sols de l'USEPA)

Les renseignements sur le Kco sont utiles pour remplir la feuille II (Potentiel de migration), section 1.B.a (Mobilité relative).
Les renseignements sur la constante adimensionnelle de la loi de Henry sont utilisés dans la feuille II (Potentiel de migration), section 4.B.a (Volatilité relative).
Les renseignements sur le log K_{oe} sont utiles pour remplir la feuille III (Exposition), section 3.B.a.iii (Exposition potentielle des récepteurs écologiques - Milieu terrestre - Ingestion) et la section 3.B.b.ii (Exposition potentielle des récepteurs écologiques - Milieu aquatique - Potentiel d'absorption).

N° CAS	Composé	Solubilité dans l'eau @ 20-25 °C (mg/L)	Constante de la loi de Henry (atm-m^3/mol)	Constante adimensionnelle de la loi de Henry (CLH [atm-m^3/mol] * 41) (25 °C)	Log K_{oe}	Log K_{co} (L/kg)
83-32-9	acénaphthène	4,24E+00	1,55E-04	6,36E-03	3,92	3,85
108-05-4	acétate de vinyle	2,00E+04	5,11E-04	2,10E-02	0,73	0,72
67-64-1	acétone	1,00E+06	3,88E-05	1,59E-03	-0,24	-0,24
65-85-0	acide benzoïque	3,50E+03	1,54E-06	6,31E-05	1,86	—
309-00-2	aldrine	1,80E-01	1,70E-04	6,97E-03	6,5	6,39
120-12-7	anthracène	4,34E-02	6,50E-05	2,67E-03	4,55	4,47
56-55-3	benz[a]anthracène	9,40E-03	3,35E-06	1,37E-04	5,7	5,6
71-43-2	benzène	1,75E+03	5,55E-03	2,28E-01	2,13	1,77
205-99-2	benzo[b]fluoranthène	1,50E-03	1,11E-04	4,55E-03	6,2	6,09
207-08-9	benzo[k]fluoranthène	8,00E-04	8,29E-07	3,40E-05	6,2	6,09
50-32-8	benzo[a]pyrène	1,62E-03	1,13E-06	4,63E-05	6,11	6,01
1336-36-3	BPC	—	—	—	5,58	5,49
75-27-4	bromodichlorométhane	6,74E+03	1,60E-03	6,56E-02	2,1	1,74
75-25-2	bromoforme	3,10E+03	5,35E-04	2,19E-02	2,35	1,94
74-83-9	bromométhane	1,52E+04	6,24E-03	2,56E-01	1,19	1,02
71-36-3	butanol	7,40E+04	8,81E-06	3,61E-04	0,85	0,84
86-74-8	carbazole	7,48E+00	1,53E-08	6,26E-07	3,59	3,53
57-74-9	chlordane	5,60E-02	4,86E-05	1,99E-03	6,32	5,08
106-47-8	p-chloroaniline	5,30E+03	3,31E-07	1,36E-05	1,85	1,82
108-90-7	chlorobenzène	4,72E+02	3,70E-03	1,52E-01	2,86	2,34
124-48-1	chlorodibromométhane	2,60E+03	7,83E-04	3,21E-02	2,17	1,8
75-01-4	chloroéthène	2,76E+03	2,70E-02	1,11E+00	1,5	1,27
67-66-3	chloroforme	7,92E+03	3,67E-03	1,50E-01	1,92	1,6
95-57-8	2-chlorophénol	2,20E+04	3,91E-04	1,60E-02	2,15	—
218-01-9	chrysène	1,60E-03	9,46E-05	3,88E-03	5,7	5,6
95-48-7	O-crésol	2,60E+04	1,20E-06	4,92E-05	1,99	1,96
72-54-8	DDD	9,00E-02	4,00E-06	1,64E-04	6,1	6
72-55-9	DDE	1,20E-01	2,10E-05	8,61E-04	6,76	6,65
50-29-3	DDT	2,50E-02	8,10E-06	3,32E-04	6,53	6,42
53-70-3	dibenz[a,h]anthracène	2,49E-03	1,47E-08	6,03E-07	6,69	6,58
95-50-1	1,2-dichlorobenzène	1,56E+02	1,90E-03	7,79E-02	3,43	2,79
106-46-7	1,4-dichlorobenzène	7,38E+01	2,43E-03	9,96E-02	3,42	2,79
91-94-1	3,3-dichlorobenzidine	3,11E+00	4,00E-09	1,64E-07	3,51	2,86
75-34-3	1,1-dichloroéthane	5,06E+03	5,62E-03	2,30E-01	1,79	1,5
107-06-2	1,2-dichloroéthane	8,52E+03	9,79E-04	4,01E-02	1,47	1,24
75-35-4	1,1-dichloroéthène	2,25E+03	2,61E-02	1,07E+00	2,13	1,77
156-59-2	cis-1,2-dichloroéthène	3,50E+03	4,08E-03	1,67E-01	1,86	1,55
156-60-5	*trans-1,2-dichloroéthène*	6,30E+03	9,38E-03	3,85E-01	2,07	1,72
75-09-2	*dichlorométhane*	1,30E+04	2,19E-03	8,98E-02	1,25	1,07
120-83-2	2,4-dichlorophénol	4,50E+03	3,16E-06	1,30E-04	3,08	—
78-87-5	1,2-dichloropropane	2,80E+03	2,80E-03	1,15E-01	1,97	1,64
542-75-6	1,3-dichloropropène	2,80E+03	1,77E-02	7,26E-01	2	1,66
60-57-1	dieldrine	1,95E-01	1,51E-05	6,19E-04	5,37	4,33
84-66-2	diéthylphtalate	1,08E+03	4,50E-07	1,85E-05	2,5	2,46
105-67-9	2,4-diméthylphénol	7,87E+03	2,00E-06	8,20E-05	2,36	2,32
51-28-5	2,4-dinitrophénol	2,79E+03	4,43E-07	1,82E-05	1,55	—
121-14-2	2,4-dinitrotoluène	2,70E+02	9,26E-08	3,80E-06	2,01	1,98
606-20-2	2,6-dinitrotoluène	1,82E+02	7,47E-07	3,06E-05	1,87	1,84
75-15-0	disulfure de carbone	1,19E+03	3,03E-02	1,24E+00	2	1,66
115-29-7	endosulfan	5,10E-01	1,12E-05	4,59E-04	4,1	3,33
72-20-8	endrine	2,50E-01	7,52E-06	3,08E-04	5,06	4,09
1024-57-3	époxyde d'heptachlore	2,00E-01	9,50E-06	3,90E-04	5	4,92
100-41-4	éthylbenzène	1,69E+02	7,88E-03	3,23E-01	3,14	2,56
206-44-0	fluoranthène	2,06E-01	1,61E-05	6,60E-04	5,12	5,03
86-73-7	fluorène	1,98E+00	6,36E-05	2,61E-03	4,21	4,14
319-84-6	a-HCH	2,00E+00	1,06E-05	4,35E-04	3,8	3,09
319-85-7	b-HCH	2,40E-01	7,43E-07	3,05E-05	3,81	3,1
58-89-9	g-HCH (lindane)	6,80E+00	1,40E-05	5,74E-04	3,73	3,03
76-44-8	*heptachlore*	1,80E-01	1,09E-03	4,47E-02	6,26	6,15

N° CAS	Composé	Solubilité dans l'eau @ 20-25 °C (mg/L)	Constante de la loi de Henry (atm-m^3/mol)	Constante adimensionnelle de la loi de Henry (CLH [atm-m^3/mol] * 41) (25 °C)	Log K_{oe}	Log K_{co} (L/kg)
118-74-1	*hexachlorobenzène*	6,20E+00	1,32E-03	5,41E-02	5,89	4,74
87-68-3	*hexachlorobuta-1,3-diène*	3,23E+00	8,15E-03	3,34E-01	4,81	4,73
77-47-4	hexachlorocyclopentadiène	1,80E+00	2,70E-02	1,11E+00	5,39	5,3
67-72-1	hexachloroéthane	5,00E+01	3,89E-03	1,59E-01	4	3,25
193-39-5	indéno[1,2,3-c,d]pyrène	2,20E-05	1,60E-06	6,56E-05	6,65	6,54
78-59-1	isophorone	1,20E+04	6,64E-06	2,72E-04	1,7	1,67
7439-97-6	mercure	—	1,14E-02	4,67E-01	—	—
72-43-5	méthoxychlore	4,50E-02	1,58E-05	6,48E-04	5,08	4,99
91-20-3	naphthalène	3,10E+01	4,83E-04	1,98E-02	3,36	3,3
98-95-3	nitrobenzène	2,09E+03	2,40E-05	9,84E-04	1,84	1,81
86-30-6	*N-nitrosodiphénylamine*	3,51E+01	5,00E-06	2,05E-04	3,16	3,11
621-64-7	N-nitrosodi-n-propylamine	9,89E+03	2,25E-06	9,23E-05	1,4	1,38
111-44-4	oxyde de bis(2-chloroéthyle)	1,72E+04	1,80E-05	7,38E-04	1,21	1,19
87-86-5	*pentachlorophénol*	1,95E+03	2,44E-08	1,00E-06	5,09	—
108-95-2	*phénol*	8,28E+04	3,97E-07	1,63E-05	1,48	1,46
85-68-7	phtalate de benzyle et de butyle	2,69E+00	1,26E-06	5,17E-05	4,84	4,76
117-81-7	phtalate de bis(2-éthylhexyle)	3,40E-01	1,02E-07	4,18E-06	7,3	7,18
84-74-2	phtalate de dibutyle	1,12E+01	9,38E-10	3,85E-08	4,61	4,53
117-84-0	phtalate de dioctyle	2,00E-02	6,68E-05	2,74E-03	8,06	7,92
129-00-0	pyrène	1,35E-01	1,10E-05	4,51E-04	5,11	5,02
100-42-5	styrène	3,10E+02	2,75E-03	1,13E-01	2,94	2,89
79-34-5	1,1,2,2-tétrachloroéthane	2,97E+03	3,45E-04	1,41E-02	2,39	1,97
127-18-4	tétrachloroéthène	2,00E+02	1,84E-02	7,54E-01	2,67	2,19
56-23-5	tétrachlorure de carbone	7,93E+02	3,04E-02	1,25E+00	2,73	2,24
108-88-3	toluène	5,26E+02	6,64E-03	2,72E-01	2,75	2,26
8001-35-2	toxaphène	7,40E-01	6,00E-06	2,46E-04	5,5	5,41
120-82-1	1,2,4-trichlorobenzène	3,00E+02	1,42E-03	5,82E-02	4,01	3,25
71-55-6	1,1,1-trichloroéthane	1,33E+03	1,72E-02	7,05E-01	2,48	2,04
79-00-5	1,1,2-trichloroéthane	4,42E+03	9,13E-04	3,74E-02	2,05	1,7
79-01-6	trichloroéthène	1,10E+03	1,03E-02	4,22E-01	2,71	2,22
95-95-4	2,4,5-trichlorophénol	1,20E+03	4,33E-06	1,78E-04	3,9	—
88-06-2	2,4,6-trichlorophénol	8,00E+02	7,79E-06	3,19E-04	3,7	—
108-38-3	*m-xylène*	1,61E+02	7,34E-03	3,01E-01	3,2	2,61
95-47-6	*o-xylène*	1,78E+02	5,19E-03	2,13E-01	3,13	2,56
106-42-3	*p-xylène*	1,85E+02	7,66E-03	3,14E-01	3,17	2,59

Source : United States Environmental Protection Agency. 1996. *Soil Screening Guidance: Technical Background Document*. EPA/540/R-95/128 (http://www.epa.gov/superfund/resources/soil/toc.htm#p5).

