

**Public Works and Canada Government Services**

**Waskaganish Airport**

**Construction of a prefabricated building**

**For sand storage**

**N° projet R.070405.001**

## SEALS AND SIGNATURE PAGE

Project N° R.070405.001

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## SUMMARY OF WORK

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**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Not Used.

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 The work covered by this contract includes construction of sand shed at the Waskaganish airport. This work includes without being limited to:
  - .1 Excavation and grading;
  - .2 Granular backfill and compaction of the foundation of the building;
  - .3 Building foundations;
  - .4 Prefabricated building steel structure;
  - .5 Mechanical and electrical components;
  - .6 Architectural works.

**1.3 CONTRACT METHOD**

- .1 Construct Work under lump sum unit price contract.
- .2 Subcontractor must have obtained contractor license before proceeding with the works require for the contractor.

**1.4 WORK SEQUENCE**

- .1 Construct Work in stages to accommodate Departmental Representative continued use of premises during construction see Section 01 35 13.13 – Special procedures for airport facilities.

**1.5 PERIOD OF EXECUTION**

- .1 The period of execution of all work is 10 weeks from the date of award of the contract to Contractor.

**1.6 OWNER OCCUPANCY**

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

**1.7 DEPARTMENTAL REPRESENTATIVE FURNISHED ITEMS**

- .1 Departmental Representative Responsibilities:
  - .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
  - .2 Deliver supplier's bill of materials to Contractor.
  - .3 Verify condition of MG 20b materials on site with Contractor.

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- .4 Arrange for replacement of damaged, defective or missing items.
- .2 Contractor Responsibilities:
  - .1 Designate submittals and delivery date for each product in progress schedule.
  - .2 Review shop drawings, product data, samples, and other submittals. Submit to Departmental Representative notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
  - .3 Receive and unload products at site.
  - .4 Inspect deliveries jointly with Departmental Representative; record shortages, and damaged or defective items.
  - .5 Handle products at site, including uncrating and storage.
  - .6 Protect products from damage, and from exposure to elements.
  - .7 Assemble, install, connect, adjust, and finish products.
  - .8 Provide installation inspections required by public authorities.
  - .9 Repair or replace items damaged by Contractor or subcontractor on site (under his control).
- .3 Schedule of Departmental Representative furnished items:
  - .1 No material is provided by the Department.

**1.8 EXISTING SERVICES**

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give the Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to airport facilities.
- .3 Provide alternative routes for vehicular traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify the Departmental Representative of findings.
- .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Where unknown services are encountered, immediately advise Department Representative and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .8 Record locations of maintained, re-routed and abandoned service lines.

**1.9 DOCUMENTS REQUIRED**

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

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- .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.

**Part 2 PRODUCTS****2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION****3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 05 50 00 - Miscellaneous Metals
- .2 Section 08 11 00 - Metal doors and frames
- .3 Section 08 36 13.02 - Sectional overhead doors
- .4 Section 08 71 00 - Door hardware
- .5 Refer also to Structural, Mechanical and Electrical Sections.

**1.2 ADMINISTRATIVE**

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

**1.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Quebec province of Canada.

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

- .7 Operating weight.
- .8 Wiring diagrams.
- .9 Single line and schematic diagrams.
- .10 Relationship to adjacent work.
- .9 After Ministerial Representative's review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Ministerial Representative may reasonably request.
- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Ministerial Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Ministerial Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within [3] years of date of contract award for project.
- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Ministerial 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.
- .14 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Ministerial 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.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Ministerial Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Ministerial Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Ministerial Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed.

If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

- .21 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

**END OF SECTION**



**Part 1 GENERAL****1.1 REFERENCES**

- .1 References to relevant standards may be made in each part of specifications.
- .2 If there is question as to whether products or systems are in conformance with applicable standards, Ministerial Representative reserves right to check through testing.
- .3 Cost for testing will be borne by Ministerial Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

**1.2 QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and otherwise use 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 Ministerial Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

**1.3 AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Ministerial Representative so 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 Ministerial Representative at start of Work and should it subsequently appear that Work may be delayed for such reason, Ministerial Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

**1.4 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration or soiling, 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 Avoid storing cement products directly on ground or on concrete floors or against walls.
- .5 Keep sand used for grout or mortar materials clean and dry. Store on wooden platforms.
- .6 Store lumber and wooden sheets or panels on flat, solid supports, and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated, well 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 to satisfaction of Ministerial Representative.
- .9 Touch up damaged factory finished surfaces to Ministerial Representative's satisfaction. Use touch-up materials to match original. Do not paint over nameplates.

## **1.5 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Ministerial Representative will be paid by the latter. Unload, handle and store these products.

## **1.6 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 manufacturer.
- .2 Notify Ministerial Representative in writing of discrepancy between specifications and manufacturer's instructions so that Ministerial Representative can take suitable action.
- .3 Improper installation or erection of products, due to failure to comply these requirements, entitles Ministerial Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

## **1.7 QUALITY OF WORK**

- .1 Ensure that Quality of Work is of highest standard, executed by workers experienced and skilled in their respective trades. Immediately notify Ministerial Representative if required Work is unlikely to produce expected results.
- .2 Do not employ persons unskilled in their required duties. Ministerial Representative reserves right to require dismissal from site of workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in any dispute rest solely with Ministerial Representative, whose decision is final.

**1.8 CO-ORDINATION**

- .1 Ensure co-operation of workers in conducting Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

**1.9 CONCEALMENT**

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, inform Ministerial Representative of any abnormal situation. Install as directed by Ministerial Representative.

**1.10 REMEDIAL WORK**

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to avoid damage or risk of damage to any portion of Work.

**1.11 LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Ministerial Representative of any conflicting installation. Install as directed.

**1.12 FASTENINGS - GENERAL**

- .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 other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings that cause spilling or cracking of material to which items are anchored are not acceptable.

**1.13 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.

#### **1.14 PROTECTION OF WORK IN PROGRESS**

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless indicated otherwise in writing by Ministerial Representative.

#### **1.15 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/or to building occupants.
- .2 Protect, relocate or maintain existing active utilities. When utilities are encountered, cap off in manner approved by appropriate authority. Stake and record location of capped utility.

**END OF SECTION**

**Part 1 GENERAL****1.1 PROJECT CLEANLINESS**

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

**1.2 CLEANING WORK**

- .1 Contractor must comply with regulations in Hazardous Materials Information System for materials used in work and must ensure that data sheets of all hazardous materials used are kept at all times in building where products are stored and are kept up to date when products are purchased and that each container, big or small, is duly labelled.
  - .2 Contractor must ensure that incompatible chemicals are stored away from each other.
  - .3 Make sure workers wear appropriate gloves when using cleaning products.
  - .4 Ensure that public is protected against slipping when floors are washed.
  - .5 Prepare the surfaces that will receive the new finishes so that the surfaces will be free of dirt, dust and other contaminants such as oil.
  - .6 During outdoor cleaning, advise Ministerial Representative if there is accumulation of excrement from birds or other animals for him to indicate requirements to be met.
- For the renovation of existing surfaces, contractor shall inspect and prepare all surfaces as required to remove all traces of stains, dust or oil as required prior to apply the new finishes. Apply new finishes as per recommendations from manufacturer.

**1.3 FINAL CLEANING**

- .1 When Work is substantially performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Ministerial Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 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.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors and ceilings.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvers, dampers and screens.
- .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Remove dirt and other disfiguration from exterior surfaces.
- .14 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

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

**END OF SECTION**

## **Partie 1        GENERAL**

### **1.1        WASTE MANAGEMENT GOALS**

- .1        Prior to start of Work, conduct meeting with Departmental Representative to review and discuss TPSGC 's Waste Management Plan and Goals.
- .2        TPSGC goals for waste management is to reduce the total flow of construction / demolition waste to landfill. Provide to Ministry representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3        Accomplish maximum control of solid construction waste.
- .4        Preserve environment and prevent pollution and environment damage.

### **1.2        RELATED REQUIREMENTS**

- .1        None.

### **1.3        DEFINITIONS**

- .1        Class III: non-hazardous waste - construction renovation and demolition waste.
- .2        Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.
- .3        Demolition Waste Audit (DWA): relates to actual waste generated from project.
- .4        Inert Fill: inert waste - exclusively asphalt and concrete.
- .5        Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .6        Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .7        Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .8        Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .9        Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
  - .1        Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
  - .2        Returning reusable items including pallets or unused products to vendors.
- .10       Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

- .11 Separate Condition: refers to waste sorted into individual types.
- .12 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
- .13 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.
- .14 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .15 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Appendix A).

#### **1.4 DOCUMENTS**

- .1 Maintain at job site, one copy of the following document:
  - .1 Construction demolition waste management and disposal plan.

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

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit non-hazardous waste management and disposal plan identifying methods and sites for disposal of solid waste and clearing debris (Section 01 74 21).

#### **1.6 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
  - .1 Number and size of bins;
  - .2 Waste type of each bin;
  - .3 Total tonnage generated.
- .4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.
- .6 Dispose waste at an authorized site.

#### **1.7 USE OF SITE AND FACILITIES**

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



**1.8 SCHEDULING**

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

**Partie 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Partie 3 EXECUTION**

**3.1 APPLICATION**

- .1 Execute work in compliance with plans and specifications and the waste disposal and management plan.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

**3.2 CLEANING**

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Dispose clean-up waste to authorized site.

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

- .1 Ministère de l'Environnement et de la Faune, siège social 150, boul. René-Lévesque Est, Québec (Québec) G1R 3P4.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 For work on or near road right-of-ways, Contractor shall control road traffic.

### **1.2 REFERENCES**

- .1 Ministère des Transports du Québec
  - .1 Tome V des Normes des ouvrages routiers intitulé « Signalisation routière »;
  - .2 CCDG, édition 2016.

### **1.3 PROTECTION OF PUBLIC TRAFFIC**

- .1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.
- .2 When working on travelled way:
  - .1 Place equipment in position to minimize interference and hazard to travelling public.
  - .2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
  - .3 Do not leave equipment on travelled way overnight.
- .3 Close lanes of road only after receipt of written approval from Departmental Representative.
  - .1 Before re-routing traffic erect suitable signs and devices according to “Tome V, Signalisation routière”.
- .4 Keep travelled way graded, free from pot holes and of sufficient width for required number of lanes of traffic.
  - .1 Provide 7 m wide minimum temporary roadway for traffic in two-way sections through Work and on detours.
  - .2 Provide 5 m wide minimum temporary roadway for traffic in one-way sections through Work and on detours.

### **1.4 INFORMATIONAL AND WARNING DEVICES**

- .1 Provide and maintain signs and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.
- .2 Supply and erect signs, delineators, barricades and miscellaneous warning devices according to “Tome V, Signalisation routière” des Normes des ouvrages routiers du ministère des Transports du Québec.
- .3 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list to approval of Departmental Representative.

- .4 Continually maintain traffic control devices in use:
  - .1 Check signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
  - .2 Remove or cover signs which do not apply to conditions existing from day to day.

## **1.5 CONTROL OF PUBLIC TRAFFIC**

- .1 Provide competent flag personnel, trained in accordance with, and properly equipped according to “Tome V, Signalisation routière” des Normes des ouvrages routiers du ministère des Transports du Québec.
  - .1 When public traffic is required to pass working vehicles or equipment that block all or part of travelled roadway.
  - .2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.
  - .3 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
  - .4 Where temporary protection is required while other traffic control devices are being erected or taken down.
  - .5 For emergency protection when other traffic control devices are not readily available.
  - .6 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.
  - .7 Delays to public traffic due to contractor's operators:[15] minutes maximum.
- .2 Where roadway, carrying two-way traffic, is restricted to one lane, for 24 hours each day, provide portable traffic signal system.
  - .1 Adjust, as necessary, and regularly maintain system during period of restriction.
  - .2 Ensure signal system meets requirements according to “Tome V, Signalisation routière” des Normes des ouvrages routiers du ministère des Transports du Québec.

## **1.6 PAYMENT**

- .1 Costs for traffic control procedures are included in tender unit prices.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

**Part 3            EXECUTION**

**3.1        NOT USED**

.1        Not Used.

**END OF SECTION**

**Part 1            GENERAL**

**1.1      RELATED REQUIREMENTS**

- .1      Not Used.

**1.2      GENERAL PROTECTION**

- .1      Do not disrupt airport business except as permitted by Departmental Representative.
- .2      Provide temporary protection for safe handling of public, personnel, pedestrians and vehicular traffic.
- .3      Provide barricades and lights where directed by Departmental Representative.

**1.3      MOVEMENT OF EQUIPMENT AND PERSONNEL**

- .1      In areas of airport not closed to aircraft traffic:
  - .1      Obtain Departmental Representative's approval on scheduling of Work.
  - .2      Control movements of equipment and personnel as directed by Departmental Representative.
  - .3      Provide qualified field personnel at locations designated by Departmental Representative to relay signals from airport traffic control tower to equipment and personnel wishing to cross live traffic areas.
  - .4      Immediately obey signals from airport traffic control tower.

**1.4      UNSERVICEABLE AREAS**

- .1      Mark off areas made unserviceable for aircraft by Work of this Contract by providing highly visible danger markings by day and red lights by night.
- .2      Open flames and flammable fuels are not permitted.
- .3      Park equipment not in use and stockpile materials so that stockpile tops are below 50 to 1 ratio from ends of useable landing strip and below 20 to 1 ratio from sides of aircraft traffic areas.
  - .1      Mark tops with red lights as directed by Departmental Representative.

**1.5      TRENCHING**

- .1      Obtain Departmental Representative's written permission to undertake trenching on pavements open to aircraft traffic which cannot be completed, backfilled and sealed within 1 working day.

**1.6      AIRPORT FACILITIES**

- .1      Departmental Representative will stake or indicate location of underground facilities such as cables, pipes, ducts and other services and utilities.
- .2      Notify Departmental Representative of work areas [48] hours minimum in advance of operations to allow sufficient time for underground facilities and service to be located.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**Part 4 SPECIFIC REQUIREMENTS**

**4.1 GENERAL**

- .1 These specifications define the special requirements set out in this Contract relative to the impacts of the Work on air traffic and the site environment. The Work specified herein consists of, without being limited to:
  - .1 Maintenance of air traffic;
  - .2 Compliance with requirements set out in “*Aerodromes Standards and Recommended Practices – TP 312, 5<sup>th</sup> Edition*” and “*Aéroports et héliports*” from the Quebec standards collection;
  - .3 Compliance of signalling equipment.

**4.2 GENERAL MEASURES**

- .1 Airport areas
  - .1 This document is consistent with the operations plan during construction (OPC), which will be produced and approved by Transport Canada. The OPC is a prerequisite for all Work carried out on the airport site and must be strictly adhered to by Contractor.
  - .2 To enable or facilitate the performance of the Work, the runway will be closed except during peak air traffic periods and for medical emergencies, in accordance with the terms and conditions described in items 4.5.2 and 4.6.1 herein.

**4.3 AIRPORT AREA WORKPLAN**

- .1 Contractor’s workplan shall be approved by Transport Canada as part of the OPC. Contractor shall request a coordination meeting with Transport Canada and the Departmental Representative at least 4 weeks prior to the start of the Work.
- .2 The present project is divided into three phases:
  - .1 Site preparation;
  - .2 Work of building foundations;
  - .3 Assembly work of the prefabricated structure and components.

- .3 Contractor is required to submit a workplan to the Departmental Representative that takes into consideration the requirements specified in item 4.6 - Air Traffic Maintenance and the impacts of the Work on airport activities, and includes provisions for maintaining air and land traffic at the site during construction.
- .4 In addition to the measures the Contractor intends to apply to mitigate impacts on air traffic, the workplan details the signs and visual markers, their locations and the equipment it plans to use.
  - .1 According to the content of the workplan, Transport Canada will issue any necessary NOTAMs (Notice to air men/Message aux navigants) with which Contractor shall comply.

#### **4.4 AIRSIDE ACCESS**

- .1 Authorization for airside access shall be given by the on-site “observer/communicator” employed by Transport Canada. Whenever the runway or part of the runway is in service, it is imperative that Contractor obtain permission to access the runway from the “observer/communicator” under penalty of the Work being suspended. Contractor shall therefore ensure that a member of its team holds a restricted radiotelephone operator’s certificate and that this person serves as an “Escort” for vehicles that require airside access.
- .2 Airside escort service is required at all times when the runway is open to air traffic. Contractor can minimize use of airside escort service by reducing the periods it works when the runway is open to aircraft traffic.

#### **4.5 WORK SCHEDULE**

- .1 General
  - .1 Work shall be performed on a regular schedule that is approved by the Departmental Representative at least 2 weeks prior to the start of the Work. Contractor shall adapt its work schedule in terms of the air traffic restrictions specified in item 4.5.2, runway closure periods specified in item 4.5.3, and the constraints pertaining to air traffic maintenance specified in item 4.6.
- .2 Air traffic restrictions
  - .1 Prior to the start of the Work and given the air traffic maintenance requirement, Contractor shall obtain confirmation from Transport Canada of the time slots during which no work and no vehicular traffic are permitted on the airport’s active movement areas.
  - .2 A daily restricted period applies as of a half hour prior to the first flight and one hour after the last flight. The regular Air Creebec passenger flight schedule is provided in the tender documents. Contractor shall note that this schedule is provided for information purposes, and that flight delays can extend the restricted period and that the flight schedule may be modified prior to the award of the contract or during the contract. With respect to freight transportation, cargo plane operations shall take place during the restricted time slot.

#### **4.6 AIR TRAFFIC MAINTENANCE**

- .1 To maintain air traffic, work undertaken on or near movement areas shall be performed primarily outside air traffic periods. No transportation on the runway is permitted within these periods.
  - .1 Distress alerts and medical emergencies
    - .1 In the event of distress alerts or medical emergencies, Contractor shall be prepared to restore the runway to active service at any time. For this purpose, Contractor shall submit an emergency plan at least 2 weeks prior to the start of the Work to the Departmental Representative for approval.
- .2 During the takeoff and landing of aircraft involved with emergency services, Contractor shall comply with the following directives:
  - .1 In the event of a medical evacuation, Contractor shall turn over full access to movement areas within a maximum of 2 hours of notice provided by Departmental Representative and suspend all work and movement for the period specified by the Departmental Representative.
  - .2 To return runway to active service, Contractor shall inspect the runway and restore it to proper condition.
  - .3 During periods when work is suspended, Contractor shall move to and store equipment at a holding position approved by the Departmental Representative.
- .3 Final cleaning and levelling
  - .1 This phase of the work shall be performed during runway closure periods, as indicated in item 4.5.3 herein.
  - .2 Contractor is responsible for any damage to marker and navigation aid equipment and to the runway subgrade surface that may occur during the execution of the Work. Contractor shall undertake replacement and/or corrective work at its expense to the satisfaction of the Departmental Representative and Transport Canada.
  - .3 Existing markers as well as visual aids to navigation, such as runway identification lights (RILS) and windsocks, shall be protected and maintained in operating condition on the entire length of the runway.
  - .4 Service interruptions on existing visual aids to navigation are authorized only for very short periods and must be approved by the Departmental Representative and Transport Canada, which will issue a NOTAM, as required.

#### **4.7 MARKING OF WORK AREAS (AIRPORT AREA)**

- .1 In general, Contractor shall comply with the requirements set out in “*Aerodromes Standards and Recommended Practices – TP 312, 4<sup>th</sup> Edition*” and in the “*Canadian Aviation Regulations, Part III.*”



#### **4.8 COMMUNICATIONS EQUIPMENT**

- .1 Contractor's site manager shall be equipped with a radio transmitter-receiver compatible with the frequencies used by the airport. The site manager shall be available at all times through this equipment.

#### **4.9 HEAVY MACHINERY AND ESCORT VEHICLES**

- .1 All vehicles used in the performance of the Work shall be equipped with an orange rotating or flashing warning light, including trucks transporting aggregate between the work site and the aggregate production site and/or stockpile. When airside, these vehicles shall have their low beam headlights turned on.
- .2 Holding points are determined for every phase of the Work and are approved by the Departmental Representative and Transport Canada. Contractor shall use these holding points to remain off the runway while waiting to receive authorization to move by the "observer-communicator."
- .3 During all takeoffs and landings and after every shift, all equipment must be moved off movement areas and must comply with standards set out in TP 312, 4<sup>th</sup> Edition.

#### **4.10 ISSUE OF NOTAM**

- .1 NOTAMs are issued by the Departmental Representative and Transport Canada. Contractor shall therefore coordinate the issue of a NOTAM with the Departmental Representative and Transport Canada in terms of its work schedule.
- .2 Contractor shall notify the Departmental Representative and Transport Canada at least 72 hours prior to beginning any work that is likely to affect air traffic, specifically:
  - .1 Starting work or working on another part of the runway, taxiway or apron;
  - .2 Using equipment that does not comply with requirements set out in TP 312, 4<sup>th</sup> Edition, as regards obstacle limitation surfaces.

#### **4.11 PAYMENT METHODS FOR AIR TRAFFIC MAINTENANCE AND WORK AREA SIGNAGE**

- .1 Air traffic maintenance and work area signage costs are included in tender lump sum prices.
- .2 Tender lump sum prices for air traffic maintenance and work area signage include all expenses arising from the requirements and specifications indicated herein, including labour, runway closure management and emergency plans, supply, installation and maintenance of signs, visual markers and runway closure markers, all perimeters established for the safety of airport users and workers, changes required during the Work, time wasted by Contractor owing to density of air traffic, distress alerts and medical emergency interventions, airside escort costs as stipulated in item 1.4 herein, and all incidental expenses. Finally, all expenses arising from related work that is not specifically described herein are included in the various phases indicated above.

**4.12 SPECIAL SIGN**

- .1 At the start of construction, Contractor shall install a 2,438 mm x 1,219 mm sign on the side of the access road to the airport as indicated in the layout plan provided by the Departmental Representative.  
  
This sign must remain in good condition for the duration of the Work. Contractor shall therefore protect the self-adhesive sheet with a transparent plastic material. The self-adhesive sheet will be supplied by the Departmental Representative.
- .2 This sign is included in the tender lump sum prices which cover the supply of all materials except the self-adhesive sheet, as well as labour, the equipment required to install the sign, sign maintenance, and any incidental expenses.

**END OF SECTION**

## HEALTH AND SAFETY REQUIREMENTS

Project N° R.070405.001

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**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Quebec
  - .1 An Act Respecting Occupational Health and Safety, R.S.Q. 1997 (updated 26 July 2005).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction, daily to Departmental Representative.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 2 days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

**HEALTH AND SAFETY REQUIREMENTS**

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**1.4 FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

**1.5 SAFETY ASSESSMENT**

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

**1.6 MEETINGS**

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

**1.7 PROJECT/SITE CONDITIONS**

- .1 Work at site will involve contact with:
  - .1 Section 01 35 000.06 - Special procedures for traffic control.
  - .2 Section 01 35 13.13 - Special procedures for airport facilities.

**1.8 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

**1.9 RESPONSIBILITY**

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

**1.10 COMPLIANCE REQUIREMENTS**

- .1 Comply with Workers Compensation Act, B.C. Reg.
- .2 Comply with Occupational Health and Safety Act, Industrial and Commercial Establishments Regulation, R.R.Q.
- .3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

**1.11 UNFORSEEN HAZARDS**

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

## HEALTH AND SAFETY REQUIREMENTS

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**1.12 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have site-related working experience specific to activities associated with works in Cree community.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .5 Be on site during execution of Work [and report directly to and be under direction of Registered Occupational Hygienist

**1.13 POSTING OF DOCUMENTS**

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

**1.14 CORRECTION OF NON-COMPLIANCE**

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

**1.15 WORK STOPPAGE**

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

**Part 2 PRODUCTS****2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION****3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**PART 1 GENERAL****1.1 SCOPE OF WORK**

- .1 Work covered by this quotation includes expertise, manpower, materials, accessories, equipment and services for design, supply, implementation and removing of concrete forms in accordance with the drawings herein and the contract Documents.

**1.2 DEFINITIONS**

- .1 The following definitions apply throughout this section of the quote
  - .1 Professional: consultant in structure or its representative on site during work execution
  - .2 Plans: unless otherwise annotated, drawings sealed and signed by the professional in structure and issued for execution of works.

**1.3 RELATED SECTIONS**

- .1 Section 03 30 05 – Cast-in-place concrete
- .2 Section 01 74 21 - Construction/demolition waste management and disposal
- .3 General requirements apply to the work described in this section

**1.4 REFERENCES**

This quotation refers to the latest edition and revision of codes and standards.

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-O86S1, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3 CSA O121, Douglas Fir Plywood.
  - .4 CSA O151, Canadian Softwood Plywood.
  - .5 CSA O153, Poplar Plywood.
  - .6 CAN/CSA-O325.0, Construction Sheathing.
  - .7 CSA O437, Standards for OSB and Waferboard.
  - .8 CSA S269.1, Falsework for Construction Purposes.
  - .9 CAN/CSA-S269.3, Concrete Formwork, National Standard of Canada
  - .10 Handbook SP 4 : «Formwork for Concrete», 4th edition, publish by the American Concrete Institute, P.O. Box 19150, Redford Station, Detroit, Michigan 48219, U.S.A.

- .2 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

## **1.5 LINES AND LEVELS**

- .1 Place and secure on site all pin terminals required to erect formwork in strict compliance with the lines and levels shown on the plans. The Contractor is solely responsible for the accuracy of these bench marks and must check them regularly and whenever the Professional deems necessary.
- .2 Replace or immediately rectify any landmark terminal that has been removed or moved before the concrete work for which it is required have been completed and approved by the Professional.

## **1.6 SHORING OF FORMS**

- .1 Comply with each provision of Section VI of Safety Code for construction work, 2.1 S, r.6 published by Québec Official Publisher.

## **1.7 SHOP DRAWINGS**

- .1 For surfaces that remain exposed, submit to Professional for review the shop drawings of formwork. The orientation and size of plywood sheets, positions of form ties, sets of plates, and joints must be clearly indicated on the drawings. Exposed surfaces are shown on the architectural drawings and have the word 'exposed concrete'.

## **1.8 OPENINGS AND SLEEVES**

- .1 Provide and implement formwork required to achieve all the openings shown on the structural drawings and other specialties including mechanical, electrical and architecture, including all sleeves. Coordinate number, diameter and position of each opening and each sleeve with the other disciplines.
- .2 Submit to Professional for approval, shop drawings clearly indicating the size, location and, if applicable, the elevation of each of the breakthroughs and cavities that are required in the concrete frame for the passing or burial of electrical and mechanical equipment of the building. These drawings must be prepared to be checked and approved by the mechanical and electrical consultant before being forwarded to the Professional.
- .3 All costs incurred to comply with the requirements of sub-section .2 above must be assumed by the Contractor.
- .4 The Contractor must not claim any extra in relation to openings shown on mechanical and electrical drawings but omitted on the structural drawings.

## **1.9 ACCESSORIES REQUIREMENTS**

- .1 Provide and implement all specified accessories on plans, even though such equipment may not be described in this section.
- .2 The brand of each manufactured products described in this section must be approved by the Professional. If the Professional requests it, submit technical description and/or

samples of the products as well as certified copies of test results and tests conducted by independent laboratories, certifying the compliance of the products with the standard specifications governing its manufacture.

### **1.10 NON STRUCTURAL ELEMENTS**

- .1 In all cases where fixations are not mentioned on plans but are required in the concrete frame of the building to support vertically and/or laterally architectural elements, mechanical equipment parts, electrical or other, the structural design and calculations of these fasteners are entirely and exclusively the responsibility of the manufacturer who provides them, and does not commit in any way the professional responsibility of the Engineer.
- .2 Fixations referred in sub-section .1 above include plates, angles and all other direct contact hardware parts with concrete of the framework, including rods, bolts, studs and various anchoring devices entirely or partially embedded in the concrete.
- .3 The Contractor must nevertheless submit to the Engineer for information two (2) copies of shop drawings clearly indicating the location of all required fasteners as well as the intensity and direction of the constraints that each fastener introduce into the concrete frame; These drawings must be beforehand "approved for construction" by an engineer active member of the Ordre des ingénieurs du Québec.