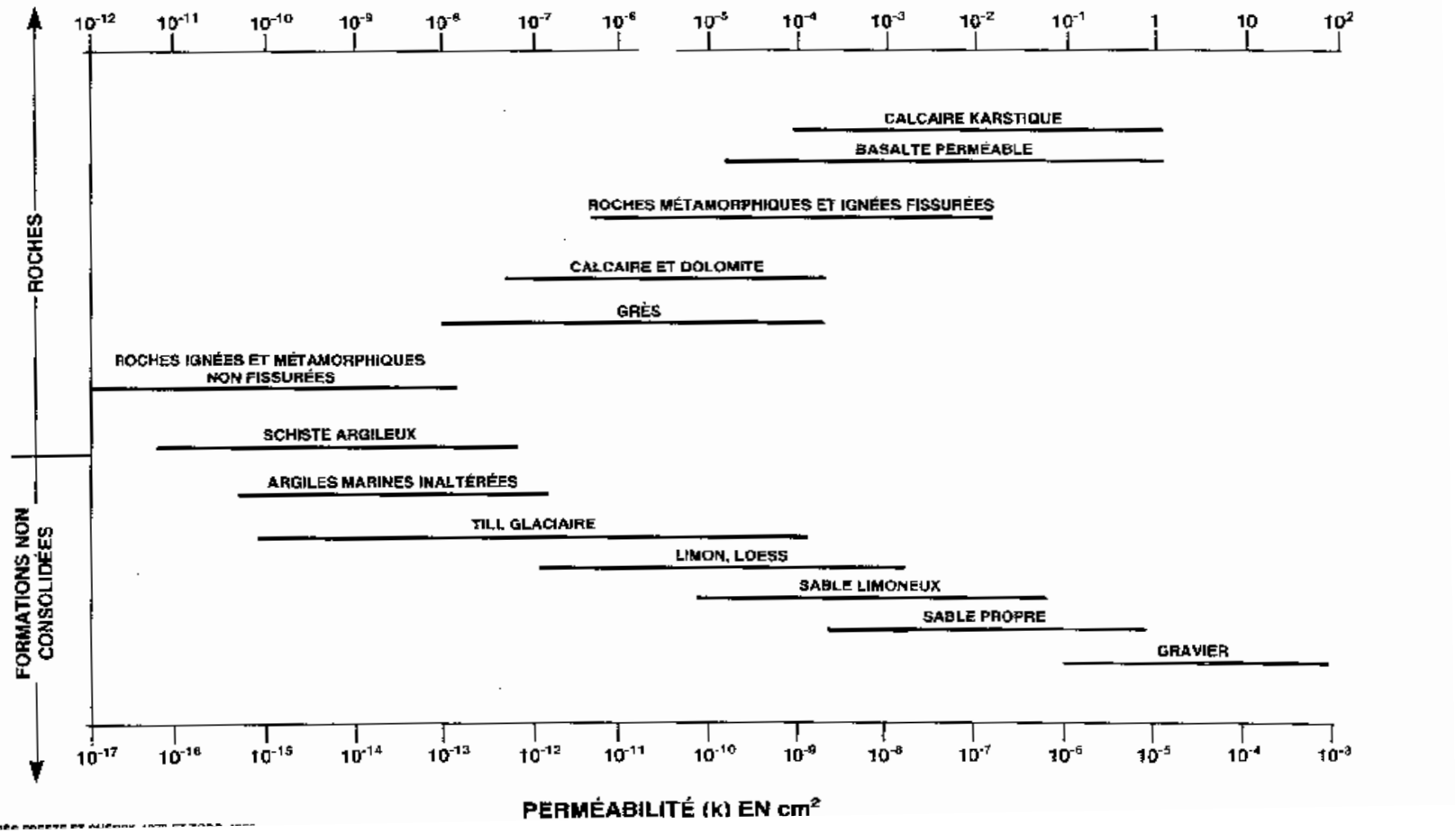
CAS = Chemical Abstracts Service

K_{oe} = coefficient de partage octanol-eau

INTERVALLE DES VALEURS DE CONDUCTIVITÉ HYDRAULIQUE ET DE PERMÉABILITÉ

Les renseignements sur le K_{co} sont utiles pour remplir la feuille II (Potentiel de migration), section 1.B.f (Conductivité hydraulique)

CONDUCTIVITÉ HYDRAULIQUE (K) EN cm/s



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Pre-Screening Checklist

Please place a checkmark in the appropriate answer box.

Question	Response Yes	Response No	Comment
1. Are **Radioactive material**, **Bacterial contamination** or **Biological hazards** likely to be present at the site?	☐	☐	If yes, do not proceed through the NCSCS. Contact applicable regulatory agency immediately.
2. Are there **no contamination exceedances** (known or suspected)? Determination of exceedances may be based on: 1) CCME environmental quality guidelines; 2) equivalent provincial guidelines/standards if no CCME guideline exists for a specific chemical in a relevant medium; or 3) toxicity benchmarks derived from the literature for chemicals not covered by CCME or provincial guidelines/standards; 4) background concentration.	☐	☐	If yes (*i.e.*, there are no exceedances), do not proceed through the NCSCS.
3. Have **partial/incompleted or no environmental site investigations** been conducted for the Site?	☐	☐	If yes, do not proceed through the NCSCS.
4. Is there direct and significant evidence of **impacts to humans** at the site, or off-site due to migration of contaminants from the site?	☐	☐	If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated.
5. Is there direct and significant evidence of **impacts to ecological receptors** at the site, or off-site due to migration of contaminants from the site?	☐	☐	Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are considered to be severe, the site may be categorized as Class 1, regardless of the numerical total NCSCS score. For the purpose of application of the NCSCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction.
6. Are there indicators of significant **adverse effects in the exposure zone** (*i.e.,* the zone in which receptors may come into contact with contaminants)? Some examples are as follows: -Hydrocarbon sheen or NAPL in the exposure zone -Severely stressed biota or devoid of biota; -Presence of material at ground surface or sediment with suspected high concentration of contaminants such as ore tailings, sandblasting grit, slag, and coal tar.	☐	☐	To answer "yes", two scenarios should be satisfied; (1) there has to be a high probability that receptors will be exposed to the contaminant source in the near future, and (2) the predicted impacts to ecological receptors after exposure have to be significant (see question 5). A low probability of exposure resulting in significant impacts, or a high probability of exposure but with only low to moderate effects expected should not result in a Class 1 designation, neither would a low probability of exposure resulting in low-to-moderate effects. If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated.
7. Do measured concentrations of volatiles or unexploded ordnances represent an **explosion hazard**?	☐	☐	If yes, do not proceed through the NCSCS. Do not continue until the safety risks have been addressed. Consult your jurisdiction's occupational health and safety guidance or legislation on exposive hazards and measurement of lower explosive limits.

Rationale for not proceeding with NCSCS
(document any assumptions, reports, or site-specific information to support selection of "Yes" in Pre-Screening checklist)

If none of the above applies, proceed with the NCSCS scoring.

APPENDIX II

SUMMARY OF SITE CONDITIONS

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Appendix II - Summary of Site Conditions

Site: *(select how site will be identified, e.g., from Civic Address, Site Common Name, Code Identifier, Lat &Long, or UTM)*	
Civic Address: *(or other description of location)*	
Site Common Name : *(if applicable)*	
Code identifier : *(e.g., FCSI 8-digit identifier)*	
Site Owner or Custodian: *(Organization and Contact Person)*	
Legal description *or* metes and bounds:	
Approximate Site area:	
Parcel Identifier(s) [PID]: *(or Parcel Identification Numbers [PIN] if untitled Crown land)*	
Centre of site: *(provide latitude/longitude or UTM coordinates)*	Latitude: _____ degrees _____ min _____ secs Longitude: _____ degrees _____ min _____ secs
	UTM Coordinate: Northing _____ Easting _____
Site Land Use:	Current:
	Proposed:
Site Plan	**To delineate the bounds of the Site a site plan MUST be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.**
Provide a brief description of the Site:	

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Appendix II - Summary of Site Conditions

Affected media and Contaminants of Potential Concern (COPC):	

Site Letter Grade
Please circle the "letter" that best describes the level of information available for the site being assessed:
(Enter Letter Grade into Summary Score Sheet)

F– Pre Phase I
E– Phase I Environmental Site Assessment
D– Limited Phase II Environmental Site Assessment
C– Detailed Phase II Environmental Site Assessment
B– Risk Assessment with or without Remedial Plan or Risk Management Plan
A– Confirmation Sampling
If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	
Date Scoring Completed:	

APPENDIX III

USER'S GUIDE

CCME National Classification System for Contaminated Sites (2008) version 1.3
Appendix III - User's Guide

Instructions

1) Please review the following overview of contents. The revised CCME National Classification System for Contaminated Sites (NCSCS) consists of a pre-screening checklist, summary of site conditions, summary score sheet, and three instruction/worksheet pages for the user to fill out: Contaminant Characteristics, Migration Potential and Exposure. For ease of printing, the method of evaluation for scoring each section of the worksheet is provided in a separate Instructions tab. Reference material is also provided to assist with the evaluation. A brief description of each sheet is as follows:

Pre-Screening Checklist - Used to determine if the Site can either be considered a Class 1 site (to be remediated immediately) or if more information must be collected before the Site can be classified, or other hazards exist at the Site that must be addressed first before the Site can be classified using the revised NCSCS.

Site Description Sheet - Summarizes Site information. It also indicates the level of information available (Site Letter Grade) for the site to conduct the NCSCS scoring evaluation. The known/potential contaminants of concern and affected media will also be summarized here.

Contaminant Characteristics Instructions & Worksheet - Prompts the user for information related to the contaminants of potential concern (COPC) found at the site.

Migration Potential Instructions & Worksheet - Prompts the user for information related to physical transport processes which may move contamination to neighboring sites or re-distribute contamination within a site. Migration potential includes many of the exposure pathways, but is not limited to exposure pathways. Migration potential does not require clearly defined receptors.

Exposure Instructions & Worksheet - Prompts the user for information related to exposure pathways and receptors which may be located on the site.

Summary Score Sheet - Generates a total site score by adding up the scores generated on each of the three worksheets and provides the corresponding Site Classification. It also provides an estimate of certainty in the score provided (Certainty Percentage).

Reference Material - Additional information which may be useful to refer to when conducting the evaluation.
- Contaminant Hazard Ranking
- Examples of Persistent Substances
- Examples of Substances in the Various Chemical Classes
- Chemical-specific Properties
- Range of Values of Hydraulic Conductivity and Permeability

The worksheet titles and sub headings are as follows.

I. Contaminant Characteristics

1. Residency Media
2. Chemical Hazard
3. Contaminant Exceedance Factor
4. Contaminant Quantity
5. Modifying Factors

II. Migration Potential

1. Groundwater Movement
2. Surface water Movement
3. Soil
4. Vapour
5. Sediment Movement
6. Modifying Factors

III. Exposure

1. Human Receptors
   - A. Known Impact
   - B Potential
     - a. Land Use
     - b. Accessibility
     - c. Exposure Route
2. Human Modifying Factors
3. Ecological Receptors
   - A. Known Impact
   - B. Potential
     - a. Terrestrial
     - b. Aquatic
4. Ecological Modifying Factors
   - a. Species at Risk
   - b. Aesthetics
5. Other Receptors
   - a. Permafrost

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2) This is an electronic form which can be printed out and **filled out on paper** by the user by hand. Within each Worksheet, the score is circled, either in the known or potential column. Subtotals will be prompted for at the end of each Section and the value transferred onto the Summary Sheet. Required calculations are also prompted in order to obtain the Total NCSCS Score. A separate Excel spreadsheet has been developed which will prompt the user for information and is meant to be used as an electronic tool for NCSCS evaluation.

3) When assigning scores for each factor, it is highly recommended to give a rationale (a column has been provided for this purpose in Worksheets I, II and III). Information that would be useful in justifying the scores assigned may include: a statement of any assumptions, a description of site-specific information, and references for any data sources (e.g., site visit, personal interview, site assessment reports, or other documents consulted).

4) The Site Letter Grade is related to the level of information available for the Site (as defined by the User) and provides an indication of completeness of information based on the level of investigation and remediation work that has been carried out at the site. More detailed descriptions of the various categories are provided below.

Site Letter Grade:	*Detailed Descriptions:*
F	***Pre Phase I ESA –*** No environmental investigations have been conducted or there are only partial or incomplete Phase I ESA for the Site. It is not recommended to continue through the NCSCS when insufficient data are available. In these cases, it will generally be necessary to conduct a Phase I ESA or other site investigation tasks in order to complete the NCSCS scoring.
E	***Phase I ESA –*** A preliminary desk-top type study has been conducted, involving non-intrusive data collection to determine whether there is a potential for the Site to be contaminated and to provide information to direct any intrusive investigations. Data collected may include a review of available information on current site conditions and history of the property, a site inspection and interviews with personnel familiar with the Site. [Note: This stage is similar to "Phase I: Site Information Assessment" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]
D	***Limited Phase II ESA –*** An initial intrusive investigation and assessment of the property has been conducted, generally focusing on potential sources of contamination, to determine whether there is contamination present above the relevant screening guidelines or criteria, and to broadly define soil and groundwater conditions; samples have been collected and analyzed to identify, characterize and quantify contamination that may be present in air, soil, groundwater, surface water or building materials. [Note: This stage is similar to "Phase II: Reconnaissance Testing Program" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]
C	***Detailed Phase II ESA –*** Further intrusive investigations have been conducted to characterize and delineate the contamination, to obtain detailed information on the soil and groundwater conditions, to identify the contaminant pathways, and to provide other information required to develop a remediation plan. [Note: This stage is similar to "Phase III: Detailed Testing Program" as described in Guidance Document on the Management of Contaminated Sites in Canada (CCME 1997).]
B	***Risk Assessment with or without Remedial Plan or Risk Management Strategy –*** A risk assessment has been completed, and if the risk was found to be unacceptable, a site-specific remedial action plan has been designed to mitigate environmental and health concerns associated with the Site, or a risk management strategy has been developed.
A	***Confirmation Sampling –*** Remedial work, monitoring, and/or compliance testing have been conducted and confirmatory sampling demonstrates whether contamination has been removed or stabilized effectively and whether cleanup or risk management objectives have been attained.

5) A few terms are used throughout which require definition, they are as follows:

Known - refers to scores that are assigned based on documented scientific and/or technical observations

Potential - refers to scores that are assigned when something is not known, though it may be suspected

Raw - refers to score totals which have not been adjusted down to the total maximum score for the given category. In most cases the possible total raw score is greater than the maximum allowed

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Note: For some questions in the worksheets, the option selected will determine whether a "known" or "potential" score is assigned. In these cases, if "Do Not Know" is selected, a score will automatically be listed as "potential", whereas all of the other options in the list will provide a "known" score.

6) Certainty Percentage: The ratio of "Known" to "Potential" responses reflects the relative certainty, or confidence, of the resulting final score and the classification. The NCSCS system defines this ratio as the "Certainty Percentage". The Certainty Percentage is generated from the number of sections assigned scores based on "known" information divided by the total number of sections. A high percentage indicates that more is known about the Site, and therefore there is more confidence in the classification, whereas a low percentage suggests that the classification should be treated with caution.

7) Site Classification Categories: Sites should not be ranked relative to one another. Sites must be classifed on their individual characteristics in order to determine the appropriate classification (Class 1, 2, 3, or N) according to their priority for action, or Class INS (Insufficient Information) for sites that require further information before they can be classifed. The classification groupings are as follows:

Class 1 - High Priority for Action (Total NCSCS Score greater than 70)
The available information indicates that action (*e.g.,* futher site characterization, risk management, remediation, etc.) is required to address existing concerns. Typically, Class 1 sites indicate high concern for several factors, and measured or observed impacts have been documented.

Class 2 - Medium Priority for Action (Total NCSCS Score between 50 and 69.9)
The available information indicates that there is high potential for adverse impacts, although the threat to human health and the environment is generally not imminent. There will tend not to be indication of off-site contamination, however, the potential for this was rated high and therefore some action is likely required.

Class 3 - Low Priority for Action (Total NCSCS Score between 37 and 49.9)
The available information indicates that this site is currently not a high concern. However, additional investigation may be carried out to confirm the site classification, and some degree of action may be required.

Class N - Not a Priority for Action (Total NCSCS Score less than 37)
The available information indicates there is probably no significant environmental impact or human health threats. There is likely no need for action unless new information becomes available indicating greater concerns, in which case the site should be re-examined.

Class INS - Insufficient Information (≥15% of Responses are "Do Not Know", or a site letter grade of F has been assigned)
There is insufficient information to classify the site. In this event, additional information is required to address data gaps.

8) Additional Complementary Tools to the NCSCS

The CCME Soil Quality Index (SoQI) is a complementary tool that focuses more on evaluating the relative hazard, by comparing contaminant concentrations with their respective soil quality guidelines. The SoQI uses three factors for its calculations, namely: 1) scope (% of contaminants that do not meet their respective guidelines), 2) frequency (% of individual tests of contaminants that do not meet their respective guidelines), and 3) amplitude (the amount by which the contaminants do not meet their respective guidelines). The soil quality index can be used to compare different contaminated sites with similar types of contamination as well as to see if the jurisdictional requirements have been met after remediation of a particular site.

The NCSCS was not developed for and is not readily applicable for the assessment of sites with a significant marine or aquatic component. Environmental conditions at marine and aquatic sites are best measured in the bed sediments as they act as long-term reservoirs of chemicals to the aquatic environment and to organisms living in or having direct contact with sediments. The CCME Sediment Quality Index (SeQI) provides a convenient means of summarizing sediment quality data and can complement the NCSCS. The SeQI provides a mathematical framework for assessing sediment quality conditions by comparing contaminant concentrations with their respective sediment quality guidelines.

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Appendix III - (I) Contaminant Characteristics

Definition	Scoring Guideline	Method of Evaluation	Notes
1. Residency Media (replaces physical state)			
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? **yes** = has an exceedance or strongly suspected to have an exceedance **no** = does not have an exceedance or strongly suspected not to have an exceedance		The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline). Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at http://st-ts.ccme.ca/ For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil			
Yes	2		
No	0		
Do Not Know	1		
B. Groundwater			
Yes	2		
No	0		
Do Not Know	1		
C. Surface water			
Yes	2		
No	0		
Do Not Know	1		
D. Sediment			
Yes	2		
No	0		
Do Not Know	1		
2. Chemical Hazard			
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?		The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site. The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file. *See Attached Reference Material for Contaminant Hazard Rankings.*	Hazard as defined in the revised NCSCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
High	8		
Medium	4		
Low	2		
Do Not Know	4		

Definition	Scoring Guideline	Method of Evaluation	Notes
3. Contaminant Exceedance Factor			
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")? NAPL (mobile or immobile) High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	 8 6 4 2 4	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the *most conservative media-specific and land-use appropriate CCME* environmental quality guidelines. **Ranking should be based on contaminant with greatest exceedance of CCME guidelines.** Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines NAPL (LNAPL or DNAPL) = Contaminant is a non-aqueous phase liquid (*i.e.,* due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (*i.e.,* greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Any amount of NAPL should be scored, i.e. small amounts and sheens cannot be ignored. The presence of a NAPL (mobile or immoblie or regardless of amount) may be considered unnaceptable by some jurisidcations. If NAPL is present, consult jurisdiction on how to proceed with NCSCS. Other standards may include local background concentration or published toxicity benchmarks. Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria. Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (*i.e.,* CEF=>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
4. Contaminant Quantity (known or strongly suspected)			
What is the known or strongly suspected quantity of all contaminants? >10 hectare (ha) or 5000 m^3 2 to 10 ha or 1000 to 5000 m^3 <2 ha or 1000 m^3 Do Not Know	 9 6 2 4	Measure or estimate the area or quantity of total contamination (i.e, all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding applicable environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances are given a higher score.

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Appendix III - (I) Contaminant Characteristics

Definition	Scoring Guideline	Method of Evaluation	Notes
5. Modifying Factors			
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment? Yes No Do Not Know	 2 0 1	Persistent chemicals, *e.g.,* PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics: (a) in air, (i) its half-life is equal to or greater than 2 days, or (ii) it is subject to atmospheric transport from its source to a remote area; (b) in water, its half-life is equal to or greater than 182 days; (c) in sediments, its half-life is equal to or greater than 365 days; or (d) in soil, its half-life is equal to or greater than 182 days. Elements do not degrade, therefore treat any metal, metalloid, or halogen COPC as persistent.	*Examples of Persistent Substances are provided in attached Reference Materials*
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location? Yes No Do Not Know	 2 0 1	If answered Yes, in Rationale for Score column document the location and extent of the infrastructure that is/may be damaged, verify the mode of contact between contaminants of potential concern (COPCs) and infrastructure, list the specific COPCs that could cause damage, and note the expected effect on specific infrastructure.	Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances? One Two to Four Five or More Do Not Know	 0 2 3 2	For the purposes of the revised NCSCS, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, polycyclic aromatic hydrocarbons, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	*Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.*

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Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
1. Groundwater Movement			
A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.			
i) For **potable groundwater environments**, 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For **non-potable environments** (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the applicable non potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.	12	Review chemical data and evaluate groundwater quality. The evaluation method concentrates on 1) a potable or non-potable groundwater environment; 2) the groundwater flow system and its potential to be an exposure pathway to known or potential receptors An aquifer is defined as a geologic unit that yields groundwater in usable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas). The evaluation of a non-potable environment will be based on a site specific basis. Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils. Seeps and springs are considered part of the groundwater pathway. In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.	The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries. Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source in the vicinity of the contaminated site. This information must be documented in the NCSCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resources such as internet links. Note that for potable groundwater that also daylights into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered. **Selected References** Potable Environments Guidelines for Canadian Drinking Water Quality: http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php Non-Potable Environments Canadian Water Quality Guidelines for Protection of Aquatic Life. CCME. 1999. http://ceqg-rcqe.ccme.ca Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	9		
iii) Meets GCDWQ for **potable environments**; meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for **non-potable environments** **or** Absence of groundwater exposure pathway (*i.e.,* there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).	0		

Definition	Scoring Guideline	Method Of Evaluation	Notes
B. Potential for groundwater pathway.			
a. Relative mobility of contaminant		Organics Koc (L/kg) / Metals with higher mobility at acidic conditions / Metals with higher mobility at alkaline conditions	Reference: US EPA Soil Screening Guidance (Part 5 - Table 39). See attached reference material.
High	4	Koc < 500 (*i.e.,* log Koc < 2.7); pH < 5; pH > 8.5	If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivities and infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.
Moderate	2	Koc = 500 to 5000 (*i.e.,* log Koc = 2.7 to 3.7); pH = 5 to 6; pH = 7.5 to 8.5	
Low	1	Koc = 5,000 to 100,000 (*i.e.,* log Koc = 3.7 to 5); pH > 6; pH < 7.5	
Insignificant	0	Koc > 100,000 (*i.e.,* log Koc > 5)	
Do Not Know	2	For PHC fractions; score F1 as Moderate, F2 as Low, and F3 and F4 as Insignificant.	
b. Presence of engineered sub-surface containment? No containment Partial containment Full containment Do Not Know	 3 1.5 0 1.5	Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved. Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for "Full Containment" scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, this category is evaluated as high. If there is less than full containment or if uncertain, then evaluate as medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.	Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links. **Selected Resources:** United States Environmental Protection Agency (USEPA) 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128.
c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway 3 m or less including no confining layer or discontinuous confining layer 3 to 10 m > 10 m Do Not Know	 1 0.5 0 0.5	The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow. Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway. The evaluation of this category is based on: 1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or 2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (*e.g.,* water table aquifer, first hydrostratigraphic unit or other groundwater pathway).	

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
B. Potential for groundwater pathway.			
d. Hydraulic conductivity of confining layer $>10^{-4}$ cm/s or no confining layer 10^{-4} to 10^{-6} cm/s $<10^{-6}$ cm/s Do Not Know	 1 0.5 0 0.5	Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use "Range of Values of Hydraulic Conductivity and Permeability" figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on: 1) The presence and hydraulic conductivity ("K") of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or 2) The presence and permeability ("k") of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.	
e. Precipitation infiltration rate (Annual precipitation factor x surface soil relative permeability factor) High (infiltration score > 0.6) Moderate (0.4 < infiltration score ≤ 0.6) Low (0.2 < infiltration score ≤ 0.4) Very Low (0 < infiltration score ≤ 0.2) None (infiltration score = 0) Do Not Know	 1 0.6 0.4 0.2 0 0.4	Precipitation Refer to Environment Canada precipitation records for relevant areas (30 year average preferred). Divide annual precipitation (rainfall + snowfall) by 1000 and round to nearest tenth (*e.g.,* 667 mm = 0.7 score). Permeability For surface soil relative permeability (*i.e.,* infiltration) assume: gravel (1), sand (0.6), loam (0.3) and pavement or clay (0). Multiply the surface soil relative permeability factor with precipitation factor to obtain the score for precipitation infiltration rate (*e.g.,* precipitation factor of 0.7 from above x 0.6 (sand) = 0.42 or "Moderate").	Selected Sources: Environment Canada web page link: http://climate.weather.gc.ca/climate_normals/index_e.html Snow to rainfall conversion apply ratio of 10(snow):1(water) https://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=108C6C74-1
f. Hydraulic conductivity of aquifer $>10^{-2}$ cm/s 10^{-2} to 10^{-4} cm/s $<10^{-4}$ cm/s Do Not Know	 2 1 0 1	Determine the nature of geologic materials and estimate hydraulic conductivity of all aquifers of concern from published material (refer to "Range of Values of Hydraulic Conductivity and Permeability" in the Reference Material sheet).	