### **1.11 AUTHORIZATION OR APPROVAL OF PROFESSIONAL**

- .1 When required in accordance with the requirements of this section, the permission or approval of the Professional must not be regarded as having been obtained until it has been notified in writing or recorded in the minutes ratified by all persons attending meeting and where Professional was also attending.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Plywood, wood, steel, aluminum, etc. must comply with the specifications of the most recent editions of CSA standards for the manufacturing of those materials.
- .2 For areas that remain exposed, use new or "new state" plywood, meaning that all corners and edges are intact and the surface should be smooth, with no unbounded surface lamellae.  
  
Smooth (meaning): at the time of stripping, plywood should not leave knot or wood fiber fingerprints in concrete.
- .3 Release oil: inert oil which does not stain the concrete and will not decrease the adhesion of coatings. Use vegetable oil that meets the requirements of laws and regulations relating to the environment. Submit specifications for consideration by the Professional.
- .4 Form ties: use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .5 For exposed surfaces, form ties should not allow metal within 35 mm of the surface and leave a net hole made with a nylon cone or otherwise.



- .6 Shoring: telescopic cylinders steel.

## 2.2 PRODUCTS ACCESSORIES

- .1 Steel Embedded parts
  - .1 Steel embedded parts meet the requirements of CSA G40.21 standard, grade 300W.
  - .2 All embedded parts in concrete and exposed to outdoor conditions is hot dip galvanized in accordance with CAN / CSA-G164,
- .2 Precasted trim joints
  - .1 Foam-cell polyvinyl chloride boards (with sealed pores) not subject to extrusion, rigid nuance and a trademark approved by the Professional.
- .3 Putty caulking joints
  - .1 Polyurethane based sealing mastic that meets the specifications of ONGC CAN2-19-GP-16M.
  - .2 The sealant used to seal joints in floors must be self-leveling.
- .4 Thermal Insulation
  - .1 For insulation boards shown in the drawings of concrete, extruded polystyrene and expanded meets the specifications of ONGC F41 GP 14a, type 4.
- .5 Grout (for base plates)
  - .1 Expansive cement grout that meets the requirements of ASTM C107, Class A. Use a pre-dosed product bag with a minimum strength of 30 MPa at the age of 7 days.

## Part 3 EXECUTION

### 3.1 ACCESSORIES

- .1 Caulking joints
  - .1 Respect the dimensions given in the drawings and follow the manufacturer's recommendations.
- .2 Thermal Insulation
  - .1 Install boards so that they are not subsequently subject to be bent or to be perforated.
  - .2 Replace with no charge to the client any board that, in the opinion of the Professional, was damaged to the point that its insulating properties are reduced.
  - .3 Join panels without leaving any gap and seal the joints with plastic moisture resistant tape.
- .3 Waterproofing seals
  - .1 Even if there is no indication in the drawings, all vertical joints below ground level must be waterproofed with sealing blades.

- .2 Take care not to deform or damage the sealing strips by placing them in the forms; avoid moving the adjacent rebar and ensure that the forms do not move or fold during concreting.
- .3 Join sealing blades by hot welding, following the manufacturer's recommendations; each weld must be perfectly sealed. The abutment of the blades on the site is permitted only in the case of segments located in the extension of one another.
- .4 Embedded parts
  - .1 All embedded parts manufacturing work must be performed in accordance with the requirements of CAN3-S16.1
- .5 Adjustment of base plates for grouting (steel framing)
  - .1 Agree with the manufacturers of the superstructure of the dates on which the final adjustment of the base plates on columns and walls will be made.
  - .2 Measure out and implement the casting of grout according to manufacturer's directions. Ensure no vacuum is left on each plate.

### 3.2 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions correspond to drawings.
- .2 Erect formwork according to the tolerances specified in section 6 of CAN / CSA A23.1.
- .3 Minimize the number of joints in the formwork. No horizontal joint is allowed at a height of less than 3.2 meters above the floor in the forms of walls and columns, where the concrete must remain exposed.
- .4 Align the inner walls of forms sides joints and make them fully waterproof.
- .5 Bevel with triangular strips of 20 mm side edges of beams and columns, concrete must remain exposed unless otherwise indicated on the plans.
- .6 Secure to framework all components required for molding grooves, reinforcements, mortises, drips, etc. in strict accordance with the details shown in the drawings, including architectural drawings.
- .7 For areas marked on the structural or architectural drawings, where the concrete will remain apparent, position if required in the drawings, boards, sticks, etc., to obtain the specified texture.
- .8 Unless otherwise specified on the structural or architectural drawings, form ties must be arranged in a regular module. Fill tie holes with gray plastic caps pale or dark gray depending on the appearance of the concrete, as approved by the architect. The caps must be set back from the face of concrete.
- .9 After forms stripping, seal the bottom of holes using caulking approved by the Professional. Exposed surface wood forms must be new or "new condition". Submit to Professional for review the shop drawings formwork.
- .10 It must be prohibited, unless the Professional have given permission, to mold into the forms openings that are not shown on the drawings referred in Article 1.9.

### 3.3 SHORING OF FORMS

- .1 Adjust the height of each of the required shoring under the forms to compensate for subsidence that may occur during the installation of the concrete and adjust forms as prescribed in sub-section .2 below.
- .2 Determine the curvature required in the middle of the span of each element of the concrete floor of the building unless more specific indications are available on drawings.
  - .1 Beams and slabs where the main reinforcement is unidirectional: 2 mm per net meter of length.
  - .2 Slabs where the main reinforcement is bidirectional: 2 mm per meter along the diagonals joining the opposite edges of the quadrilateral formed by each panel.
  - .3 In the case of beams or slabs that are cantilever, unless the Professional specifies height, camber at the unsupported end of these elements must be 2 mm per net meter of length.
- .3 Make sure that items of formwork with imposed curvature will not be shallower in thicknesses or depths than those indicated on the plans.

### 3.4 CONSTRUCTION JOINTS

- .1 Vertical elements laid in the forms to delimit construction joints in the concrete frame must be stiff, straight and perfectly straight; they must also be perforated so that the reinforcement that crosses them may be placed at the specified height and spacing according to the plans.
- .2 Set up the wood pieces to practice the key in the concrete.

### 3.5 ANCHOR BOLTS

- .1 Position accurately and secure in the forms anchor bolts shown on the plans.
- .2 Use wooden template to position the anchors according to the elements to be anchored. Fix the anchors to the template with a nut and a washer above and below the template.
- .3 Coordinate delivery to the site of the anchor bolts with the supplier of those bolts.

### 3.6 ACCESSORY PARTS

- .1 Place and secure in the forms in accordance with the details shown on the plans all accessory parts to be fully or partially embedded in the concrete.
- .2 Place and also secure in the forms other accessory part to be embedded in the concrete frame that is shown on architectural drawings, mechanical or electrical expressly approved in this regard by the Professional.
- .3 Coordinate the delivery to site and the installation of accessory parts with suppliers of these parts.
- .4 It is prohibited to place in the forms accessory parts not stated on the plans or on the drawings referred to in Article .2 above, unless the Professional has given his authorisation.

**3.7 REMOVAL OF FORMWORK**

- .1 Leave the formwork in place after placing concrete until the following periods have expired:
  - .1 Footings: 24 hours;
  - .2 Walls, columns and beams sides: 3 days;
  - .3 Slab and beam soffits: 28 days, or 3 days if reshoring is made immediately (within 30 minutes or less) and remains in place until the end the aforementioned period of 28 days.
  - .4 The period of time specified above represent a number of cumulative hours, days or fractions of days, not necessarily consecutive, during which the ambient temperature is maintained to at least 10 ° C.
- .2 Notwithstanding the provisions of sub section .1 above, do not proceed to removal of formworks unless the Professional is satisfied, with the measures taken to ensure concrete cure and protection against cold or heat and weather, and has given permission.
- .3 Professional can however cancel the provisions of sub-section .1 above if non-destructive testing of the concrete in place in the forms indicates that the concrete has reached the following percentages of resistance to the specified compression:
  - .1 Footings: 20%
  - .2 Walls: 40%
  - .3 Columns: 60%
  - .4 Beams and slabs: 80%
- .4 Non-destructive testing mentioned above must have a recognized value and be approved by the Professional; it will determine beforehand where they are made. The costs of these tests must be assumed by the Contractor.
- .5 Even when it was authorized by the Professional to proceed to removal of formwork and/or shore, the Contractor remains solely responsible for any damage to concrete framing members as a result of the premature execution of this work.

**3.8 RESHORING**

- .1 Submit to Professional for approval a sketch indicating the number and the position of shoring to be held in place under framework of the floors after removal of formwork. This sketch must be sealed and signed by the Engineer referred in Article 1.6.2.
- .2 No charge in addition to their own weight must solicit the backbone of concrete elements when they are reshored immediately after removal of formwork.
- .3 The reshoring must be executed according to the requirements of Chapter 10 of Handbook SP 4 of the American Concrete Institute (see section 1.4).

**END OF SECTION**

**Part 1 GENERAL****1.1 DEFINITIONS**

- .1 The following definitions apply throughout this section of the quote
  - .1 Professional: consultant in structure or its representative on site during work execution
  - .2 Plans: unless otherwise annotated, drawings sealed and signed by the professional in structure and issued for execution of works.

**1.2 RELATED SECTIONS**

- .1 General requirements apply to the work described in this section
- .2 Section 01 74 21 - Construction/demolition waste management and disposal
- .3 Section 03 30 05 – Cast-in-place concrete

**1.3 REFERENCES**

This quotation refers to the latest edition and revision of codes and standards.

- .1 Reinforcing Steel Institute of Canada (RSIC), RSIC-2004, Reinforcing Steel, Manual of Standard Practice.
- .2 CSA A23.1-14 - A23.2-14 “Concrete materials and methods of concrete construction, test methods and standard practices for concrete”, article 6. Make the reinforcements and position them in the forms in accordance with the requirements of this Article unless they are modified or strengthened in this section.
- .3 CSA-A23.3-14 - Design of concrete structures, articles 7 to 12.

**1.4 DOCUMENTS / SAMPLES SUBMITTALS**

- .1 Drawings of reinforcement must be applied according to the Manual of Standard Practice.
- .2 Submit shop drawings, which must show in particular , the location of the reinforcements, and specify or include the following:
  - .1 Rebar bending details.
  - .2 Rebar list.
  - .3 Number of rebar.
  - .4 Drawings must show the dimensions, spacing, location of rebar and if necessary, mechanical connections. The rebar that are shown must be marked by an identification code to identify their location without the need to consult the structural drawings.
  - .5 Drawings must also indicate the size, spacing, and placement of chairs, spacers and supports.
  - .6 Lengths of encasement and lengths of overlap must comply with CSA A23.3.

- .3 Quality Control
  - .1 Report of the tests performed in the factory: provide the Professional with a certified copy of the steel reinforcements test report made at the factory.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Reinforcing steel: billet steel, grade 400, deformed bars compliant with CSA-G30.18.
- .2 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .3 Cold-drawn annealed steel wire ties: compliant with ASTM A497/A497M.
- .4 Deformed steel wire for concrete reinforcement: compliant with ASTM A497/A497M.
- .5 Welded steel wire fabric: compliant with ASTM A185/A185M.
- .6 Chairs, bolsters, bar supports, spacers: compliant with CSA-A23.1/A23.2.
- .7 Mechanical splices: subject to approval of Quebec Ministry Representative.
- .8 Plain round bars: compliant with CSA-G40.20/G40.21.

### **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ANSI/ACI 315 and the handbook "Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada".
- .2 The Professional must approve the locations of reinforcement splices other than those shown on placing drawings.
- .3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

## **Part 3 EXECUTION**

### **3.1 FABRICATION OF REINFORCEMENTS**

- .1 The manufacture of reinforcement should begin only when drawings and slips of these reinforcements have been reviewed by the Professional.
- .2 Cut and bend the bars in strict conformity with the details shown on the reinforcement drawings reviewed by the Professional. All bars should be bent cold.
- .3 No substitution of bars shown on the reinforcement drawings reviewed by the Professional is permitted without the consent of the latter.
- .4 Ship armatures to the site in separate batches labeled so that they are easily identified on the order forms.
- .5 Take all precautions not to deform nor defile the reinforcements during transport, handling and storage on site.

### 3.2 IMPLEMENTATION OF REINFORCEMENT

- .1 If necessary before positioning them in the forms, straighten cold reinforcement and get rid of excess rust, scales, mud, oil and other soiling which reduces adhesion concrete.
- .2 Use an appropriate number of bar supports, with the height and rigidity required to allow covert everywhere that is consistent with thicknesses stipulated in Article 6 of CAN/CSA A23.1; in our case however bars 10-35 inclusive placed in slabs and walls not exposed to the weather or in contact with the ground, the thickness of the coating must be 25 mm. The distance between the bar supports must not exceed 1000 mm.
- .3 All rebar must be position sufficiently in advance to allow the Professional to make full inspection before the start of each cast.

### 3.3 REINFORCEMENT CONCRETE COVER

- .1 Cover of reinforcements of structural elements must comply with CSA-A23.1 and CSA-S413, latest editions and respect the following table:

• Structural slab	Steel at top Steel at bottom	25 mm $\pm$ 10mm 25 mm $\pm$ 10mm
• Beam (stirrups)	Steel at bottom And on sides	30mm $\pm$ 10mm
• Foundation wall and interior wall	Typical In contact with ground	25mm $\pm$ 10mm 50mm $\pm$ 10mm
• Column cast-in-place (ties)	Typical In contact with ground	30mm $\pm$ 10mm 50mm $\pm$ 10mm
• Footing	In contact with ground Cast against ground (leaning against ground)	50mm $\pm$ 10mm 75mm $\pm$ 10mm
• Others	see CSA-A23.1 (latest edition)	

### 3.4 TOLERANCE

- .1 Tolerances allowed in the cutting of rebar are:
  - .1 10M and 15M bars and having a length less than 4 meters: + or 12 mm.
  - .2 10M and 15M and bars having a length greater than 4 meters: + or 25 mm.
  - .3 20M to 35M Bars:  $\pm$  25 mm.
  - .4 45M and 55M bars:  $\pm$  25 mm.
- .2 Tolerances allowed in the shaping of bent rebar are the following
  - .1 Bars 10M to 35M:
    - .1 Overall length: 25 mm + or
    - .2 Overall height: 12 mm
    - .3 Hooks diameter: 12 mm or +

- .2      Stirrups and ligatures:
  - .1      Width and overall height 12 mm or +
- .3      45M Bars
  - .1      Width and overall height 65 mm or +
- .4      55M Bars
  - .1      Width and overall height  $\pm 90$  mm.