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
2. Surface Water Movement			
A. Demonstrated migration of COPC in surface water above background conditions			
Known concentrations of surface water: i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by >1 X; or There is known contact of contaminants with surface water based on site observations. or In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (*e.g.,* toxicity testing; or other indicator testing of exposure).	12	Collect all available information on quality of surface water near to site. Evaluate available data against Canadian Water Quality Guidelines (select appropriate guidelines based on local water use, e.g., recreation, irrigation, aquatic life, livestock watering etc.). The evaluation method concentrates on the surface water flow system and its potential to be an exposure pathway. Contamination is present on the surface (above ground) and has the potential to impact surface water bodies. Surface water is defined as a water body that supports one of the following uses: recreation, irrigation, livestock watering, aquatic life.	General Notes: Someone experienced must provide a thorough description of the sources researched to classify the surface water body in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links. Selected References: CCME. 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life. http://ceqg-rcqe.ccme.ca/ CCME. 1999. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water). http://ceqg-rcqe.ccme.ca/ Health and Welfare Canada. 1992. Guidelines for Canadian Recreational Water Quality. http://www.hc-sc.gc.ca/ewh-semt/water-eau/recreat/index-eng.php
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	8	Examples of indirect evidence may include observed staining of sediment and/or river banks, but surface water has not been tested.	
iii) Meets CWQG or absence of surface water exposure pathway (*e.g.,* Distance to nearest surface water is > 5 km.)	0		

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
B. Potential for migration of COPCs in surface water			
a. Presence of containment No containment Partial containment Full containment Do Not Know	 5 3 0.5 3	Review the existing engineered systems and relate these structures to site conditions and proximity to surface water and determine if full containment is achieved: score low if there is full containment such as capping, berms, dikes; score medium if there is partial containment such as natural barriers, trees, ditches, sedimentation ponds; score high if there are no intervening barriers between the site and nearby surface water. Full containment must include containment of all chemicals.	
b. Distance to Surface Water 0 to <100 m 100 - 300 m >300 m Do Not Know	 3 2 0.5 2	Review available mapping and survey data to determine distance to nearest surface water bodies.	
c. Topography Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	 2 1.5 1.5 1 0.5 0 1	Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (*e.g.,* trench, above ground, etc.).	
d. Run-off potential High (run-off score > 0.6) Moderate (0.4 < run-off score ≤ 0.6) Low (0.2 < run-off score ≤ 0.4) Very Low (0 < run-off score ≤ 0.2) None (run-off score = 0) Do Not Know	 1 0.6 0.4 0.2 0 0.4	Precipitation Refer to Environment Canada precipitation records for relevant areas (30 year average preferred). Divide precipitation (rainfall + snowfall) by 1000 and round to nearest tenth (*e.g.,* 667 mm = 0.7 score). Permeability For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the permeability (infiltration) factor with precipitation factor to obtain Run-off potential score (*e.g.,* precipitation factor of 0.7 from above x 0.6 (loam) = 0.42 or "Moderate").	Selected Sources: Environment Canada web page link: http://climate.weather.gc.ca/climate_normals/index_e.html Snow to rainfall conversion apply ratio of 10(snow):1(water) https://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=108C6C74-1
e. Flood potential 1 in 2 years 1 in 10 years 1 in 50 years not in floodplain Do Not Know	 1 0.5 0.2 0 0.5	Review published data such as flood plain mapping or flood potential (*e.g.,* spring or mountain run-off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.	

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
3. Surface Soils (potential for dust, dermal and ingestion exposure)			
A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)			
COPCs measured in surface soils exceed the CCME soil quality guideline.	12	Collect all available information on quality of surface soils (*i.e.,* top 1.5 metres) at the site. Evaluate available data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (*i.e,* agricultural, residential/parkland, commercial, or industrial), and soil texture if applicable (*i.e.,* coarse or fine). Examples of strongly suspected exceedences of soil guidelines may include evidence of staining, odours, or significant debris infill materials.	Selected References: CCME. 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health http://ceqg-rcqe.ccme.ca/
Strongly suspected that soils exceed guideline(s).	9		
COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	0		
B. Potential for a surface soils (top 1.5 m) migration pathway			
a. Are the soils in question covered?		Consult engineering or risk assessment reports for the site. Alternatively, review photographs or perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCSCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.
Exposed	6		
Vegetated	4		
Landscaped	2		
Paved	0		
Do Not Know	4		
b. For what proportion of the year does the site remain covered by snow?		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).	
0 to 10% of the year	6		
10 to 30% of the year	3		
More than 30% of the year	0		
Do Not Know	3		

Definition	Scoring Guideline	Method Of Evaluation	Notes
4. Vapour			
A. Demonstrated COPCs in vapour.			
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9		
Vapour has not been measured (i.e. not detected) and volatile hydrocarbons have not been found in site soils or groundwater, or vapour has been measured (indoor or outdoor) in concentrations not exceeding risk based concentrations.	0	Due to the potential for significant spatial and temporal variation in soil vapour concentrations, limited vapour monitoring studies (*e.g.,* single point in time "snap-shot") that do not detect vapour at sites where volatiles are suspected, does not necessarily mean that vapours are not an issue at the site. In this case, section B " Potential for COPCs in vapour" should be completed.	
B. Potential for COPCs in vapour			
a. Relative Volatility based on Henry's Law Constant, H' (dimensionless)		Reference: US EPA Soil Screening Guidance (Part 5 - Table 36) *Provided in Attached Reference Materials*	If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5.
High (H' > 1.0E-1)	4	For PHC fractions; score F1 as High, F2 as Moderate, and F3 and F4 as Not Volatile.	
Moderate (H' = 1.0E-1 to 1.0E-3)	2.5		
Low (H' < 1.0E-3)	1	Substance is considered Not Volatile (*i.e.,* pathway not a concern) if the product of the water solubility and unitless Henry's law constant does not exceed published or derived tolerable concentration or risk-specific concentration. If NAPL is present, see Appendix D of the CCME soil vapour quality guidelines protocol (CCME 2014) for further guidance	
Not Volatile	0		Selected References: CCME. 2014. A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours. Winnipeg, Manitoba. http://ceqg-rcqe.ccme.ca/
Do Not Know	2.5		
b. What is the soil grain size?		Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours.	
Fine	2		
Coarse	4		
Do Not Know	3	Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter (D50 < 75 µm). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter (D50 > 75 µm).	
c. Is the depth to the source less than 10m?		Review groundwater depths below grade for the site.	
Yes	2		
No	0		
Do Not Know	1		
d. Are there any preferential pathways?		Visit the site during dry summer conditions and/or review available photographs.	Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Yes	2	Where bedrock is present, fractures would likely act as preferential pathyways.	
No	0		
Do Not Know	1		

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
5. Sediment Movement			
A. Demonstrated migration of sediments containing COPCs			
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in the area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
Strongly suspected (based on observations and/or modelling)	9		
Sediments have been contained and there is no indication that sediments will migrate in future. or Sediment meets CCME sediment quality guidelines or absence of sediment exposure pathway (*i.e.,* within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0		
B. Potential for sediment migration			
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?		Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
Yes	0		
No	4		
Do Not Know	2		
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?		Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.	
Yes	4		
No	0		
Do Not Know	2		
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?		Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional may become scoured. If the sediments present at the site are in a lake or marine habitat, select "no" for this question.	
Yes	4		
No	0		
Do Not Know	2		

Appendix III - (II) Migration Potential (Evaluation of contaminant migration pathways)

Definition	Scoring Guideline	Method Of Evaluation	Notes
6. Modifying Factors			
Are there subsurface utility conduits in the area affected by contamination? Yes No Do Not Know	 4 0 2	Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
1. Human			
A. Known exposure			
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site*)	22	*Where adverse effects on humans are documented, the site should be automatically designated as a Class 1 site (*i.e.,* action required). Known impacts could include blood test results (e.g. blood lead > 10 µg/dL) or results of other health based studies and tests. There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired. A score of 22 can also be assigned when Hazard Quotients (or Hazard Index) >> 1.0 or incremental lifetime cancer risks considerably exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals.	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet. Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site. **Selected References:** Health Canada – Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Heath Screening Level Risk Assessments http://www.hc-sc.gc.ca/ewh-semt/pubs/contamsite/index-eng.php United States Environmental Protection Agency, Integrated Risk Information System (IRIS) – http://toxnet.nlm.nih.gov
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients (or Hazard Index) > 0.2 (excluding the Estimated Daily Intake) or >1.0 with Estimated Daily Intake and/or for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this is typically either $>10^{-5}$ or $>10^{-6}$).	
No quantified or suspected exposures/impacts in humans.	0	The category, no exposure/impacts, can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients (or Hazard Index) of ≤ 0.2 (excluding the Estimated Daily Intake) or ≤ 1.0 with Estimated Daily Intake AND incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10^{-6} or 10^{-5}).	
B. Potential for human exposure			
a) Land use (provides an indication of potential human exposure scenarios)		Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (*e.g.,* greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Parkland includes campgrounds, but excludes wildlands such as national or provincial parks. Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (*e.g.,* children).
Agricultural	3		
Residential / Parkland	2		
Commercial	1		
Industrial	0.5		
Do Not Know	1.5		
b) Indicate the level of accessibility to the contaminated portion of the site (*e.g.,* the potential for coming in contact with contamination)		Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.	
Limited barriers to prevent site access; contamination not covered	2		
Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered.	1		
Controlled access or remote location and contaminants are covered	0		
Do Not Know	1		

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
B. Potential for human exposure			
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential). i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know	 3 0 1.5	If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
ii) inhalation (*i.e.,* inhalation of dust, vapour) Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know	 3 0 1.5	If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances) relative to buildings. Refer to (II) Migration Potential worksheet, 4B.a), *Potential for COPCs in Vapour* for a definition of volatility.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion. Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.
Dust - If there is contaminated surface soil (*e.g.,* top 1.5 m) , indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent (bedrock) Do Not Know Texture	 3 1 0 2	Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2006)) then these soils are more likely to generate dusts.	General Notes; Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links. **Selected References;** Canadian Council of Ministers of the Environment (CCME). 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 1332. http://ceqg-rcqe.ccme.ca/ Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC

Definition	Score	Method Of Evaluation	Notes
B. Potential for human exposure			
iii) Ingestion (*i.e.,* ingestion of food items, water and soils [for children]), including traditional foods. Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future). 0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present No potential for aquifer contamination Do Not Know	 3 2.5 2 1.5 0 0 2	Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (*e.g.,* provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure. The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of flow and contaminant transport. For aquifers, examples of "No drinking water present" includes municipal bylaws prohibiting water wells for potable water use and naturally non-potable (e.g. saline) shallow groundwater. Groundwater drinking water may not be at risk from contamination due to a lack of hydrological connection between contaminated soil or groundwater, or the drinking water is sufficiently up-gradient of the contamination source. Selection of "No potential for aquifer contamination" must be supported with sufficient documentation, e.g. lithological and contaminant properties, well capture zones (map drawn to scale), and capture zone delineation methodology.	**Selected References:** Guidelines for Canadian Drinking Water Quality: http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable. Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.
Is an alternative water supply readily available? Yes No Not Applicable Do Not Know	 0 1 0 0.5	Answer Not Applicable if "No drinking water present" or "No potential for aquifer contamination" was selected in previous question.	
Is human ingestion of contaminated soils possible? Yes No Do Not Know	 3 0 1.5	If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.	
Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings? Yes No Do Not Know	 1 0 0.5	Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (*e.g.,* large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.	
2. Human Exposure Modifying Factors			
a) Strong reliance of local people on natural resources for survival (*i.e.,* food, water, shelter, etc.) in contaminated area. Yes No Do Not Know	 6 0 1		