### **3.5      WAITING REINFORCEMENTS**

- .1      It is prohibited to bend on-site reinforcement partially embedded in cured concrete unless the Professional has granted permission.

### **3.6      WELDING OF REINFORCEMENTS**

- .1      Welding of reinforcements is allowed in specific cases where the Professional granted permission.
- .2      Any welding work should be done by an enterprise accredited by the Canadian Welding Bureau and must be performed in accordance with the requirements of CSA Standard W186. Submit in advance to Professional for approval all details of welds to be carried out. In this case, the reinforcing steel welding must comply with requirements of CAN/CSA G30.18 standard, 400W.
- .3      If the welded joints are required, they will be of type "CADWELD" or an approved equivalent. Those joints will be able to resist tensile load equivalent to 125% of the specified yield strength of the bars to be join unless otherwise specified in the drawings.
- .4      Subcontractor must verify the capacity of joints by destructive testing of joints made-in-place and selected by the Professional. All costs of such tests and corrective measures are incidental expense assumed by Subcontractor with the exception of laboratory testing costs which are paid for by the Contractor.
- .5      Conformity verifications must have at least three (3) samples per used bar diameter and one sample per ten joints.

**END OF SECTION**



**Part 1 GENERAL****1.1 DEFINITION**

- .1 The following definitions apply throughout this section of the quote
  - .1 Professional: consultant in structure or its representative on site during work execution
  - .2 Laboratory : the firm designated by the Ministry representative to perform material characterization tests.

**1.2 RELATED SECTIONS**

- .1 Concrete forming and accessories – Section 03 10 00
- .2 Concrete reinforcing – Section 03 21 00
- .3 Construction-demolition waste management and disposal - Section 01 74 21
- .4 General requirements apply to the work described in this section

**1.3 REFERENCES**

This quotation refers to the latest edition and revision of codes and standards.

- .1 CSA A23.1 - A.23.2-14: "Concrete materials and methods of concrete construction, test methods and standard practices for concrete"; Comply with each requirement of this standard applicable to work to be performed, and changes or clarifications contained in this section. If there is contradiction between the two, this section shall prevail.
- .2 With reference to the above standards is an integral part of this section of the estimate, the Contractor must have a copy he keeps in his office the site.

**1.4 QUALITY ASSURANCE**

- .1 The Contractor is responsible for the quality control of the product and must provide his quality control program for examination by the Professional.
- .2 The Contractor must submit to the laboratory for examination and evaluation, the formulas proposed for the assay mixtures of each class of concrete, he must specify the type, brand and source of all additives used.
- .3 The Contractor must provide the laboratory, upon request, samples of aggregates that will be incorporated into concrete mixes and identify their sources.
- .4 Unless otherwise permitted in writing by the Professional, the laboratory must submit a test report performed by a laboratory recognized by him, certifying that the aggregates used in the manufacture of concrete are not likely to cause an expansion exceeding the values in table 1 of the standard method CAN / CSA-A23.2-27A.
- .5 The laboratory is authorized to issue memos about the quality and the implementation of concrete to which the contractor must comply. This does not relieve the responsibility of the contractor of its obligations to perform the work according to the plans and specifications; the quality of concrete is not a guarantee that concrete works were executed according to plans and specifications.

- .6 The Contractor must cooperate with the Laboratory's representative so that during each cast, he can closely monitor the implementation of concrete and collect samples required for control tests.
- .7 The Laboratory will measure slump and air content of the concrete each time it will take samples for resistance testing, and as often as necessary in regard to the nature of the work to build.
- .8 Professional reserves the right to inspect the work at the concrete factory of the Contractor at any time during opening hours. The Contractor must provide his cooperation during these visits.

### **1.5 CONCRETE SUPPLY**

- .1 All concrete must be supplied ready for use ("Ready-mix") by the same manufacturer. The concrete plant must hold a certificate issued by the "Bureau de normalisation du Québec" in accordance with NQ 2621-905 certification protocol.
- .2 The manufacturer of the concrete ready for use is responsible for dosing it and must at its own expense take all necessary steps to ensure the quality and consistency of its product.

### **1.6 AUTHORIZATION OR APPROVAL OF PROFESSIONAL**

- .1 In accordance with the requirements of this section, the permission or approval of the Professional must not be regarded as having been obtained until he has been notified in writing or recorded in the minutes ratified by all persons attending meeting and where Professional was also attending.

### **1.7 NON-COMPLIANCE OF CONCRETE**

- .1 Remove defective concrete, wet or containing debris and repair as directed by the Engineer. Fill honeycombs before applying the asphalt coating on concrete surfaces.
- .2 Under 75% of the compressive strength of concrete required, the Contractor will demolish the structure represented by the audit sample and rebuild at its expense as directed by the Engineer.
- .3 From 76 to 80% of the compressive strength required, concrete, concrete quantity represented by the audit sample, will not be paid.
- .4 From 81 to 99% of the required compressive strength of the concrete represented by the audit sample, the concrete will be paid 1/20 of the cost per 1% counted from 80%.
- .5 If compressive strength of the concrete is exceeded, no bonus compensation will be awarded to the contractor.
- .6 Additional verification samples will be at the expense of the Contractor and are performed to verify the result of the first sample.

As well, any additional work necessitated by non-compliance of concrete to specified requirements will be assumed by the Contractor.

**Part 2 PRODUCTS****2.1 MATERIALS**

- .1 Portland Cement for general use, according to CAN/CSA A3001, Type GU-SF.
- .2 Water: according to CAN/CSA-A23.1/A23.2.
- .3 Rebar: shade 400, according to CAN/CSA-G30.18.
- .4 Steel mesh welded mesh : according to ASTM A185.
- .5 Precast joint
  - .1 fiber-bituminous board, according to ASTM D1751.

**2.2 CONCRETE CONSTITUENTS**

- .1 Conform to CAN/CSA-A23.1.
- .2 Mixing water: fresh, clear and clean.
- .3 Nominal size of coarse aggregate:
  - .1 14 mm in case of concrete slabs on metal deck;
  - .2 10 mm where there are high concentrations of armature;
  - .3 20 mm in all other cases.
- .4 The use of calcium chloride or adjuvant containing aggregate is prohibited.

**2.3 MIXES FORMULAS**

- .1 The sagging at the time and at point of discharge is minimum 75 mm and maximum 100 mm.
- .2 Provide documented proof that the selected dosage will produce a concrete with the prescribed quality and yield and resistance provided in accordance with CAN/CSA-A23.1. Approval of the concrete formula must be done in conformance to materials sampled on site. However, the Contractor remains responsible for the result.
- .3 Obtain approval of the laboratory before using chemical additives other than those specified in the mixing formula that was previously provided for verification.

**2.4 MIXES**

- .1 Produce and provide normal weight concrete as specified in the table below and in accordance with the requirements of this specification and drawings.

Structural element	Type of exposure	Resistance at 28 days (MPa)	Cement	Ratio W / L	Aggregates	air-entrained	Note
			Type				
Foundations, isolated footings	F2	30	GU	0.55	20	4% à 7%	--
Ground slab, interior	N	30	GU	0.55	20	4% à 7%	--
Foundation wall	F2	30	GU	0.55	20	4% à 7%	--
Columns/Pilasters, interior	N	30	GU	0.55	20	4% à 7%	--
Typical slabs and beams	N	30	GU	0.55	20 SIC	4% à 7%	--
Retaining wall, outside	F2	30	GU	0.55	20	4% à 7%	--
Sidewalks	C2	32	GU	0.45	20	5% à 8%	--

### Part 3 EXECUTION

#### 3.1 PREPARATION

- .1 Ensure that erection of the formwork is completed, that they are clean and free of ice, snow and water, and the reinforcements and extra parts have been placed in accordance with the prescriptions of sections 03 10 00 and 03 21 00.
- .2 If it is required to melt ice that adheres to reinforcement or to the inner walls of the formwork, use a steam jet or any other method approved by the Professional. The use of de-icing agents is never permitted.

#### 3.2 AUTHORIZATION TO CAST CONCRETE

- .1 Advise Professional at least 24 hours in advance whenever a concrete casting of any volume is planned.
- .2 No concrete cast should be undertaken without the authorization of the Professional.
- .3 The authorization will be granted only when the Professional has conducted his own inspection of forms and is satisfied in regard to the requirements of Article 3.1.
- .4 It is prohibited to cast concrete when raining or snowing, unless the Professional is satisfied with the arrangements made to protect the concrete during transport and casting, and has granted permission.
- .5 The authorization granted by the Professional to cast concrete when the outside temperature is below 5 ° C or above 25 ° C does not relieve the Contractor of any way of its responsibility with respect to the strength and durability of concrete which will be implemented.

**3.3 PRODUCTION AND TRANSPORT OF CONCRETE**

- .1 Ensure that the temperature of concrete delivered to the site is to the opposite of the outside temperature when it will be implemented, but is below the lower and upper limits specified in Tables 16 of CAN/CSA A23.1.
- .2 Plan the production of concrete and stagger deliveries to the site so that each casting can be carried out without interruption. Each batch of concrete must be fully discharged in the forms less than two (2) hours after the start of mixing.
- .3 It is prohibited to add water to the concrete during the journey from factory to building site. It is also prohibited to add water to the concrete before the casting of concrete trucks, unless the Professional gave permission; if so, the amount of water added will be recorded on the delivery and certified by the representative of the professional who will then sign the slip.

**3.4 IMPLEMENTATION OF CONCRETE**

- .1 Cast concrete without interruption or thick layers as each new layer will integrate with the underlying layers before the concrete thereof has hardened enough to cause cold joint.
- .2 If difficulties arise during its implementation, change the formula of concrete as directed by the Professional or the laboratory and use the adjuvant prescribed by the Professional or the laboratory; the Contractor will assume all costs.
- .3 Use appropriate vertical tubular conduit whenever the concrete must be deposited over a height of 1.5 meters or more.
- .4 The addition of the superplasticizing admixture to concrete before it is casted in the forms is required when concrete walls with height greater than 2 meters (including retaining walls), and also columns beams containing a high concentration of reinforcement.

**3.5 CONSOLIDATION OF CONCRETE**

- .1 Use internal mechanical vibrators and only entrust the handling to qualified operators. The diameter and the frequency of these vibrators are subject to approval by the Professional.

**3.6 CURE AND PROTECTION OF CONCRETE**

- .1 Except for the items mentioned in paragraph below, the use of curing compounds is permitted provided that these products meet the specifications of ASTM C309 03 and they detract from the adhesion or the establishment finishes.
- .2 In the case of floor tiles (or other items) exposed to the weather, sidewalks and curbs, the cure must be made in water by either of the methods described in section 21.1 .8 CAN/CSA A23.1 (water treatment).
- .3 Ensure that, for the duration of his treatment, the concrete will not be loaded with any overload and will be adequately protected against violent impacts, excessive vibrations, weather and other disruptions.
- .4 When the outside temperature is 27 C or more, comply with the requirements of CAN/CSA A23.1.

- .5 When the outside temperature is 5 ° C or less, or when it is possible that it drops to that level or lower in the 24 hours following the casting of concrete, comply with the requirements of CAN/CSA A23.1.
- .6 The supply, installation and maintenance of all temporary structures and devices required for curing and protection of concrete in hot weather or cold weather, as well as the power of these devices are part of the work contractors; bear all costs.

### **3.7 CONSTRUCTION JOINTS**

- .1 The location of construction joints defining each concrete casting must be approved by the Professional. If he thinks fit for reasons of structural continuity or appearance, the Professional may require that these joints get closer together or arranged differently.
- .2 No construction joints shown on the plans should not be cut or moved without the authorization of Professional.
- .3 Shape the vertical and horizontal construction joints in walls according to typical “groove and tongue” joint detailed on the plans. Also provide a longitudinal “groove and tongue” joint of a depth of 38 mm in any construction joint introduced into slabs having a thickness of 200 mm or more.
- .4 Subject for approval by the Professional, details of all the overlapping splices required in frames, that pass through construction joints not shown on the plans or drawings of reinforcement.
- .5 The execution of construction joints is part of the regular work of the Contractor and gives him no right to charge any supplement even when joints are added following the Professional guidelines.

### **3.8 RESUMING CONCRETE CASTING**

- .1 It is prohibited to undertake the concrete slabs and beams under two (2) hours after completing the walls and columns that support them, or while the concrete and the walls of these columns is still plastic.
- .2 Immediately before resuming casting of concrete against a construction joint or above it, scarify the surface of hardened concrete to detach milt and fragments that adhere to it and to partially expose the coarse aggregate; Then clean the surface thoroughly and moisten without saturating.
- .3 When the concrete is to be resumed over a horizontal construction joint introduced in a wall, a column or a beam of inverted T, pour a first layer of concrete having a thickness of 300 to 450 mm; use a mixture who collapse after adding a superplasticizing, is at least 150 mm and consolidate properly in place before resuming casting work.

### **3.9 SLAB ON GRADE**

- .1 Check that the embankments on which the concrete slabs will casted have been compacted and leveled to the satisfaction of the Engineer and the laboratory, and they are clean and contain no traces of disturbed soil. If the work is performed in cold weather, make sure that these embankments are not frozen.

- .2 Moisten the embankments before placing concrete; in doing so, avoid causing the formation of puddles and muddy or soft areas.
- .3 It is prohibited to deposit directly on embankments welded wire mesh and other reinforcement required in slabs in preparation to raise and support the liquid concrete during its casting thereof.
- .4 Increase if necessary the thickness of the slab to allow an overlap of at least 40 mm of concrete above and below the electrical conduits.
- .5 In construction joints, 40 mm keys must be provided and coat the surface of the joint already in place with a curing agent to break the adhesion.
- .6 Alternatively, the Contractor can make control joints with a saw, respecting the requirements for construction joints.
- .7 In slabs, execute control joints in compliance with the following:
  - .1 Undertake this work 6 to 8 hours after casting, and complete within 18 hours after installation of the concrete.
  - .2 Use a chain saw equipped with a 5 mm thick blade and carve grooves with depth equivalent to a quarter (1/4) of the slab thickness.
  - .3 Immediately clean the grooves with a high pressure water jet to remove any milt accumulation.
  - .4 When concrete has completely dried, but not less than 21 days after its casting, dry clean each groove before closing them with self-leveling sealing mastic.

### **3.10 SLABS FINISHING SLABS AND HARDENER AND SEALER**

- .1 See architectural plans and structural and architectural specifications to determine the type of finish required for each slab of the building according to the requirements of sub-items .2 and .3 below.
- .2 Slabs that will be covered with hard coating or screed, clean tiles, outdoor platforms and stairs, sidewalks: execute the last finish using wooden trowel to obtain slightly rough surfaces without ridges or ripples.
- .3 The tolerance permitted in the finish, as defined by the CAN/CSA A23.1, is 8 mm to 3.00 meters.
- .4 Interior slabs of the building whose concrete remain exposed or will be covered with carpeting or flexible coating or roof slab: execute the last finish using trowels equipped with metal blades; pass these trowels several times and at appropriate intervals to obtain dense and perfectly smooth surfaces without imperfections.
- .5 The tolerance permitted in the finish, as defined by the CAN/CSA A23.1, is 5 mm to 3.00 meters.
- .6 When drawings or slips require floor finish with hardener, apply a non-metallic uncolored aggregate such as Diamag 7 Sika approved or an equivalent at the minimum rate of 5 kg per square meter and following manufacturer's instructions.
- .7 The floor where concrete surfaces remain exposed (without paint, carpet, tile or other finish) must receive after applying hardener and after curing of concrete, two coats of

sealer to minimize dust accumulation. This sealer must meet the requirements of CAN/CGSB-25.20 "Primer floors" of the following types as indicated on the drawings:

- .1 Flortec 22 clear or an approved equivalent.
- .2 Sikaguard Color A50 color "gray" or an approved equivalent.
- .3 Sikaguard Clear / Seal 2 or an approved equivalent.
- .4 71H Sikaguard or an approved equivalent.
- .5 Sikaguard Clearsel or an approved equivalent.

The first layer is applied after the concrete has cured, the second following a delay of 6 months to 12 months after the first application.

### **3.11 TREATMENT OF FORMED SURFACES**

- .1 Nests of pebbles spotted on the concrete surface at the time of stripping should not be repaired before the Professional has reviewed them and has accepted the corrective methods to be used.
- .2 Burrs, unsightly streaks and other irregularities on formed surfaces that remain exposed or that will receive a waterproofing membrane, must be removed within 24 hours after stripping. Holes left by the rods must also be closed at the same time.

### **3.12 CUTS, HOLES AND NOTCHES IN CURED CONCRETE**

- .1 It is never allowed for any reason whatsoever, to cut, drill hole or notch already cured concrete elements, unless the Professional has granted permission.
- .2 Any cut, hole or notch into the cured concrete authorized by the Professional must be performed in the exact place and according to the exact dimensions approved by him. Use rotary tools that prevent bursts.

### **3.13 TOLERANCES**

- .1 If tolerances specified by CAN/CSA A23.1 were not met during the construction of any element whatsoever shown on plans, the Professional may require that this element be demolished and rebuilt following the tolerances of that article, without additional cost to the Owner.

**END OF SECTION**



**Part 1 GENERAL****1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for concrete hardener and curing compound 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 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials 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 FLOOR HARDENER**

- .1 Concrete sealer, densifier, liquid floor hardener:
  - 1. Sikafloor 3S by Sika Canada Inc.
  - 2. Euco Diamond Hard by Euclid Canada.
  - 3. Kure-n-Harden by BASF.

**Part 3 EXECUTION****3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of site conditions previously installed under other Sections or Contracts are acceptable for concrete hardener and curing compound application installation in accordance with manufacturer's written instructions.
- .2 Clean the surfaces so that they are free of dirt and oil.

**3.2 HARDENING**

- .1 Apply in accordance with manufacturer's written instructions.

**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 in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse / recycling in accordance with Section 01 74 21 - Construction Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.4 PROTECTION**

- .1 Protect finished installation until floor treatment has completely cured.
- .2 Repair damage to adjacent materials caused by concrete floor hardener installation.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 08 36 13.02 - Sectional overhead doors
- .2 Section 09 91 23 - Painting

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM A53/A53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A269-02, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3 ASTM A307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canada General Standards Board (CGSB)
  - .1 CAN/CGSB-1.40-97 - Anticorrosive Structural Steel Alkyd Primer.
  - .2 CAN/CGSB-1.181-92 Ready-Mixed Organic Zinc-Rich Coating.
- .3 CSA International
  - .1 CSA G40.20/G40.21-04.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA G164-M92(R1998)], Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CSA S16.1-01, Design of Steel Structures.
  - .4 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .5 CSA W59-M1989(R2001)], Welded Steel Construction (Metal Arc Welding) Metric.
- .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - current edition.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Shop Drawings:
  - .1 Submit shop drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
  - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, accessories and extensions of the mezzanine guards.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Packaging, shipping, handling and unloading:
  - .1 Materials to be delivered, stored, handled and protected in accordance with general and particular conditions.
- .2 Storage and protection:
  - .1 Do not remove protective coating from surfaces until final cleaning of building. Provide instructions for removal of protective coating.

**Part 2 PRODUCTS****2.1 MATERIALS**

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W.
- .2 Steel pipe: to ASTM A53/A53M standard weight, galvanized finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A307.
- .6 Aluminum sheet: proprietary utility sheet, plain, 3 mm minimum thickness, clear anodized finish.
- .7 Stainless steel tubing: to ASTM A269, Type 302, commercial grade.
- .8 Grout: non-shrink, non-metallic, 15 MPa at 24 hours.

**2.2 FABRICATION**

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

**2.3 FINISHES**

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to CAN/CSA-G164.
- .2 Shop coat primer: MPI-INT 5.1A.
- .3 Zinc primer: zinc rich, ready mix to MPI-INT 5.2C in accordance with chemical component limits and restrictions requirements and VOC limits of CCD-047a.

**2.4 SHOP PAINTING**

- .1 Compliance: Surfaces to be cleaned according to instructions in Volume 2 of Steel Structures Painting Council manual.
- .2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .3 Surfaces inaccessible after assembly to receive two coats of primer of separate colour.
- .4 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scales and grease. Do not paint when temperature is lower than 7 degrees C.
- .5 Clean surfaces to be field welded; do not paint.

**2.5 SUPPORT ANGLES**

- .1 Steel angles: galvanized for exterior work, coated with primer paint for interior work based on specified dimensions, unless indicated otherwise, for openings. Provide 150 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated. In block masonry wider than 1370 mm, angles to be welded.
- .3 Finish: shop painted.

**2.6 OTHER METALWORK**

- .1 Sectional overhead doors supports:
  - .1 Provide all required elements for a solid and adequate for the sectional doors.
  - .2 Coordinate with the garage door sub-trade.
  - .3 Steel frame around de sectional doors (coordinate with the door sub-trade).

**Part 3 EXECUTION****3.1 EXAMINATION**

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

**3.2 ERECTION**

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Ministerial Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply and install steel sections or plates needed for support or fastening of material or works, bracket-mounted or recessed, specified in other sections in accordance with shop drawings and schedule.
- .6 Make field connections by welding or with bolts to CSA S16.1.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 After assembly, touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

**3.3 OTHER METALWORK**

- .1 Install other metal work as indicated on plans.

**3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Clean metal work after installation to remove dust generated by construction work or surroundings.
- .4 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

**Part 1 GENERAL****1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM C919-02, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
  - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (April 1976 issue reaffirmed, incorporating Amendment No. 1).
  - .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - .3 CGSB 19-GP-14M-76, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
  - .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
  - .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit most recent data sheets on joint sealants, specifying product characteristics, performance criteria, physical size, finish and limitations. Manufacturer's data sheets must cover:
  - .1 Caulking compounds.
  - .2 Primers.
  - .3 Sealing compounds, including compatibility with one another.
- .3 Manufacturer's Instructions:
  - .1 Submit instructions to include installation instructions for each product used.

**1.3 QUALITY/SKILL ASSURANCE**

- .1 Installer's qualification: company specializing in performing work set out in this section, with five years' documented experienced, approved by manufacturer.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

## **1.5 WASTE MANAGEMENT AND REMOVAL**

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

## **1.6 SITE CONDITIONS**

- .1 Ambient Conditions:
  - .1 Proceed with installation of joint sealants only when:
    - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
    - .2 Joint substrates are dry.
    - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Joint-Width Conditions:
  - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
  - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

## **1.7 ENVIRONMENTAL REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding removal of hazardous materials as well as labelling and provision of data sheets acceptable to Labour Canada.

## **1.8 WARRANTY**

- .1 Provide written and signed document, issued on behalf of Ministerial Representative, certifying the work performed will be free of defects, including loss of adhesion or cohesion, cracking, crumbling, fusing, disintegration, shrinkage, leakage or soiling of adjacent surfaces for a period of five years from issuance date of certificate of provisional acceptance of work.



**Part 2 PRODUCTS****2.1 SEALANT MATERIALS**

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas that off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Caulking for each location must be of the same type and from the same manufacturer.
- .4 Where sealants are qualified with primers use only these primers.
- .5 Unless indicated otherwise, the colour of each caulking product for each location to be chosen by Ministerial Representative from among manufacturers' standard colour.

**2.2 SEALANT MATERIAL DESIGNATIONS**

- .1 Type 1: Silicon one part, to CAN/CGSB-19.13.

**2.3 SEALANT LOCATIONS**

- .1 Exterior and interior steel doors and windows joints: sealant type 1.

**2.4 JOINT CLEANER**

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.
- .2 Primer: in accordance with sealant manufacturer's written recommendations.

**Part 3 EXECUTION****3.1 PROTECTION OF WORK**

- .1 Protect work installed by others from dirt or other contamination.

**3.2 SURFACE PREPARATION**

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter that may impair Work.
- .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 surfaces in accordance with manufacturer's directions.

**3.3 PRIMING**

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

**3.4 BACKUP MATERIAL**

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

**3.5 MIXING**

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.

**3.6 APPLICATION**

- .1 Sealant:
  - .1 Apply sealant in accordance with manufacturer's written instructions.
  - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
  - .3 Apply sealant in continuous beads.
  - .4 Apply sealant using gun with proper size nozzle.
  - .5 Use sufficient pressure to fill voids and joints solid.
  - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
  - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
  - .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing:
  - .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.
- .3 Cleaning:
  - .1 Clean adjacent surfaces immediately and leave work area clean.
  - .2 Remove excess and droppings, using recommended cleaners as work progresses.
  - .3 Remove masking tape after initial set of sealant.
  - .4 Ensure that installed sealants are free of film formation, poor adhesion or defects that could affect quality of work.

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

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 07 92 00 - Joint Sealants
- .2 Section 08 71 00 - Hardware Groups
- .3 Section 09 91 23 - Painting

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A653/A653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
  - .2 ASTM B29-03, Standard Specification for Refined Lead.
  - .3 ASTM B749-03, Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
  - .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
  - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
  - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.

**1.3 SYSTEM DESCRIPTION**

- .1 Design Requirements:
  - .1 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.
  - .2 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 and NFPA 252 for ratings specified or indicated.
- .2 General Requirements:
  - .1 Provide required supports to fix the frames into the exterior walls.
  - .2 Manage to adapt perfectly the frame with the wall that receives it. Provide a solid and damp-proofed assembly.

- .3 Ensure the frame capability with the pre-fabricate envelop.

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

- .1 Submit required drawings for the doors and frames.
- .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings for glazing, arrangement of hardware, and finishes.
- .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, and types of 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 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate and recycle waste in accordance with Section - 01 74 21 Construction/ Waste and Removal.
  - .2 Do not pour unused paint or sealants into sewers, streams or lakes or onto the ground or any other place where it may present a health or environmental risk.

#### **1.6 WARRANTY**

- .1 Provide signed document issued to Ministerial Representative stating that steel frames are guaranteed against warping, buckling, joint defects, cracking, delamination or subsidence for a period of two years from signing date of final certificate of completion.

### **Part 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Hot dipped galvanized steel sheet: to ASTM A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653M, ZF75.

#### **2.2 DOOR TYPE**

- .1 Hollow metal single doors non-insulated without glazing.

#### **2.3 PRIMER**

- .1 Touch-up prime CAN/CGSB-1.181.
  - .1 Maximum VOC limit 50 g/L to GC-03.

**2.4 PAINT**

- .1 Field paint steel frames in accordance with Section 09 91 23 - Painting. Provide final finish free of scratches or other blemishes.

**2.5 ACCESSORIES**

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Metallic paste filler: to manufacturer's standard.
- .3 Sealant: type 1 in accordance with to specifications in Section 07 92 00 - Joint Sealants.

**2.6 FRAMES FABRICATION GENERAL**

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Exterior frames: 1.6 mm welded type construction.
- .4 Blank, reinforce, drill and tap frames for mortised, templated hardware and necessary electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .5 A steel reinforcing frame plate must be installed in frames (lock side) located in security partition.
- .6 Protect mortised cut-outs with steel guard boxes.
- .7 Prepare frame for door silencers, three for single door, two at head for double door.
- .8 Manufacturer's nameplates on frames and screens are not permitted.
- .9 Conceal fastenings except where exposed fastenings are indicated.
- .10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

**2.7 FRAME ANCHORAGE**

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

**2.8 FRAMES: WELDED TYPE**

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on 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 two temporary jamb spreaders per frame to maintain proper alignment during shipment.
- .7 For certain bays, frames to be made in sections as indicated in the schedule, with pointing devices for on-site assembly.

## **2.9 ACCESSORIES**

- .1 Provide drip-edges required at the top of the door frames.
- .2 Provide the exterior wall trims.
- .3 Provide sealing according to the section 07 92 00 - Joint sealant.

## **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 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.

### **3.3 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.  
Install glazing.

### **3.4 DOOR INSTALLATION**

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
  - .1 Hinge side: 1.0 mm.
  - .2 Latch side and head: 1.5 mm.

.3 Finished floor and thresholds: 13 mm.

.3 Adjust operable parts for correct function.

.4 Install louvers.