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
3. Ecological			
A. Known exposure			
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.	18	Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (*i.e.,* a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired.	CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life. CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses. http://ceqg-rcqe.ccme.ca/ Sensitive receptors- review: Canadian Council on Ecological Areas; www.ccea.org Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in *A Framework for Ecological Risk Assessment: General Guidance* (CCME 1996). Notes: Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	12	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.	
No quantified or suspected exposures/impacts in terrestrial or aquatic organisms	0	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects, such as site observations, tissue testing, toxicity testing and quantitative community assessments.	
B. Potential for ecological exposure (for the contaminated portion of the site)			
a) Terrestrial i) Land use Agricultural (or Wild lands) Residential/Parkland Commercial Industrial Do Not Know	 3 2 1 0.5 1.5	Review zoning and land use maps. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (*e.g.,* greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (*e.g.,* herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
ii) Uptake potential Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know	 1 0 0.5	If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
B. Potential for ecological exposure (for the contaminated portion of the site)			
iii) Ingestion (*i.e.,* wildlife or domestic animals ingesting contaminated food items, soils or water)			
Are terrestrial animals likely to be ingesting contaminated water at the site?		Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.	
Yes	1		
No	0		
Do Not Know	0.5		
Are terrestrial animals likely to be ingesting contaminated soils at the site?		Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.	
Yes	1		
No	0		
Do Not Know	0.5		
Can the contamination identified bioaccumulate?		Substances can be considered bioaccumulative if; • There is a Tissue Residue Guideline (TRG) or Soil Quality Guideline for Soil and Food Ingestion for the protection of secondary (SQG_{2C}) and/or tertiary consumers (SQG_{3C}). • Bioaccumulation factor (BAF) or bioconcentration factor (BCF) greater than 5000. • If BAF or BCF is not available, or reliable, the log Kow is equal to or greater than 5. If a literature review indicates that a substance biomagnifies, it should be treated as biomagnifying regardless of whether or not it meets the criteria above. It should also be noted that some substances with a log Kow greater than 5 do not biomagnify. If studies on a substance with a high Kow demonstrate a lack of biomagnification in upper trophic levels, then the substance can be considered not bioaccumulative. Petroleum hydrocarbons F1 to F4 are not considered bioaccumulative.	*See attached Reference Material including log(Kow)* Consult *CEPA (1999) Persistence and Bioaccumulation Regulations* for additional guidance; http://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-107/page-1.html
Yes	1		
No	0		
Do Not Know	0.5		
Distance to sensitive terrestrial ecological area		It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
0 to 300 m	3		
300 m to 1 km	2		
1 to 5 km	1		
> 5 km	0.5		
Do Not Know	1.5		
b) Aquatic			
i) Classification of aquatic environment		"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species. "Typical aquatic environments" include those in areas other than those listed above.	
Sensitive	3		
Typical	1		
Not applicable (no aquatic environment present)	0		
Do Not Know	2		

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
B. Potential for ecological exposure (for the contaminated portion of the site)			
ii) Uptake potential Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know	 1 0 0.5	Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge) . 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater.	
Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	 3 2 1 0.5 1.5	It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and fens and other aquatic environments.
Are aquatic species (*i.e.,* forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No (or Not Applicable) Do Not Know	 1 0 0.5	Substances can be considered bioaccumulative if; • There is a Tissue Residue Guideline (TRG) • Bioaccumulation factor (BAF) or bioconcentration factor (BCF) greater than 5000. • If BAF or BCF is not available, or reliable, the log Kow is equal to or greater than 5. If a literature review indicates that a substance biomagnifies, it should be treated as biomagnifying regardless of whether or not it meets the criteria above. It should also be noted that some substances with a log Kow greater than 5 do not biomagnify. If studies on a substance with a high Kow demonstrate a lack of biomagnification in upper trophic levels, then the substance can be considered not bioaccumulative.	*See attached Reference Material including log(Kow)* Consult *CEPA (1999) Persistence and Bioaccumulation Regulations* for additional guidance; http://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-107/page-1.html

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
4. Ecological Exposure Modifying Factors			
a) Known, or potential, occurrence of a species at risk. Is there a potential for a species at risk to be present at the site, or a known presence? Yes No Do Not Know	 2 0 1	Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as NatureServe Explorer (http://explorer.natureserve.org/). Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance. To assess the potential for a species at risk to be present, the site (or surroundings) should be located within range of a species at risk (using on-line resources and consultation with knowledgeable government departments or biologists, see above), and there should be an assessment of habitat suitability for any identified potential species at risk.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act (http://www.sararegistry.gc.ca/species/schedules_e.cfm?id=1). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCMWLAP. 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection. http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk
b) Potential impact of aesthetics (*e.g.,* enrichment of a lake or tainting of food flavour). Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know	 2 0 1	Documentation may consist of environmental investigation reports, press articles, petitions or other records.	This Item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Is there evidence of olfactory impact (*i.e.,* unpleasant smell)? Yes No Do Not Know	 2 0 1	Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.	
Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know	 2 0 1	A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients *e.g.,* nitrogen or phosphorous releases to an aquatic body can act as a fertilizer.	
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	 2 0 1	Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	

Appendix III - (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Method Of Evaluation	Notes
5. Other Potential Contaminant Receptors			
a) Exposure of permafrost (leading to erosion and structural concerns) Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity? Yes No Do Not Know	 4 0 2	Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.	Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	 2 0 1	Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	

Correctional Service Canada | Service correctionnel Canada

PROTECTED / PROTÉGÉ **B** — ONCE COMPLETED / UNE FOIS REMPLI

INSTITUTIONAL ACCESS CPIC CLEARANCE REQUEST

ACCÈS À UN ÉTABLISSEMENT DEMANDE DE VÉRIFICATION DU DOSSIER AU CIPC

PUT AWAY ON FILE – CLASSER AU DOSSIER
ADMINISTRATIVE OR OPERATIONAL FILE
DOSSIER ADMINISTRATIF OU OPÉRATIONNEL
▶ **Original =** 3170-12

▶ **PLEASE PRINT INFORMATION CLEARLY - VEUILLEZ ÉCRIRE EN LETTRES MOULÉES**

Institution – Établissement	**Request received / Demande reçue le** (Date (YYAA-MM-DJ))	**PUT AWAY ON FILE / CLASSER AU DOSSIER**
321 – Donnacona		▶ **3170-12**

A. PERSONAL INFORMATION – RENSEIGNEMENTS PERSONNELS

Surname / Nom de famille	Full name (no nicknames or initials) / Nom au complet (pas de surnoms ou d'initiales)	Maiden name (if applicable) / Nom de jeune fille (s'il y a lieu)

Date of birth / Date de naissance (YYAA-MM-DJ)	Place of birth – Lieu de naissance: City/Town – Ville ou municipalité	Province/State – Province ou état	Country – Pays

B. PHYSICAL DESCRIPTION – DESCRIPTION PHYSIQUE

☐ Male / Homme ☐ Female / Femme

Height – Grandeur	Weight – Poids	Eye color – Couleur des yeux	Hair color / Couleur des cheveux

C. ADDRESS – ADRESSE

Street – Rue	City/Town – Ville ou municipalité	Province	Postal Code - Code postal	Telephone number – Numéro de téléphone: Home – Domicile	Work – Bureau

Representing (name of company/organization) – Représente (nom de la compagnie ou de l'organisation)

D. GENERAL INFORMATION – RENSEIGNEMENTS GÉNÉRAUX

1.	Have you ever been convicted of a criminal offence for which you have not been granted a pardon, or an offence for which you have been granted a pardon and such a pardon has been revoked? / Avez-vous déjà été reconnu coupable d'une infraction criminelle pour laquelle on ne vous a pas octroyé un pardon ou d'une infraction pour laquelle on vous a octroyé un pardon qui a été révoqué?	☐ Yes / Oui	☐ No / Non
2.	Do you personally know of any person incarcerated in a correctional facility?: / Connaissez-vous personnellement une personne qui est incarcérée dans un établissement correctionnel? If so, provide names - Si oui, fournir son nom :	☐ Yes / Oui	☐ No / Non
3.	Do you have any reason to believe coming into contact with this person could pose a risk to your or their personal safety? / Avez-vous des raisons de croire que le fait d'entrer en contact avec cette personne pourrait présenter un risque pour votre sécurité personnelle ou la sienne ?	☐ Yes / Oui	☐ No / Non
4.	Are you related/associated to an inmate or on an inmate's visiting list? / Êtes-vous apparenté ou associé à un détenu ou inscrit sur la liste des visiteurs d'un détenu?	☐ Yes / Oui	☐ No / Non

If you have answered YES to any of the above, please explain below. – Si vous avez répondu OUI à une des questions ci-dessus, veuillez fournir une explication ci-après.

▶

E. SIGNATURE (When sections A to E are filled out completely, please return the completed form to the institution for approval.) (Une fois que les sections A à E ont été remplies, veuillez retourner le formulaire dûment rempli à l'établissement aux fins d'approbation.)

In making this application, I hereby give the Correctional Service of Canada my consent to use the information provided on this form to conduct such inquiries with police authorities as may be necessary to ascertain my suitability. Finally, I acknowledge that the Correctional Service of Canada has no responsibility for any harm that may come to me in the course of my activities, except where such harm is a direct result of negligence on the part of an employee(s) of the Service.
NOTE: Access may be denied for submitting false information. Passes may be issued for those receiving clearance and approval.

En soumettant la présente demande, j'autorise le Service correctionnel du Canada à se servir des renseignements fournis dans le formulaire afin de mener, auprès des services de police, toute enquête jugée nécessaire pour vérifier mon admissibilité. Par ailleurs, je conviens que le Service correctionnel du Canada ne peut être tenu responsable d'un préjudice subi dans le cadre de mes activités sauf si ce préjudice est directement attribuable à la négligence d'un ou de plusieurs employés du Service.
NOTA : Tout demandeur qui fournit de faux renseignements peut se voir refuser l'accès à l'établissement. Un laissez-passez peut être émis aux demandeurs dont la demande d'accès est approuvée.

Applicant's signature – Signature du demandeur ▶	Date (YYAA-MM-DJ)

F. FOR OFFICE USE ONLY – RÉSERVÉ AU SCC

Reason for clearance – Motif justifiant la demande d'accès

Services de construction et d'experts dans le cadre du projet 321-4601_Construction d'un champ de tir-Donnacona

Department making the request (please print) / Unité qui soumet la demande (en lettres moulées s.v.p.)	Signature of Division Head / Signature du chef de la division ▶	Date (YYAA-MM-DJ)

☐ No criminal record / Aucun casier judiciaire ☐ A possible criminal record #: / Numéro du casier judiciaire ▶ Last entry: / Dernière entrée : ▶

☐ An outstanding warrant/charge held by: / Auteur du mandat non exécuté/accusation en instance : ▶

SIGNATURES

The individual has been advised. – Le demandeur a été informé de la décision. ▶ ☐ Yes / Oui ☐ No / Non By: / Par :

▶ ☐ Approved / Approuvée ☐ Not approved / Non approuvée

Security Intelligence Officer / Agent de renseignements de sécurité ▶	Date (YYAA-MM-DJ)	Institutional Head / Directeur de l'établissement ▶	Date (YYAA-MM-DJ)	Visit Review Board / Comité des visites ▶	Date (YYAA-MM-DJ)

Correctional Service Canada | Service correctionnel Canada

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Security Intelligence Officer / Agent de renseignements de sécurité ▶	Date (YYAA-MM-DJ)	Institutional Head / Directeur de l'établissement ▶	Date (YYAA-MM-DJ)	Visit Review Board / Comité des visites ▶	Date (YYAA-MM-DJ)