### **3.5 FINISH REPAIRS**

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

**END OF SECTION**



**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

1. Section 07 92 00 – Joint Sealing.
2. Section 08 11 00 – Metal doors and frames.

**1.2 REFERENCES**

- .1 Aluminum Association (AA)
  - .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .2 ASTM International
  - .1 ASTM A1008/A1008M-10, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
  - .2 ASTM D523-08, Standard Test Method for Specular Gloss.
  - .3 ASTM D822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.105-M91, Quick-Drying Primer.
  - .2 CAN/CGSB-1.213-04, Etch Primer (Pre-treatment Coating or Tie Coat) for Steel and Aluminum.
  - .3 CAN/CGSB-1.181-99, Ready-Mixed, Organic Zinc-Rich Coatings.
- .4 CSA International
  - .1 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-Installation Meetings:
  - .1 Convene pre-installation meeting to coordinate all support required for the installation of the items listed in this section.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for doors, hardware, and accessories 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 Quebec, Canada.
  - .2 Indicate sizes, service rating, types, materials, operating mechanisms, glazing locations and details, hardware and accessories, required clearances and electrical connections.
- .4 Certificates: submit 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.

### **1.5 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for [sectional metal doors] for incorporation into manual.

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

- .1 Deliver, store and handle materials in accordance with the general conditions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect sectional metal doors, hardware and accessories from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Spare parts:
  - .1 Supply spare parts for sectional wood doors as follows:
    - .1 Door rollers: Six (6).
    - .2 Weatherstripping: Two (2) sets.
  - .2 Store where directed. Identify each part and reference to appropriate door.
- .3 Packaging Waste Management: remove for reuse of packaging materials in accordance with Section 01 74 21 - Construction Waste Management and Disposal.

### **1.7 WARRANTIES**

- .1 Certificates: product certificates signed by manufacturer certifying garage doors and electric door operators for a period of one (1) year against defects under normal use conditions.

- .2 The door panels shall be guaranteed 10 years against corrosion and / or delamination by the manufacturer.
- .3 The electric operator will be guaranteed 2 years parts and 1 year labor.

## **1.8 QUALIFICATIONS**

- .1 The door manufacturer will be a garage sectional door manufacturer with a minimum of at least ten years of experience.
- .2 Installation must be made by a company approved by the manufacturer of the garage doors, using skilled and experienced in this type of work. The contractor must hold the necessary licenses and be in good standing with regulatory agencies (RBQ, CCQ, and CSST).

## **Part 2 PRODUCTS**

### **2.1 GENERAL**

- .1 The works that are the subject of this section include labor, materials, tools, transportation, equipment and scaffolding required for garage doors, as shown on plans and described in the specifications.
- .2 Robustness of all: Heavy duty industrial level.  
Door assembly type: Low head room overhead door system.

### **2.2 MANUFACTURER**

- .1 Standard of acceptance, with minimum requirements as specified herein:
  - .1 Model T175 by Richard Wilcox Canada.
  - .2 Model G5000 by Garaga Inc.
  - .3 Model G X-175S by Garex Inc.

### **2.3 MATERIALS**

- .1 Galvanized steel sheet in accordance with ASTM A653 and ASTM A653M, has G60 coating with a thickness of 26 gauge, exterior and interior, in the color Ice White. The galvanized steel sheet has a zinc coating with a minimum of 0.04 lb./ (ft<sup>2</sup>180 g/m<sup>2</sup>). The polyester paint finish, 2 layers.  
Insulation: High-pressure, CFC-free, polyurethane foam has been injected between the walls of each section. Its density is 2.5 lb. / (ft<sup>3</sup>40.4 kg/m<sup>3</sup>) with a thermal resistance factor of RSI 1.6 per 1" (25 mm) of thickness.
- .2 Glazing: No glazing.
- .3 Cable: multi-strand galvanized steel aircraft cable.

### **2.4 DOORS**

- .1 Fabricate 45 mm thick min. door sections.

- .2 Fabricate panel frames in a continuous box frame with 2.1mm vertical stiffeners for hinge supports.
- .3 Glazing: No glazing.
- .4 Assemble components by means of spot or arc welding or coated rivet system or adhesive and self-tapping screws to manufacturer's recommendations.
- .5 Apply shop coat of primer after fabrication of door. Fabricate doors from pre painted steel stock.
  - .1 VOC limit 250 g/L maximum to GS-11.

## **2.5 HEAVY DUTY INDUSTRIAL HARDWARE**

- .1 Track: low head room hardware with 75 mm size 2.6 mm core thickness galvanized steel track.
- .2 Track Supports: 2.3 mm core thickness continuous galvanized steel angle track supports.
- .3 Spring counter balance: heavy duty oil tempered torsion spring with manufacturer's standard brackets.
  - .1 Drum: 200 mm diameter die cast aluminum.
  - .2 Shaft: 32 mm diameter galvanized steel.
- .4 Top roller carrier: galvanized Steel 3.04 mm thick adjustable.
- .5 Rollers: full floating grease packed hardened steel, ball bearing 75 mm diameter solid steel tire.
- .6 Roller brackets: adjustable, minimum 2.5 mm galvanized steel.
- .7 Hinges: heavy duty, 3.04 mm thick. Double hinges as recommended by manufacturer.
- .8 Cable: 6 mm diameter galvanized steel aircraft cable.
- .9 The door operation is low headroom type. Refer to the indications on the Drawings for clearance above overhead door below structure.

## **2.6 ASSEMBLY JOINTS**

- .1 Galvanized steel sheets of each door section will be assembled with a mechanically-embedded, triple-contact weather-stripping, ensuring a thermal break, and the integrity and strength of the assembly

## **2.7 ACCESSORIES**

- .1 Overhead horizontal track and operator supports: galvanized steel, type and size to suit installation.
- .2 Track guards: 5 mm thick formed sheet 1500 mm high track guards. Refer to the detail on the drawings.
- .3 Pusher springs.
- .4 Handles:
  - .1 Flat bar door latch with night latch and electric interlock switch.

- .5 Two horizontal sliding lock bolts on interior.
- .6 Weather stripping:
  - .1 Sills: bulb type full width extruded neoprene weather strip.
  - .2 Jambs and head: extruded aluminum and arctic grade vinyl weather strip to manufacturer's standard.
- .7 Finish ferrous hardware items with minimum zinc coating of 300 g/m<sup>2</sup> to CAN/CSA-G164.

## **2.8 ALUMINUM FINISHES**

- .1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.

## **2.9 PREFINISHED STEEL SHEET**

- .1 Prefinished steel with factory applied silicone modified polyester.
  - .1 Class F1S
  - .2 White colour from manufacturer's standard range.
  - .3 Specular gloss: 30 units +/-5 in accordance with ASTM D523.
  - .4 Coating thickness: not less than 22 micrometers.
  - .5 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.

## **2.10 OPERATORS**

- .1 Equip doors for operation by:
  - .1 Hand, two handles on inside face of door.
  - .2 Chain hoist with galvanized steel chain.
- .2 Cable fail safe device.
  - .1 Able to stop door immediately if cable breaks on door free fall. Braking capacity 500 kg.

## **2.11 ELECTRICAL OPERATOR**

- .1 Electrical jack shaft centre mounted type operator.
- .2 Electrical motors, controller units, remote pushbutton stations, relays and other electrical components: to CSA approval with CSA enclosure
- .3 Power supply to suit power available.
  - .1 Motor: 240 V, 3 phase, 60 Hz. Power requirements to be verified and coordinated to suit power available based on the recommendations from the manufacturer.

- .2 Ensure compliance of the motor with the door and lift system provided to suit door weight, speed and power available.
- .3 Provide all steel supports as required for door operators, door track and lift system.
- .4 Controller units with one (1) integral motor reversing starter, one (1) solenoid operated brake, three (3) heater elements for overload protection, including pushbuttons and control relays as applicable.
- .5 Operation:
  - .1 Remote pushbutton stations: surface mounted, with "OPEN-STOP-CLOSE" designations on pushbuttons.
- .6 Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom section of door, to reverse door to open position when coming in contact with object on closing cycle.
- .7 For jack shaft operators:
  - .1 Provide floor level disconnect device to allow for manual operation in event of power failure.
  - .2 Equip Operator with:
    - .1 Electrical interlock switch to disconnect power to operator when in manual operation.
    - .2 Built-in chain hoist for manual operation in event of power failure.
- .8 For trolley operators:
  - .1 Attach operator to door with quick release device to disconnect door from operator in event of power failure.
- .9 Automatic illumination complete with time delay, self extinguishing.
- .10 Door speed: 300 mm per second.
- .11 Control transformer: for 24 VAC control voltage.
- .12 Mounting brackets: galvanized steel, size and gauge to suit conditions.

## **Part 3 EXECUTION**

### **3.1 GENERAL**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Install doors and hardware in accordance with manufacturer's instructions.
- .3 Rigidly support rail and operator and secure to supporting structure.
- .4 Touch-up steel doors with primer where galvanized finish damaged during fabrication.
- .5 Install operator including electrical motors, controller units, pushbutton stations, relays and other electrical equipment required for door operation.

- .6 Lubricate and adjust door operating components to ensure smooth opening and closing of doors.
- .7 Adjust weather stripping to form a weather tight seal.
- .8 Adjust doors for smooth operation.
- .9 Install door and hardware parts as required.  
Electrical connections to be performed by a qualified electrician.

### **3.2 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .2 Ensure manufacturer's representative is present before and during critical periods of installation.
  - .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 Twice during progress of Work at 25% and 60% complete.
    - .3 Upon completion of Work, after cleaning is carried out.

### **3.3 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning:
  - .1 Remove traces of primer; clean doors and frames.
  - .2 Clean glass and glazing materials with approved non-abrasive cleaner.

**END OF SECTION**

**Part 1 GENERAL****1.1 REFERENCES**

- .1 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
  - .1 CSDMA, Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit product data and manufacturer's specifications and documents as required.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Packaging, delivery and handling:
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .2 Storage and protection:
  - .1 Store finishing hardware in dry, clean, locked area.
  - .2 Store and protect door hardware from nicks, scratches, and blemishes.
  - .3 Protect prefinished surfaces with wrapping.
  - .4 Replace defective or damaged materials with new.

**1.4 WASTE MANAGEMENT AND REMOVAL**

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

**1.5 MAINTENANCE**

- .1 Replacement material:
  - .1 Provide two sets of keys for maintenance of door-closers, locks and exit door accessories.
- .2 Maintenance records:
  - .1 Provide maintenance record for use and maintenance of door-closers, locks and exit door accessories.
- .3 Provide a master key compatible to the existing hardware.

**1.6 WARRANTY**

- .1 Provide signed document issued to Ministerial Representative stating that:



- .1 Installation and door-closers are guaranteed for a period of ten years.
- .2 Installation and all other hardware items are guaranteed for a period of two years from the signing date of the certificate of final completion of work.

## **Part 2 PRODUCTS**

### **2.1 GENERAL**

- .1 Use one manufacturer's products only for similar items.

### **2.2 DOOR HARDWARE**

- .1 Locks and latches:
  - .1 Mortise locks and latches: to CAN/CSGB-69.29, Series 1000 function and key type as stated in Hardware Schedule.
  - .2 Cylinders/Barrels: according to list of key-based hardware items that are part of key systems. Barrels prepared by others.
- .2 Luggage door hinges:
  - .1 Butts and hinges: to CAN/CGSB-69.18, designated by numerical code followed by size and finish, listed in Hardware Schedule.
- .3 Door Closers and Accessories:
  - .1 Door controls (closers): to CAN/CGSB-69.20, listed in Hardware Schedule.
  - .2 Closer/holder release devices: to CAN/CGSB-69.31, listed in Hardware Schedule.
- .4 Architectural door trim: to CAN/CGSB-69.22, listed in Hardware Schedule.
  - .1 Door protection plates, push plates and push/pull units.
- .5 Auxiliary hardware: to CAN/CGSB-69.22, listed in Hardware Schedule.
  - .1 Wall-mounted or floor-mounted stop blocks, as listed in Hardware Schedule.
- .6 Weatherstripping at bottom of door: sturdy weatherstripping made of extruded aluminum frame with closed-cell neoprene sealing tape, closed ends, adjustable with automatic retraction mechanism when door opens, transparent anodized finish.
- .7 Weatherstripping:
  - .1 Posts and lintel
    - .1 Extruded aluminum frame, with drawn-back seal, closed-cell neoprene, transparent anodized finish.

### **2.3 MISCELLANEOUS HARDWARE**

- .1 Indexed key control system: to CAN/CSGB-69-21, as listed in Hardware Schedule.

**2.4 FASTENINGS**

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 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.
- .5 Use fasteners compatible with material through which they pass.

**2.5 KEYING**

- .1 Doors, padlocks and cabinet locks to be keyed differently and subject to existing master keys and existing grand master key.
- .2 Keying to be conducted by Ministerial Representative.
- .3 Hand over permanent cores Ministerial Representative.

**Part 3 EXECUTION****3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.

**3.2 INSTALLATION**

- .1 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .2 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .3 Install key control cabinet.
- .4 Use only manufacturer's supplied fasteners. Failure to comply with this requirement may jeopardize guarantees and invalidate product approval. Quick release devices, unless specifically provided by manufacturer, will not be accepted.

**3.3 ADJUSTING**

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.

- .3 Adjust door hardware to ensure tight fit at contact points with frames.

### **3.4 CLEANING**

- .1 When installation is complete, clean site to remove accumulated dirt and debris from construction work or surroundings.
- .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
- .3 Remove protective material from hardware items where present.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and security barriers.

### **3.5 DEMONSTRATION**

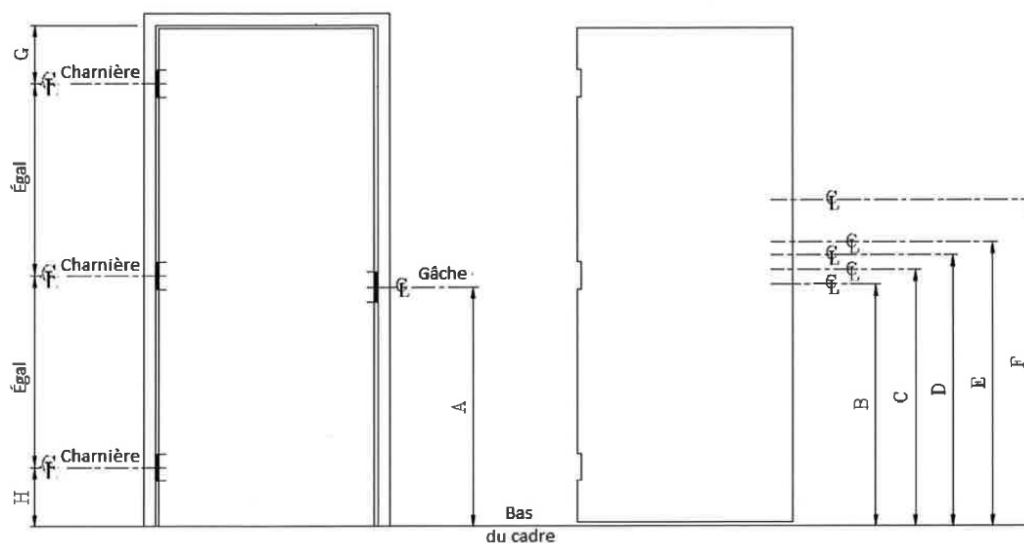
- .1 Keying System Setup and Cabinet:
  - .1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
  - .2 Place file keys and duplicate keys in key cabinet on their respective hooks.
  - .3 Lock key cabinet and turn over key to Ministerial Representative.
- .2 Maintenance Staff Briefing:
  - .1 Brief maintenance staff regarding:
    - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
    - .2 Description, use, handling, and storage of keys.
    - .3 Use, application and storage of wrenches for door closers, locksets and fire exit hardware.
  - .2 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

## **Part 4 HARDWARE LIST**

### **4.1 GENERAL INFORMATION**

- .1 Model type may vary to adapt the final configuration of the doors and frames.

## .2 Hardware placement:

**Emplacement standard pour la quincaillerie architecturale**

Item de quincaillerie		Impériale (jusqu'à)	Métrique (jusqu'à)
<b>A</b>	Ligne du centre pour serrures rondes et à levier, dispositifs de sortie de secours & pènes à rouleau	40 5/16"	1035
<b>B</b>	Ligne de centre d'une poignée à tirer et ensemble de barres à tirer & pousser	42"	1065
<b>C</b>	Ligne du centre d'un pêne de bras à tirer d'hôpital	45"	1145
<b>D</b>	Ligne du centre d'un bras à tirer d'hôpital (type vertical)	47"	1195
<b>E</b>	Ligne du centre d'une plaque à pousser d'hôpital	48"	1220
<b>F</b>	Ligne du centre de la serrure auxiliaire	48"	1220
<b>G</b>	Ligne du centre de la charnière du haut (max)	9 ¾"	250
<b>H</b>	Ligne du centre de la charnière du bas (max)	13"	330

*Note : Les dimensions peuvent être sujettes à des variations mineures selon les manufacturiers.*

**HARDWARE LIST:****Door 1: Exterior to Warehouse 01:**

Porte de garage et cadre fournis par d'autres.

**Door 2 and Door 3: Exterior to Warehouse 01:**

Hardware for each door:

QTÉ	DESCRIPTION	FINI	MANUFAC.
3	Heavy duty hinges : T4A3786, 114mm x 101mm x NR	630	Mckinney
1	Mortise lock, depot function with anti-vandal trim : AV-LC-8204 x LNL.	630	Sargent
1	Mortise keyed cylinder : 41 x core x rosette x trim x keying system x cme  Keying system requirements: Coordinate keying system with contractor and owner.	630	Sargent
1	Heavy duty door holder/stop surface mounted: 590S Install door holder above weather-stripping.	626	Sargent
1	Kickplate : K1050, 508mm x 863mm x CSK.	630	Rockwood
1	Aluminium sill : 176A x 863mm x non-corrosive screws.	719	Pemko
1	Door sweep with nylon brush gasketing and rain drip : 3452CNB x 914mm x non-corrosive screws.	628	Pemko
3	Heavy duty perimeter gasketing : Weather stripping with nylon brush inserts 29045ANB x 1/head & 2/Jambs  Each length installed in one piece.	719	Pemko

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 05 00 00 – Miscellaneous metals
- .2 Section 08 11 00 - Metal doors and frames

**1.2 REFERENCES**

- .1 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

**1.3 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Contractor: minimum of five years proven satisfactory experience.
  - .2 Journeymen: qualified journeymen who have Tradesman Qualification Certificate of Proficiency engaged in painting work.
  - .3 Apprentices: working under direct supervision of qualified tradesperson in accordance with trade regulations.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit required documents.
- .2 Product Data:
  - .1 Submit product data and instructions for each paint and coating product to be used.
  - .2 Submit product data for the use and application of paint thinner.

**1.5 MAINTENANCE**

- .1 Extra Materials:
  - .1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels.
  - .2 Quantity: provide one container of each type and colour of primer or sealer. Identify colour and paint type in relation to established colour schedule and finish system.
  - .3 Delivery, storage and protection: comply with Ministerial Representative's requirements for delivery and storage of extra materials.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, Shipping, Handling and Unloading:

- .1 Pack, ship, handle and unload materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
- .2 Remove damaged, opened and rejected materials from site.
- .3 Storage and Protection:
  - .1 Provide and maintain dry, temperature controlled, secure storage.
  - .2 Store materials and supplies away from heat sources.
  - .3 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
- .4 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .5 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.
- .6 Remove paint materials from storage only in quantities required for same day use.
- .7 Fire Safety Requirements:
  - .1 Provide one 9 kg ABC 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.

## **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction Waste Management and Disposal.
- .2 Place in designated containers all substances meeting the definition of toxic or hazardous waste:
  - .1 Handle and remove hazardous materials in accordance with Canadian Environmental Protection Act.
  - .2 Seal empty containers and store correctly for removal.
  - .3 Move unused paint products to authorized hazardous materials collection site accepted by Ministerial Representative.
  - .4 Treat non-reusable products as hazardous waste, and remove appropriately.
  - .5 Place materials and products designated as hazardous or toxic, including used tubes and containers of adhesive and sealant, to areas or receptacles designated for receiving hazardous waste.

## 1.8 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
  - .1 Coordinate use of existing ventilation system with Ministerial Representative and ensure its operation during and after application of paint as required.
  - .2 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.
  - .3 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 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.
- .3 Additional interior application requirements:
  - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
  - .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Ministerial Representative to allow for adequate drying and curing of painted surfaces before occupants return.

## Part 2 PRODUCTS

### 2.1 MATERIALS

- .1 Provide paint materials for paint systems from single manufacturer.
- .2 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .3 Products used, whether primers or sealers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents or others, must appear on approved products list in MPI Architectural Painting Specification Manual.
- .4 Provide paint products meeting MPI Environmentally Friendly E2 or E3 ratings based on VOC (EPA Method 24) content levels.
- .5 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
  - .1 Water-based.
  - .2 Non-flammable.
  - .3 Manufactured without compounds that contribute to ozone depletion in upper atmosphere.



- .4 Manufactured without compounds that contribute to smog in lower atmosphere.
- .5 Not containing methylene chloride, chlorinated hydrocarbons or toxic metal pigments.

## 2.2 COLOURS

- .1 Ministerial Representative to submit choice of colours to Contractor at awarding of contract.
- .2 Selection of colours from manufacturers full range of colours.
- .3 Where specific products are available in restricted range of colours, selection based on limited range.
- .4 Second coat in three-coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

## 2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .5 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 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

Gloss level	Gloss @ 60 degrees	Sheen @ 85 degrees
1 - Matte Finish	max. 5	max. 10
2 - Velvet Finish	max.10	10 to 35
3 - Platinum Finish	10 to 20	10 to 35
4 - Pearl Finish	20 to 30	min. 35
5 - Melamine Finish	20 to 30	
6 - Semi-Gloss Finish	35 to 70	
7 - Gloss Finish	70 to 85	
8 - High Gloss Finish	more than 85	

- .2 Gloss level ratings of painted surfaces as indicated.

## **2.5 DOORS AND FRAMES PAINTING**

- .1 One (1) rust zinc phosphate alkyd primer layer.
- .2 Two (2) metal semi-gloss rust alkyd such.

## **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 sheet.

### **3.2 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.

### **3.3 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, except test concrete floors for moisture using simple cover patch test. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
  - .1 Concrete: 12%.
  - .2 Clay and Concrete Block/Brick: 12%.

### **3.4 PREPARATION**

- .1 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 and general public in or near the building.
- .2 Surface Preparation:

- .1 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.
- .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Ministerial Representative.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual for specific requirements and as follows:
  - .1 Remove dust, dirt, and other surface debris by wiping with dry, clean cloths.
  - .2 Wash surfaces with a biodegradable detergent 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 no foreign matter remains.
  - .4 Allow surfaces to drain completely and let 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.
- .4 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 pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
  - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
  - .2 Apply wood filler to nail holes and cracks.
  - .3 Tint filler to match stains for stained woodwork.
- .6 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.
- .7 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 and clean pockets and corners.
- .8 Touch up of shop primers with primer as specified.

### 3.5 APPLICATION

- .1 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.
  - .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 that are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .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 visible defects.
- .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 cut-outs of doors after fitting as specified for door surfaces.

### 3.6 SITE TOLERANCES

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 01 33 00 Submittal procedures
- .2 05 50 00 Miscellaneous Metals
- .3 07 92 00 Joint Sealants
- .4 08 11 00 Metal Doors And Frames
- .5 08 71 00 Door Hardware

### **1.2 REFERENCES**

- .1 CSA International
  - .1 CSA A660 Certification of manufacturers of steel building systems
- .2 W47.1-F09 (C2014) - Certification of companies for fusion welding of steel
- .3 Institut canadien de la tôle d'acier pour le bâtiment (ICTAB)
  - .1 ICTAB 10M-[08], Standard for Steel Roof Deck..
  - .2 ICTAB 12M-[08], Standard for Composite Steel Deck.

### **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 the self-supporting steel arches 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 Québec, Canada.
  - .2 Submit design calculations if requested by Departmental Representative.
  - .3 Indicate plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

### **1.4 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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect steel plate from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse as specified in section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **Part 2 PRODUCTS**

### **2.1 CERTIFICATION**

The steel building system manufacturer must be certified in accordance with CSA A660-F10 (C2014).

### **2.2 WARRANTY**

- .1 Warranty required from manufacturer at least 30 years against perforating rust.

### **2.3 DESIGN CRITERIA**

- .1 Steel building system must be calculated according to loads indicated on the plans.
- .2 Steel building system and these fasteners must resist eo permanent loads, dynamic loads and other stresses and strains, including lateral loads from wind foresaw in the National Building Code.
- .3 Deformation caused by snow loads and dynamic loads must not exceed 1/240.

### **2.4 MATERIALS**

- .1 Sheet steel coated with an Aluminum-Zingue alloy (AZ180) of at least 2.28 mm thick (14 gauge) for exterior surfaces subjected to weathering.
- .2 Closures: in accordance with manufacturer's recommendations.
- .3 Caulking: to Section 07 92 00 - Joint Sealants.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates 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 approval to proceed from Departmental Representative.

### **3.2 INSTALLATION**

- .1 Welding: in accordance with CSA W59, except where specified otherwise.
- .2 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.

### **3.3 ERECTION**

- .1 Erect self-supporting steel arches as indicated and in accordance with approved erection drawings by manufacturer.
- .2 Self-supporting steel arches to be free of soil, debris, standing water, loose mil scale and other foreign matter.
- .3 Temporary shoring, if required, to be designed to support construction loads and other construction equipment. Do not remove temporary shoring until concrete attains 75% of its specified 28 day compression strength.

### **3.4 CLOSURES**

- .1 Install closures in accordance with approved details.

### **3.5 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.

### **3.6 CONNECTIONS**

- .1 Install connections in accordance with manufacturer recommendations as indicated.

### **3.7 CLEANING**

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

### **3.8 PROTECTION**

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

**END OF SECTION**



## **Part 1 GENERAL**

### **1.1. GENERAL**

1. The electrical, structural, architectural, and civil technical specifications and drawings are an integral part of the mechanical technical specifications and drawings.
2. The Contractor must familiarize himself with the proposed type of construction by attentively examining the plans and work charges for the architectural, structural, electrical and civil engineering work.
3. Overtime fees will not be allowed for work that has not been approved even though required by the type of construction.

### **1.2. RELATED REQUIREMENTS**

1. Section 01 33 00 - Submittal Procedures
2. Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
3. Section 09 91 23 - Interior Painting.
4. Sections Heating, Ventilating and Air Conditioning (HVAC).

### **1.3. IDENTIFICATION**

1. The term « Professionals » used throughout this text refers to the different disciplines of Engineers concerned.
2. The term « Engineer » that could be used elsewhere in the technical specifications is equivalent to the term “Professionals”, as per defined in the contractual documents and general requirements and specific to the Client.
3. Refer to the Client’s terminology for the other terms used.

### **1.4. LISTE OF MATERIALS**

1. Submit a list describing the names of the manufacturers with material details and proposed materials and equipment. It is forbidden to order materials and equipment before the list has been approved. Use the forms provided for this purpose as per the commissioning technical specifications (see architectural technical specifications).
2. The list must be submitted within 21 days following the invitation to bid on the contract.
3. The list must include, without limitations, the following equipment:
  - Shutters;
  - Ventilation ducting.
  - Static evacuation fans.
4. This list is not restrictive and does not relieve the Contractor’s responsibilities of supplying a complete list.
5. The Contractor cannot differ from this list without the consent of the Professionals.

### **1.5. ACCEPTED PRODUCTS**

1. The expression « accepted products » means that the mentioned article that is identified by a Manufacturer's name and catalogue number, or both takes the place of prescription and defines the performance and efficiency criteria, the quality of the equipment and materials and the quality of execution, and if a Standard is referred to, it must be considered as a complementary.

### **1.6. EQUIVALENCE**

1. The Manufacturer's name is only mentioned to establish a standard of quality in terms of material and service.
2. When an apparatus of material is identified by a catalogue number, this means that the system is designed with the identified apparatus and the Contractor must present his original bid with the apparatus as identified with a number.
3. However, The Contractor can present his demand to the engineer in the bid period to accept his equivalence product. If the engineer accepts, the engineer will indicate his decision in a addenda. Only the indicated products on drawing or specification will be accepted.

### **1.7. SUBSTITUTION**

1. When the Contractor wishes to install an apparatus or a material in which only the name of the Manufacturer is mentioned in the technical specifications, a written request for substitution must be submitted, in the bid period, by written.

The Contractor must attach to his request for substitution three (3) examples of comparative tables showing the principle characteristics of the apparatus or of the material specified and proposed. This table must include all relative data concerning the characteristics of the type of apparatus or material.