APPENDIX IV

SITE CLASSIFICATION WORKSHEETS

CCME National Classification System (2008) version 1.3

(I) Contaminant Characteristics

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
1. Residency Media (replaces physical state)			
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? yes = has an exceedance or strongly suspected to have an exceedance no = does not have an exceedance or strongly suspected not to have an exceedance			
A. Soil			
Yes	2		
No	0		
Do Not Know		1	
B. Groundwater			
Yes	2		
No	0		
Do Not Know		1	
C. Surface water			
Yes	2		
No	0		
Do Not Know		1	
D. Sediment			
Yes	2		
No	0		
Do Not Know		1	
1. Residency Media Subtotal			enter into Summary Score Sheet and add to Raw Total Score below
2. Chemical Hazard			
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?			
High	8		
Medium	4		
Low	2		
Do Not Know		4	
2. Chemical Hazard Subtotal			enter into Summary Score Sheet and add to Raw Total Score below
3. Contaminant Exceedance Factor			
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?			
NAPL (mobile or immobile)	8		
High (>100x)	6		
Medium (10x to 100x)	4		
Low (1x to 10x)	2		
Do Not Know		4	
3. Contaminant Exceedance Factor Subtotal			enter into Summary Score Sheet and add to Raw Total Score below

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(I) Contaminant Characteristics

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
4. Contaminant Quantity (known or strongly suspected)			
What is the known or strongly suspected quantity of all contaminants?			
>10 hectare (ha) or 5000 m^3	9		
2 to 10 ha or 1000 to 5000 m^3	6		
<2 ha or 1000 m^3	2		
Do Not Know		4	
4. Contaminant Quality Subtotal			enter into Summary Score Sheet and add to Raw Total Score below
5. Modifying Factors			
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment?			
Yes	2		
No	0		
Do Not Know		1	
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location?			
Yes	2		
No	0		
Do Not Know		1	
How many different contaminant classes have representative CCME guideline exceedances?			
One	0		
Two to Four	2		
Five or More	3		
Do Not Know		2	
5. Modifying Factor Subtotal			enter into Summary Score Sheet and add to Raw Total Score below

Contaminant Characteristic Total

Raw Total Score			add up each Subtotal Column
Raw Combined Total Score (Known + Potential)			add two values above
Adjusted Total Score (Raw Combined / 40 * 33)			maximum 33

Total Number of Times that "Do Not Know" was Selected	

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(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
1. Groundwater Movement			
A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.			
i) For **potable groundwater environments**, 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For **non-potable environments** (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the appropriate non potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.	12		
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	9		
iii) Meets GCDWQ for **potable environments**; meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for **non-potable environments** **or** Absence of groundwater exposure pathway (*i.e.,* there is no aquifer at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).	0		
		Go to Potential (1B)	
Score (go to 2A)		enter into Summary Score Sheet (Section 1 - Known) and add to Raw Total Score below	

NOTE: If a score is assigned here for Known COPC Exceedances, then you should skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)

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(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
B. Potential for groundwater pathway.			
a. Relative mobility of contaminant			
High		4	
Moderate		2	
Low		1	
Insignificant		0	
Do Not Know		2	
b. Presence of engineered sub-surface containment?			
No containment		3	
Partial containment		1.5	
Full containment		0	
Do Not Know		1.5	
c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway			
3 m or less including no confining layer or discontinuous confining layer		1	
3 to 10 m		0.5	
> 10 m		0	
Do Not Know		0.5	
d. Hydraulic conductivity of confining layer			
$>10^{-4}$ cm/s or no confining layer		1	
10^{-4} to 10^{-6} cm/s		0.5	
$<10^{-6}$ cm/s		0	
Do Not Know		0.5	
e. Precipitation infiltration rate			
(Annual precipitation factor x surface soil relative permeability factor)			
High (infiltration score > 0.6)		1	
Moderate (0.4 < infiltration score ≤ 0.6)		0.6	
Low (0.2 < infiltration score ≤ 0.4)		0.4	
Very Low (0 < infiltration score ≤ 0.2)		0.2	
None (infiltration score = 0)		0	
Do Not Know		0.4	
f. Hydraulic conductivity of aquifer			
$>10^{-2}$ cm/s		2	
10^{-2} to 10^{-4} cm/s		1	
$<10^{-4}$ cm/s		0	
Do Not Know		1	
1B Potential for groundwater pathway Subtotal			enter into Summary Score Sheet (Section 1 - Potential) and add to Raw Total Score below Note: if a "Known" score is provided, the "Potential" score is disallowed

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(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
2. Surface Water Movement			
A. Demonstrated migration of COPC in surface water above background conditions			
Known concentrations of surface water: i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by >1 X; or There is known contact of contaminants with surface water based on site observations. or In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (*e.g.,* toxicity testing; or other indicator testing of exposure).	12		
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	8		
iii) Meets CWQG or absence of surface water exposure pathway (*e.g.,* Distance to nearest surface water is > 5 km.)	0		
		Go to Potential (2B)	
Score (go to 3A)		enter into Summary Score Sheet (Section 2 - Known) and add to Raw Total Score below	

NOTE: If a score is assigned here for Demonstrated Migration in Surface Water, then you should skip Part B (Potential for migration of COPCs in surface water) and go to Section 3 (Surface Soils)

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(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
B. Potential for migration of COPCs in surface water			
a. Presence of containment			
No containment		5	
Partial containment		3	
Full containment		0.5	
Do Not Know		3	
b. Distance to Surface Water			
0 to <100 m		3	
100 - 300 m		2	
>300 m		0.5	
Do Not Know		2	
c. Topography			
Contaminants above ground level and slope is steep		2	
Contaminants at or below ground level and slope is		1.5	
Contaminants above ground level and slope is intermediate		1.5	
Contaminants at or below ground level and slope is intermediate		1	
Contaminants above ground level and slope is flat		0.5	
Contaminants at or below ground level and slope is flat		0	
Do Not Know		1	
d. Run-off potential			
High (run-off score > 0.6)		1	
Moderate (0.4 < run-off score ≤ 0.6)		0.6	
Low (0.2 < run-off score ≤ 0.4)		0.4	
Very Low (0 < run-off score ≤ 0.2)		0.2	
None (run-off score = 0)		0	
Do Not Know		0.4	
e. Flood potential			
1 in 2 years		1	
1 in 10 years		0.5	
1 in 50 years		0.2	
not in floodplain		0	
Do Not Know		0.5	
2B. Potential for Surface water pathway subtotal			enter into Summary Score Sheet (Section 2 - Potential) and add to Raw Total Score below Note: if a "Known" score is provided, the "Potential" score is disallowed

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
3. Surface Soils (potential for dust, dermal and ingestion exposure)			
A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)			
COPCs measured in surface soils exceed the CCME soil quality guideline. Strongly suspected that soil exceeds guideline(s). COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	12 9 0	Go to Potential (3B)	
Score (go to 4A)		enter into Summary Score Sheet (Section 3 - Known) and add to Raw Total Score below	

NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you should skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)

B. Potential for a surface soils (top 1.5 m) migration pathway			
a. Are the soils in question covered?			
Exposed		6	
Vegetated		4	
Landscaped		2	
Paved		0	
Do Not Know		4	
b. For what proportion of the year does the site remain covered by snow?			
0 to 10% of the year		6	
10 to 30% of the year		3	
More than 30% of the year		0	
Do Not Know		3	
3B. Potential for Soil pathway Subtotal			enter into Summary Score Sheet (Section 3 - Potential) and add to Raw Total Score below Note: if a "Known" score is provided, the "Potential" score is disallowed

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(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
4. Vapour			
A. Demonstrated COPCs in vapour.			
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12		
Strongly suspected (based on observations and/or modelling)	9		
Vapour has not been measured (i.e. not detected) and volatile hydrocarbons have not been found in site soils or groundwater, or vapour has been measured (indoor or outdoor) in concentrations not exceeding risk based concentrations.	0		
		Go to Potential (4B)	
Score (go to 5A)		enter into Summary Score Sheet (Section 4 - Known) and add to Raw Total Score below	

NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you should skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)

B. Potential for COPCs in vapour			
a. Relative Volatility based on Henry's Law Constant, H' (dimensionless)			
High (H' > 1.0E-1)		4	
Moderate (H' = 1.0E-1 to 1.0E-3)		2.5	
Low (H' < 1.0E-3)		1	
Not Volatile		0	
Do Not Know		2.5	
b. What is the soil grain size?			
Fine		2	
Coarse		4	
Do Not Know		3	
c. Is the depth to the source less than 10m?			
Yes		2	
No		0	
Do Not Know		1	
d. Are there any preferential pathways?			
Yes		2	
No		0	
Do Not Know		1	
4B. Potential for Vapour pathway Subtotal			enter into Summary Score Sheet (Section 4 - Potential) and add to Raw Total Score below Note: if a "Known" score is provided, the "Potential" score is disallowed

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(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
5. Sediment Movement			
A. Demonstrated migration of sediments containing COPCs			
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12		
Strongly suspected (based on observations and/or modelling)	9		
Sediments have been contained and there is no indication that sediments will migrate in future. or Sediment meets CCME sediment quality guidelines or absence of sediment exposure pathway (*i.e.,* within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0		
		Go to Potential (5B)	
Score (go to 6)		enter into Summary Score Sheet (Section 5 - Known) and add to Raw Total Score below	

NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you should skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)

B. Potential for sediment migration			
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?			
Yes		0	
No		4	
Do Not Know		2	
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?			
Yes		4	
No		0	
Do Not Know		2	
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?			
Yes		4	
No		0	
Do Not Know		2	
5B. Potential for Sediment pathway Subtotal			enter into Summary Score Sheet (Section 5 - Potential) and add to Raw Total Score below Note: if a "Known" score is provided, the "Potential" score is disallowed

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(II) Migration Potential (Evaluation of contaminant migration pathways)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
6. Modifying Factors			
Are there subsurface utility conduits in the area affected by contamination? Yes No Do Not Know	 4 0	 2	
6. Migration Potential Modifying Factors Subtotal			enter into Summary Score Sheet (Section 6 - Known or Potential) and add to Raw Total Score below

Migration Potential Total

Raw Total Score			add up each Subtotal Column
Raw Combined Total Score (Known + Potential)			add two values above
Adjusted Total Score (Raw Combined / 64 *33)			maximum 33

Total Number of Times that "Do Not Know" was Selected		Do not count "Do Not Know" in Potential sections when a score was assigned in corresponding Known section (applies to sections 1 through 5).

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(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
1. Human			
A. Known exposure			
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 site)	22		
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10		
No quantified or suspected exposures/impacts in humans.	0	Go to Potential (1B)	
Score (go to 2)		enter into Summary Score Sheet (Section 1 - Known) and add to Raw Combined Total Human Score below	

NOTE: If a score is assigned here for Known Exposure, then you should skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)

B. Potential for human exposure (if no exposure enter a score of zero)			
a) Land use (provides an indication of potential human exposure scenarios)			
Agricultural		3	
Residential / Parkland		2	
Commercial		1	
Industrial		0.5	
Do Not Know		1.5	
b) Indicate the level of accessibility to the contaminated portion of the site (*e.g.,* the potential for coming in contact with contamination)			
Limited barriers to prevent site access; contamination not		2	
Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered.		1	
Controlled access or remote location and contaminants are covered		0	
Do Not Know		1	
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential).			
i) direct contact			
Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated?			
Yes		3	
No		0	
Do Not Know		1.5	

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(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
B. Potential for human exposure (if no exposure enter a score of zero)			
ii) inhalation (*i.e.*, inhalation of dust, vapour)			
Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)?			
Yes		3	
No		0	
Do Not Know		1.5	
Dust - If there is contaminated surface soil (*e.g.*, top 1.5 m) , indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero.			
Fine		3	
Coarse		1	
Surface soil is not contaminated or absent (bedrock)		0	
Do Not Know Texture		2	
iii) Ingestion (*i.e.*, ingestion of food items, water and soils [for children]), including traditional foods.			
Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future).			
0 to 100 m		3	
100 to 300 m		2.5	
300 m to 1 km		2	
1 to 5 km		1.5	
No drinking water present		0	
No potential for aquifer contamination		0	
Do Not Know		2	
Is an alternative water supply readily available?			
Yes		0	
No		1	
Not Applicable		0	
Do Not Know		0.5	
Is human ingestion of contaminated soils possible?			
Yes		3	
No		0	
Do Not Know		1.5	
Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?			
Yes		1	
No		0	
Do Not Know		0.5	
1B Potential for Human Exposure Subtotal			enter into Summary Score Sheet (Section 1 - Potential) and add to Raw Combined Total Human Score below. Note: if a "Known" score is provided, the "Potential" score is disallowed.

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(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
2. Human Exposure Modifying Factors			
a) Strong reliance of local people on natural resources for survival (*i.e.,* food, water, shelter, etc.) in contaminated area.			
Yes	6		
No	0		
Do Not Know		1	
2. Human Exposure Modifying Factors Subtotal			enter into Summary Score Sheet (Section 2 - Known or Potential) and add to Raw Combined Total Human Score below
3. Ecological			
A. Known exposure			
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.	18		
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	12		
No quantified or suspected exposures/impacts in terrestrial or aquatic organisms	0		
		Go to Potential (3B)	
Score (go to 4)			enter into Summary Sheet (Section 3 - Known) and add to Raw Combined Total Ecological Score below

Note : If a score is assigned here for Known Exposure, then you should skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)

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(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
B. Potential for ecological exposure (for the contaminated portion of the site)			
a) Terrestrial			
i) Land use			
Agricultural (or Wild lands)		3	
Residential/Parkland		2	
Commercial		1	
Industrial		0.5	
Do Not Know		1.5	
ii) Uptake potential			
Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site?			
Yes		1	
No		0	
Do Not Know		0.5	
iii) Ingestion (*i.e.,* wildlife or domestic animals ingesting contaminated food items, soils or water)			
Are terrestrial animals likely to be ingesting contaminated water at the site?			
Yes		1	
No		0	
Do Not Know		0.5	
Are terrestrial animals likely to be ingesting contaminated soils at the site?			
Yes		1	
No		0	
Do Not Know		0.5	
Can the contamination identified bioaccumulate?			
Yes		1	
No		0	
Do Not Know		0.5	
Distance to sensitive terrestrial ecological area			
0 to 300 m		3	
300 m to 1 km		2	
1 to 5 km		1	
> 5 km		0.5	
Do Not Know		1.5	

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(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
B. Potential for ecological exposure (for the contaminated portion of the site)			
b) Aquatic			
i) Classification of aquatic environment			
Sensitive		3	
Typical		1	
Not Applicable (no aquatic environment present)		0	
Do Not Know		2	
ii) Uptake potential			
Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact?			
Yes		1	
No (or Not Applicable)		0	
Do Not Know		0.5	
Distance from the contaminated site to an important surface water resource			
0 to 300 m		3	
300 m to 1 km		2	
1 to 5 km		1	
> 5 km		0.5	
Do Not Know		1.5	
Are aquatic species (*i.e.,* forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues?			
Yes		1	
No (or Not Applicable)		0	
Do Not Know		0.5	
3B Potential for Ecological Exposure Subtotal			enter into Summary Score Sheet (Section 3 - Potential) and add to Raw Combined Total Ecological Score below. Note: if a "Known" score is provided, the "Potential" score is disallowed.

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(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
4. Ecological Exposure Modifying Factors			
a) Known, or potential, occurrence of a species at risk.			
Is there a potential for a species at risk to be present at the site, or a known presence?			
Yes	2		
No	0		
Do Not Know		1	
b) Potential impact of aesthetics (*e.g.,* enrichment of a lake or tainting of food flavor).			
Is there evidence of aesthetic impact to receiving water bodies?			
Yes	2		
No	0		
Do Not Know		1	
Is there evidence of olfactory impact (*i.e.,* unpleasant smell)?			
Yes	2		
No	0		
Do Not Know		1	
Is there evidence of increase in plant growth in the lake or water body?			
Yes	2		
No	0		
Do Not Know		1	
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different?			
Yes	2		
No	0		
Do Not Know		1	
4. Ecological Exposure Modifying Factors Subtotal			enter into Summary Score Sheet (Section 4 - Known and/or Potential) and add to Raw Combined Total Ecological Score below

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(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site (from Appendix II):

Definition	Known	Potential	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)
5. Other Potential Contaminant Receptors			
a) Exposure of permafrost (leading to erosion and structural concerns)			
Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity?			
Yes	4		
No	0		
Do Not Know		2	
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment?			
Yes	2		
No	0		
Do Not Know		1	
5. Other Potential Contaminant Receptors Subtotal			enter into Summary Score Sheet (Section 5 - Known and/or Potential) and add to Total Other Receptors Score below

Exposure Total

Raw Combined Total Human Score (Known + Potential)		add up all Subtotals for Human Exposure and Human Modifying Factors (Known + Potential)
Raw Combined Total Ecological Score (Known + Potential)		add up all Subtotals for Ecological Exposure and Ecological Modifying Factors (Known + Potential)
Total Other Receptors Score (Known + Potential)		add up Subtotals for Other Potential Contaminant Receptors (Known + Potential)
Adjusted Total Human Score		Enter the Raw Combined Total Human Score from above, or 22, whichever is lower
Adjusted Total Ecological Score		Enter the Raw Combined Total Ecological Score from above, or 18, whichever is lower
Total Exposure Score		add three values above (*i.e.,* Total Other, Adjusted Human, Adjusted Ecological)
Adjusted Total Score (Total Exposure / 46 * 34)		maximum 34

Total Number of Times that "Do Not Know" was Selected		Do not count "Do Not Know" in Potential sections when a score was assigned in corresponding Known sections (applies to section 1 and 3).

APPENDIX V

SUMMARY SCORE SHEET

CCME National Classification System (2008) version 1.3

Appendix V - Score Summary

Scores from individual worksheets are tallied in this worksheet.
Refer to this sheet after filling out the NCSCS completely.

I. Contaminant Characteristics

	Known	Potential
1. Residency Media		
2. Chemical Hazard		
3. Contaminant Exceedance Factor		
4. Contaminant Quantity		
5. Modifying Factors		
Raw Total Score		
Raw Combined Total Score (Known + Potential)		

Adjusted Total Score (Raw Combined Total /40*33) _____ (maximum 33)
(use for Total NCSCS Score)

II. Migration Potential

	Known	Potential
1. Groundwater Movement		
2. Surface Water Movement		
3. Soil		
4. Vapour		
5. Sediment Movement		
6. Modifying Factors		
Raw Total Score		
Raw Combined Total Score (Known + Potential)		

Adjusted Total Score (Raw Combined Total /64*33) _____ (maximum 33)
(use for Total NCSCS Score)

III. Exposure

	Known	Potential
1. Human Receptors		
2. Human Receptors Modifying Factors		
Raw Total Human Score		
(Add values in Sections 1 and 2 above)		
Raw Combined Total Human Score (Known + Potential)		add two values above
Adjusted Total Human Score		(maximum 22)
(Enter the Raw Total above, or 22, whichever is lower)		
3. Ecological Receptors		
4. Ecological Receptors Modifying Factors		
Raw Total Ecological Score		
(Add values in Sections 3 and 4 above)		
Raw Combined Total Ecological Score (Known + Potential)		add two values above
Adjusted Total Ecological Score		(maximum 18)
(Enter the Raw Total above, or 18, whichever is lower)		
5. Other Receptors		
Total Other Receptors Score (Known + Potential)		add two values above
Total Exposure Score (Human + Ecological + Other)		add Adjusted Totals for Human, Ecological, and Other Receptors
Adjusted Total Score (Total Exposure /46*34)		(maximum 34)
(use for Total NCSCS Score)		

Site Score

Site (from Appendix II):

Site Letter Grade		
Certainty Percentage		(Number of gray-shaded boxes with values) / 16 x 100%
% Responses that are "Do Not Know"		(Total number of "Do Not Know" responses from 3 worksheets) / 58 x 100%
Total NCSCS Score for site		
Site Classification Category		

Site Classification Categories*:

Class 1** - High Priority for Action (Total NCS Score >70)
Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
Class N - Not a Priority for Action (Total NCS Score <37)
Class INS - Insufficient Information (≥15% of Responses are "Do Not Know", or a site letter grade of F has been assigned)

* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.
**assign Class 1 if "Known" human exposure = 22

APPENDIX 8 – Contaminated Soil Management Grill

Annexe 5 : Grille de gestion des sols excavés

La grille de gestion des sols excavés ne s'applique, pour les critères supérieurs à A, que pour une contamination de nature anthropique. Si la concentration naturelle dans le sol est supérieure à A, la gestion des sols contenant cette concentration naturelle est considérée comme équivalente à celle attribuable au critère A.

≤ critère A[1]

Utilisés sans restriction sur tout terrain.

< critère B (valeurs limites de l'annexe I du RPRT)

1. Ailleurs que sur le terrain d'origine, les sols ne peuvent être déposés que sur des sols dont la concentration en contaminants est égale ou supérieure à celle des sols remblayés (article 4 du RSCTSC) et s'ils n'émettent pas d'odeurs d'hydrocarbures perceptibles.
2. Aux mêmes conditions, déposés sur ou dans des terrains destinés à l'habitation s'ils sont utilisés comme matériau de remblayage dans le cadre de travaux de réhabilitation de terrains faits conformément à la LQE.

≤ critère B (valeurs limites de l'annexe I du RPRT)

1. Valorisés sur le terrain d'origine ou sur le terrain à partir duquel a eu lieu l'activité à l'origine de la contamination.
2. Valorisés comme matériau de recouvrement journalier ou final dans un lieu d'enfouissement technique (LET) ou comme matériau de recouvrement hebdomadaire ou final dans un lieu d'enfouissement en tranchée ou comme recouvrement mensuel ou final dans un lieu d'enfouissement de débris de construction ou de démolition, conformément au REIMR aux conditions des articles 42, 50, 90, 91, 105 ou 106.
3. Valorisés comme recouvrement final dans un lieu d'enfouissement de sols contaminés (LESC) aux conditions décrites à l'article 38 du RESC ou valorisés dans un système de captage des gaz prévu à l'article 13 du RESC.
4. Valorisés comme recouvrement final d'un lieu de dépôt définitif de matières dangereuses aux conditions de l'article 101 du RMD.
5. Valorisés comme matériau de recouvrement final dans un système de gestion qui comporte le dépôt définitif par enfouissement de déchets de fabriques de pâtes et papiers, aux conditions de l'article 116 du Règlement sur les fabriques de pâtes et papiers (RFPP).
6. Valorisés sur un lieu d'élimination nécessitant un recouvrement, aux conditions prévues au certificat d'autorisation en vertu de l'article 22 de la LQE.
7. Valorisés avec ou sans MRF, comme matériau apte à la végétation dans des projets de restauration d'aires d'accumulation de résidus miniers[2] ou dans la couverture de lieux visés par le RFPP, le RESC ou le RMD. Ne doit dégager aucune odeur d'hydrocarbures perceptible. Dans le cas d'ajout de MRF, le projet doit être autorisé et respecter le *Guide sur l'utilisation de matières résiduelles fertilisantes pour la restauration de la couverture végétale de lieux dégradés*[3].
8. Valorisés comme couche de protection d'une géomembrane utilisée dans un système multicouche lors de la restauration d'une aire d'accumulation de résidus miniers générateurs d'acide[2].

9. Éliminés dans un lieu d'enfouissement visé par le RESC.
10. Éliminés dans un LET, un lieu d'enfouissement en tranchée, un lieu d'enfouissement en milieu nordique, un lieu d'enfouissement de débris de construction ou de démolition ou un lieu d'enfouissement en territoire isolé, conformément à l'article 4 du REIMR.

≥ critère B et ≤ critère C

1. Utilisés sur le terrain d'origine comme matériau de remblayage à la condition que les concentrations mesurées respectent les critères ou valeurs limites réglementaires applicables aux sols selon l'usage et le zonage.
2. Valorisés comme matériau de recouvrement dans un LET ou comme matériau de recouvrement hebdomadaire dans un lieu d'enfouissement en tranchée, aux conditions des articles 42, 50 ou 90 du REIMR. Ces conditions incluent notamment que les concentrations de composés organiques volatils soient égales ou inférieures aux critères B.
3. Traités sur place ou dans un lieu de traitement autorisé.
4. Éliminés dans un lieu d'enfouissement visé par le RESC.

< annexe I du RESC

1. Utilisés pour remplir des dépressions naturelles ou des excavations sur le terrain d'origine lors de travaux de réhabilitation aux conditions prévues dans le plan de réhabilitation approuvé dans le cadre d'une analyse de risques (dossiers GTE), à la condition que les C_{10}-C_{50} et les COV respectent les critères d'usage.
2. Traités sur place ou dans un lieu de traitement autorisé.
3. Éliminés dans un lieu d'enfouissement visé par le RESC.

≥ annexe I du RESC

1. Décontaminés sur place ou dans un lieu de traitement autorisé et gestion selon le résultat obtenu. Si cela est impossible, éliminés dans un lieu d'enfouissement visé par le RESC pour les exceptions mentionnées à l'article 4.1º a, b ou c.

Cas particuliers

1. Des sols contaminés peuvent être utilisés, à condition de ne dégager aucune odeur d'hydrocarbures perceptible, pour la construction d'un écran visuel ou antibruit dont l'utilité est démontrée :
    a. Sur un terrain résidentiel avec des sols du terrain d'origine :
        i. dont les concentrations sont ≤ B;
        ii. dont les concentrations sont ≤ C, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols contiennent des concentrations ≤ B en C_{10}-C_{50} et en composés organiques volatils (COV)[4];
        iii. dont les concentrations sont < annexe I du RESC, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols en place soient de niveau > C et que les sols déposés contiennent des concentrations ≤ B en C_{10}-C_{50} et en COV[4];

b. Sur un terrain commercial/industriel avec des sols du terrain d'origine :

   i. dont les concentrations sont ≤ C;

   ii. dont les concentrations sont ≤ C, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement;

   iii. dont les concentrations sont < annexe I du RESC, lors de travaux de réhabilitation sur le terrain réalisés conformément au plan de réhabilitation approuvé dans le cadre d'une analyse de risque (dossiers GTE), sous les mesures de confinement, à condition que les sols en place soient > C, et que les sols déposés contiennent des concentrations ≤ C en C_{10}-C_{50} et en COV[4].

2. La valorisation de sols contaminés dans un procédé en remplacement d'une matière vierge est possible aux conditions de l'autorisation.

3. Les sols ≥ B peuvent être acheminés sur les aires de résidus miniers, s'ils sont contaminés exclusivement par des métaux ou métalloïdes résultant des activités minières de l'entreprise responsable de l'aire, aux conditions de l'autorisation délivrée par le Ministère (article 6 du RSCTSC).

4. Les sols ≥ B peuvent être acheminés dans un lieu de dépôt définitif de matières dangereuses aux conditions du certificat d'autorisation détenu par ce lieu pour recevoir des sols.

Note : S'il y a présence de matières résiduelles dans les sols, se référer à la figure 12 de la section 7.7.2.

1. S'il est établi que la concentration naturelle dans le sol importé est supérieure au critère A et à la concentration du sol récepteur, il est recommandé au propriétaire du terrain récepteur de garder une trace du remblayage (localisation, niveau de contamination, provenance des sols importés), de façon à ce qu'il puisse, le cas échéant, démontrer qu'il ne s'agit pas d'une contamination anthropique. Faute de l'existence d'une telle trace, le Ministère considérera que les sols ont été contaminés par l'activité humaine et ils devront donc être gérés comme tels. Advenant le cas où les concentrations naturelles excèdent largement les critères génériques recommandés pour l'usage qui est fait du terrain récepteur, un avis sur les possibles risques à la santé et l'à-propos du remblayage avec de tels sols pourra être demandé à la direction de santé publique.

2. Ne s'applique pas aux sols contaminés = B, à moins que ces sols n'aient d'abord transité par un lieu visé à l'article 6 du Règlement sur le stockage et les centres de transfert de sols contaminés. Les sols excavés ≥ B ne peuvent en effet être acheminés directement que dans des lieux légalement autorisés à les recevoir et listés à l'article 6 du RSCTSC.

3. Il faudra toutefois s'assurer que la valorisation de sols A-B, auxquels on aura ajouté des matières fertilisantes ou non, entraîne un effet bénéfique, par exemple, sur la croissance de la végétation, et que ces sols répondent à un besoin réel, l'ajout de sols n'étant pas essentiel dans tous les cas de restauration minière. Il sera possible de s'assurer du bien-fondé du projet de valorisation et de son contrôle dans le cadre du certificat d'autorisation délivré préalablement à sa réalisation.

4. L'écran visuel ou antibruit doit être recouvert de 1 m de sols ≤ A ou de 40 cm ≤ A aux endroits recouverts d'une structure permanente (asphalte ou béton). Il est possible d'utiliser des MRF dans la couche apte à la végétation selon les orientations du *Guide sur l'utilisation des matières résiduelles fertilisantes pour la restauration de la couverture végétale des lieux dégradés* si la résultante est ≤ A.

SNC·LAVALIN
6155, rue des Tournelles
Québec (Québec) G2J 1P7
418 626-5211 - 418 626-9312
www.snclavalin.com

APPENDIX C

Correctional Service Canada | Service correctionnel Canada

PROTECTED / PROTÉGÉ **B** — ONCE COMPLETED / UNE FOIS REMPLI

INSTITUTIONAL ACCESS CPIC CLEARANCE REQUEST

ACCÈS À UN ÉTABLISSEMENT DEMANDE DE VÉRIFICATION DU DOSSIER AU CIPC

PUT AWAY ON FILE – CLASSER AU DOSSIER
ADMINISTRATIVE OR OPERATIONAL FILE
DOSSIER ADMINISTRATIF OU OPÉRATIONNEL
▶ **Original =** 3170-12

▶ **PLEASE PRINT INFORMATION CLEARLY - VEUILLEZ ÉCRIRE EN LETTRES MOULÉES**

Institution – Établissement	**Request received / Demande reçue le**	**PUT AWAY ON FILE / CLASSER AU DOSSIER**
321 – Donnacona	Date (YYAA-MM-DJ)	▶ **3170-12**

A. PERSONAL INFORMATION – RENSEIGNEMENTS PERSONNELS

Surname / Nom de famille	Full name (no nicknames or initials) / Nom au complet (pas de surnoms ou d'initiales)	Maiden name (if applicable) / Nom de jeune fille (s'il y a lieu)

Date of birth / Date de naissance (YYAA-MM-DJ)	Place of birth – Lieu de naissance: City/Town – Ville ou municipalité	Province/State – Province ou état	Country – Pays

B. PHYSICAL DESCRIPTION – DESCRIPTION PHYSIQUE

☐ Male / Homme ☐ Female / Femme

Height – Grandeur	Weight – Poids	Eye color – Couleur des yeux	Hair color / Couleur des cheveux

C. ADDRESS – ADRESSE

Street – Rue	City/Town – Ville ou municipalité	Province	Postal Code - Code postal	Telephone number – Numéro de téléphone: Home – Domicile	Work – Bureau

Representing (name of company/organization) – Représente (nom de la compagnie ou de l'organisation)

D. GENERAL INFORMATION – RENSEIGNEMENTS GÉNÉRAUX

1.	Have you ever been convicted of a criminal offence for which you have not been granted a pardon, or an offence for which you have been granted a pardon and such a pardon has been revoked? / Avez-vous déjà été reconnu coupable d'une infraction criminelle pour laquelle on ne vous a pas octroyé un pardon ou d'une infraction pour laquelle on vous a octroyé un pardon qui a été révoqué?	☐ Yes / Oui	☐ No / Non
2.	Do you personally know of any person incarcerated in a correctional facility?: / Connaissez-vous personnellement une personne qui est incarcérée dans un établissement correctionnel? If so, provide names - Si oui, fournir son nom :	☐ Yes / Oui	☐ No / Non
3.	Do you have any reason to believe coming into contact with this person could pose a risk to your or their personal safety? / Avez-vous des raisons de croire que le fait d'entrer en contact avec cette personne pourrait présenter un risque pour votre sécurité personnelle ou la sienne ?	☐ Yes / Oui	☐ No / Non
4.	Are you related/associated to an inmate or on an inmate's visiting list? / Êtes-vous apparenté ou associé à un détenu ou inscrit sur la liste des visiteurs d'un détenu?	☐ Yes / Oui	☐ No / Non

If you have answered YES to any of the above, please explain below. – Si vous avez répondu OUI à une des questions ci-dessus, veuillez fournir une explication ci-après.

▶

E. SIGNATURE (When sections A to E are filled out completely, please return the completed form to the institution for approval.) (Une fois que les sections A à E ont été remplies, veuillez retourner le formulaire dûment rempli à l'établissement aux fins d'approbation.)

In making this application, I hereby give the Correctional Service of Canada my consent to use the information provided on this form to conduct such inquiries with police authorities as may be necessary to ascertain my suitability. Finally, I acknowledge that the Correctional Service of Canada has no responsibility for any harm that may come to me in the course of my activities, except where such harm is a direct result of negligence on the part of an employee(s) of the Service.
NOTE: Access may be denied for submitting false information. Passes may be issued for those receiving clearance and approval.

En soumettant la présente demande, j'autorise le Service correctionnel du Canada à se servir des renseignements fournis dans le formulaire afin de mener, auprès des services de police, toute enquête jugée nécessaire pour vérifier mon admissibilité. Par ailleurs, je conviens que le Service correctionnel du Canada ne peut être tenu responsable d'un préjudice subi dans le cadre de mes activités sauf si ce préjudice est directement attribuable à la négligence d'un ou de plusieurs employés du Service.
NOTA : Tout demandeur qui fournit de faux renseignements peut se voir refuser l'accès à l'établissement. Un laissez-passez peut être émis aux demandeurs dont la demande d'accès est approuvée.

Applicant's signature – Signature du demandeur ▶	Date (YYAA-MM-DJ)

F. FOR OFFICE USE ONLY – RÉSERVÉ AU SCC

Reason for clearance – Motif justifiant la demande d'accès

Services de construction et d'experts dans le cadre du projet 321-4601_Construction d'un champ de tir-Donnacona

Department making the request (please print) / Unité qui soumet la demande (en lettres moulées s.v.p.)	Signature of Division Head / Signature du chef de la division ▶	Date (YYAA-MM-DJ)

☐ No criminal record / Aucun casier judiciaire ☐ A possible criminal record #: / Numéro du casier judiciaire ▶ Last entry: / Dernière entrée : ▶

☐ An outstanding warrant/charge held by: / Auteur du mandat non exécuté/accusation en instance : ▶

SIGNATURES

The individual has been advised. – Le demandeur a été informé de la décision.

▶ ☐ Approved / Approuvée ☐ Not approved / Non approuvée ▶ ☐ Yes / Oui ☐ No / Non By: / Par :

Security Intelligence Officer / Agent de renseignements de sécurité ▶	Date (YYAA-MM-DJ)	Institutional Head / Directeur de l'établissement ▶	Date (YYAA-MM-DJ)	Visit Review Board / Comité des visites ▶	Date (YYAA-MM-DJ)

APPENDIX D

PRICE SCHEDULE – COST BREAKDOWN FOR LUMP SUM WORK

SNC·LAVALIN

Project : Donnacona Establishment - Firing Range Construction
Project no. : 638589
Location Donnacona

Uniformat II, ASTM E-1557-05

COST BREAKDOWN FOR LUMP SUM WORK

	Construction facilities, mobilization, demobilization, signage and security	$
A1010	Foundations	$
A1030	Slabs	$
B1020	Roofing work	$
B2010	Exterior walls	$
B2020 and B2030	Exterior doors and windows	$
B3010	Roof cladding	$
C1010	Interior walls	$
C1020 and C1030	Interior doors and integrated accessories	$
C3010 and C3030	Walls, floors and ceiling finishes	$
D2010 to D2030	Plumbing fixtures, domestic potable water and sanity sewer systems	$
D3040 to D3070 and D4030	HVAC distribution, packageg factory assembled components or one-piece units, regulation and instrumentation and testing and ajustment of HVAC systems and other fire protection accessories	$
D5010 to D5090	Services and electricity distribution, secondary distribution of lighting, communication, security and other electrical systems	$
G1010 to G1030	Clearing of site, displacement and demolition and earthwork, networks and services	$
G2010 to G2030	Pavement and walking surface	$
G2040 to G2050	Landscaping work	$
G3010 to G3030	Water supply, sanitary sewer and storm systems	$
G4010 and G4020	Power distribution and outdoor lighting	$
G90	Special equipment (bullet trap)	$
	Sub-total :	$
	GST (5 %) :	$
	QST (9.975 %) :	$
	TOTAL :	$