2. In addition to the comparative table described in paragraph 1, the Contractor must attach the following information.
  1. A copy of the quotation for the apparatus or materials specified.
  2. A copy of the quotation for the apparatus or materials proposed; should there be a savings, the difference in price must be returned to the Owner.
  3. The reasons for the substitution request.

Also, the materials or apparatus proposed will be examined while considering maintenance facility and the availability of replacement parts.

3. The decision of the Professional or Owner will be final. If the characteristics of the approved apparatus or materials require modifications to the technical specifications and works to be conducted, the Contractor is responsible for paying the costs of these modifications, and thus for all concerned engineering disciplines.

If the apparatus or material proposed by the Contractor is not approved, he must supply and install the apparatus or material specified by number, and thus without additional fees.

### **1.8. MATERIAL : REQUIREMENTS CONCERNING THE INSTALLATION**

1. With the use of union fittings and flanges, assure that the maintenance and dismantling of the materials and apparatus can be done without displacing as much as possible, the connecting piping and ducting. Also assure that the elements and building structure or any other installations does not constitute an obstacle for the execution of the works.
2. All the union fittings and/or flanges are not necessarily shown in the drawings. The Contractor must supply and install all the union fittings required for the dismantling and maintenance of the materials and equipment.
3. Provide means of access to the materials for maintenance reasons, including lifelong lubricated bearings in conformity with the Manufacturer's recommendations and instructions.
4. Connect material and apparatus evacuations to ground level drainage.
5. Whenever possible, align equipment edges and the rectangular cleanouts and other similar articles with the walls of the building.

### **1.9. ENERY CONSUMPTION**

1. The Professionals can refuse a proposed equipment in regards to the performance criteria or enery demand or energy consmption.
2. This clause applies particularly to the mechanical equipment.

### **1.10. ANCRE BOLTS AND TEMPLATES**

1. Supply ancre bolts and the necessary templates, in which will be installed in terms of other divisions.

### **1.11. OPENING SEALS**

1. Using appropriate elements prevent dust, dirt and other foreign matter from penetrating the installation openings and apparatus.
2. The Contractor must locate on the architectural drawings the exact location of the fire walls. All openings in a fire wall must be sealed with a ULC homologous material, equivalent or superior, to a degree of wall fire resistance.

### **1.12. EQUIPMENT SUPPORTS**

1. The equipment Manufacturers supplied supports are prescribed in Division 23.
2. Supports not supplied by the equipment Manufacturers: structural steel. Provide structural calculations with the shop drawings.
3. The Contractor must supply and install all supplementary support elements required to attach the piping, ducting, and equipment supports to the building structure.
4. Mounting pedestals for local maintenance: bevelled edge, thickness at least 100 mm and exceedances at 50 mm surrounding supported apparatus.
5. The Contractor is responsible for the complete fabrication of the grading bases relative to the equipment supplied and installed.

### **1.13. TRAVERSE SLEEVES**

1. EMPTY

### **1.14. TESTS**

1. Give a 48 hour prior notice for the date of the tests.
2. Do not insulate or hide works that have not been approved by the Professionals.
3. Conduct the tests in the presence of the Professionals.
4. Assume all costs including those related to re-testing and rehabilitation.
5. Piping:
  1. General : maintain the test pressure without loss for a period of at least 4 hours, unless otherwise specified.
  2. Conduct the hydrostatic test of the piping network at a pressure equal to 1-1/2 times the network service pressure or at a pressure of at least 860 kPa: chose the higher of the two values.
  3. Conduct the ventilation evacuation piping test in conformity with the National Building Code and with those of the competent authorities.
6. The material must be tested in conformity to the prescriptions of the sections in the technical specifications.
7. Prior to proceeding with the tests, isolate all equipment parts or other material not conceived to resist the test pressures.

### **1.15. PAINTING REPARIS AND RESTORATION**

1. Do painting in accordance with Section 09 91 23 – Interior Painting.
2. Prime and touch up marred finished paintwork to match original.
3. Restore to new condition, finishes which have been damaged.

### **1.16. ROSACES**

1. EMPTY

### **1.17. REPLACEMENT PARTS**

1. Supply all replacement parts as per the Manufacturer's recommendations.
2. This list is not limited and does not release the Contractor from the responsibility of supplying any other replacement part deemed essential par the Professionals.
3. Once the works completed and prior to the final acceptance of the installation, replace the filter cartridges and the filter banks of the filtration batteries.

### **1.18. SPECIAL TOOLS**

1. Supply a kit for all special tools required for the maintenance of the materials, in accordance with the Manufacturers recommendations.
  1. Supply a commercial quality grease gun and adaptors that can handle any type grease category and greasing equipment fittings to be used.

### **1.19. DIELECTRIC CONNECTIONS**

1. EMPTY

### **1.20. OPERATION AND MAINTENANCE SHEETS**

1. Supply operation and maintenance sheets, which will be incorporated to the Contractors' Operation and Maintenance Manual.
2. The Operation and Maintenance Manual must be approved by the Professionals and a final copy must be submitted to the Professionals prior the final inspection.
3. The Operations sheets must include the following:
  1. Command/ambiance regulation network schema and all other command/regulation network (including environmental).
  2. A description of each system/installation and their command/regulation devices.
  3. A functional description of each system/installation under different loads, with program change set points and seasonal differences indication.
  4. Instructions concerning the operation of each system/installation and each of the components.
  5. A description of the measures to take in case of and emergency equipment default.
  6. A table indicating the fittings and flowsheet.
  7. A colour code.
  8. A copy of all the system and equipment shop drawings.
4. The Maintenance sheets must include the following :
  1. Instructions concerning the operation, maintenance and repairs for each equipment part.
  2. The list of periodic maintenance recommended by the Manufacturer, frequencies and required tools.
5. The performance data must include the following :
  1. The performance sheets supplied by the equipment Manufacturer with « as build » operation points.
  2. The equipment performance test data.
  3. The special performance test results, as specified in the other sections.

4. The test reports, settings and system calibrations as specified in sections 23 05 93, 23 05 94 and 23 08 02.
6. Verification :
  1. For verification purposes, submit two drafts copies of the Operation and Maintenance Manual to the Professionals. Unless required by the Professionals, it will not be permitted to submit individual sheets..
  2. Apply required modifications to the Operation and Maintenance Manual and re-submit it to the Professionals, or as instructed.
7. Supplementary data :
  1. Prepare and insert all pertinent information into the Manual during the training.

#### **1.21. OPERATION AND MAINTENANCE MANUAL**

1. Manual :
  1. The manual is a structured compilation of operating and maintenance data, including information, data sheets, documents and also the technical details, with the functional description and maintenance of an element or a system in each section of the technical specifications.
2. General:
  1. The Operation and Maintenance Manual must be approved, prior to final inspection, by the Professionals whom will keep the final copies.
  2. Approval :
    - For approval purposes, submit to the Professional two (2) copies of the preliminary version of the Operation and Maintenance Manual. Unless otherwise instructed by the Professionals, the sheets must not be submitted individually.
    - Apply all required modifications to the Operation and Maintenance Manual and re-submit it according to the instructions given by the Professionals.
3. Additional information :
  - Prepare additional information sheets and attach them to the Operation and Maintenance Manual, if deemed necessary during the training sessions.

#### **1.22. SHOP DRAWINGS AND TECHNICAL SHEETS**

1. EMPTY

#### **1.23. CLEANING**

1. Do the cleaning in compliance with the prescriptions of section 01 74 11 Cleaning.

#### 1.24. AS BUILD DRAWINGS SUPPLIED BY THE CONTRACTOR

1. Documents to conserve on site :
  1. The Professionals will supply a set of mechanical drawings that are reproducible. Supply the number of sets printed required for each work phase and indicate, as the work progresses, all changes brought. The changes brought to the control systems and wiring must follow the same procedure.
  2. Consign on a weekly basis, the information indicated on the printed drawings; hire the services of a qualified draughtsman.
  3. Use different colored ink for each service.
  4. Keep the drawings on site and make them available to the concerned personnel for reference and verification.
2. As build drawings :
  1. Prior to starting the tests, calibration and regulation of the systems, complete the as build drawings.
  2. Identify each drawing at the bottom right hand corner, in 12 mm high letters, as follows :

**AS BUILD DRAWINGS: THE FOLLOWEING DRAWING WAS REVISED  
AND SHOWS THE SYSTEMS/MECHANICAL AS THEY HAVE BEEN  
INSTALLED**

**(Contractor Signature) (Date).**
  3. Submit the drawings to the Professionals for verification, after conduct the necessary corrections.
  4. Conduct the test, calibration and regulation of the systems, apparatus, and network as per the indications on the as build drawings.
  5. Return reproducible copies of the as build drawings with the Operation and Maintenance Manual.
3. Submit a copy of the as build drawings so that they may be integrated into the final report (ERE).

#### 1.25. MECHANICAL TECHNICAL SPECIFICATIONS AND DRAWINGS

1. The mechanical technical specifications and drawings are complementary. All that appears on the drawings or the technical specification is considered included in the mechanical technical specification and drawings.
2. The drawings indicate approximately the placements of the apparatus and new and/or existing ducting; their exact location must be determined by the Contractor as per the architectural and structural drawings, the drawings of the existing and the Contractor's survey. Also, the Contactor must verify on site the space available prior to installing the systems and apparatus.

3. No architectural or structural data will be taken from the mechanical drawings.
4. No additional fees will be allocated for displacing ducting or apparatus judged necessary because of the structure, of the architecture or any other normal consideration.
5. During the quotation period, the Contractor must verify the feasibility of the work and take into consideration all visible existing elements that could be conflicting with the works. The Contractor must include in his bid, the costs of dismantling and reinstalling these elements.
6. Prior to submitting the quotation, the Contractor must notify the Professionals of all errors or omissions that could be found in the mechanical technical specification and drawings and also any architectural or structural incompatibility. No supplement will be accorded for this.
7. The detailed drawings that could be supplied to the Contractor during the works will also be a part of the mechanical technical specification and drawings. If the Contractor needs detailed drawings, he must ask the Professionals, in writing at least fifteen (15) days in advance.
8. The Professional reserves the right to interpret the mechanical technical specifications and drawings.

If there is a disagreement, with the technical specification and drawings in regards to the quantity, the quality, the nature and the cost of certain works or materials, the Contractor must use or prepare his quotation in consequence. A credit will be awarded to the Owner if another solution is adopted during the construction.

#### **1.26. WORK COMPLETION**

1. The mechanical technical specifications and drawings do not contain a description, nor mentions all the accessories, details, installation methods, etc., required for the complete execution of the work and for the proper functioning of the network systems.
2. Even if not shown or specifically described in the mechanical technical specification and drawings, the Contractor must execute all works and to supply all materials required for the proper functioning of the network and systems, and for a complete installation in compliance with the rules of art, the codes and rules that govern the present works and to the equipment Manufacturer's recommendations.
3. Consequently, the Contractor agrees to accept the Professional's decision in regards to the supply of materials and the execution of the works required to satisfy the requirement as per the mechanical technical specifications, rules of art, the codes and rules that govern the present works and to the equipment Manufacturer's recommendations.

#### **1.27. EXECUTION**

1. Manner to proceed
  1. The Contractor must indicate on time the spaces to leave in the walls, floors, and partitions for the installation of the different apparatus and systems.
  2. To this, the Contractor must coordinate his work in a manner to locate on time all the sleeves and openings needed. The Contractor must execute at his cost all the openings and fillings required for passing the piping sheaths and ducting.



3. Each day, the Contractor must remove all residual waste arising from the works. Once the works completed, he must remove from the rooms all tools, debris and surplus material and residual waste resulting from the works conducted, clean all apparatus installed and assure that they are not damaged; if so, he must repair or replace.
4. All materials must be carefully stored in appropriate areas, without perturbing the circulation.
2. Work protection
  1. The Contractor must protect his installation against all damage until the completion and acceptance of the works by the concerned personnel.
  2. All duct extremities and installed piping by the Contractor must be air tightly sealed. All indoor floor surfaces must be protected from damage caused by scaffolding, other equipment and debris.
3. Roof traverses
  1. When a pipe or a duct traverses a roof, the Contractor must take all necessary dispositions in regards to the possible damages incurred by dilation and contraction.

#### **1.28. HIDDEN WORKS**

1. No works must be hidden prior to the approval by a Professional. In regards to this, the Contractor must inform the Professionals, in writing, at least three (3) days in advance. If the Contractor does not abide, he must pay the costs associated with an inspection.

#### **1.29. SCHEMAS, DIAGRAMS, PLAN AND ELEVATION VIEWS**

1. All schemas, diagrams, detailed cuts, plan views and cuts shown in the mechanical drawings, and also that the indicated prescriptions in the technical specification are complementary. The Contractor must supply and install all material, systems and accessories shown in the schematics, diagrams, detail types, plan views cuts and/or in the technical specifications at no extra cost.

#### **1.30. PROOF TESTING**

1. Once the works completed, or part of the works, the Contractor must, at his cost and in the presence of a Professional conduct proof testing in order to prove that the work has been conducted according to all the requirements. If the works seem defective, the Contractor will be held responsible to correct the defects and to do other proof testing, at his cost until the proof testing give acceptable results.

#### **1.31. GUARANTEE**

1. The Contractor will guarantee his works in conformity with the governing rules established at the site where the works are to be conducted. The guarantees mentioned in the technical specifications and the ensuing responsibilities will not be interpreted as being limitative to the laws in place or opposing them. The laws have precedence over the technical specifications requirements, unless the thereof requirements are more considerable than those of the laws in place.

2. The Contractor will correct without hesitation either by repairing or replacing, with respect to the Professional's choice, all defects that appear within one (1) year following the provisional acceptance of the works, in his work or in the supplied apparatus, the accepted usage wear. All damage to any other material caused by such a defect and all expenses directly incurred by the repairs will be at the cost of the Contractor.

**1.32. WASTE MANAGEMENT**

1. EMPTY

**1.33. TRAINING**

1. EMPTY

**END OF SECTION**

## **Part 1            GENERAL**

### **1.1.    REFERENCE**

1.    American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
2.    American Society for Testing and Materials International, (ASTM).
  1.    ASTM A 480/A 480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
  2.    ASTM A 635/A 635M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
  3.    ASTM A 653/A 653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
3.    National Fire Protection Agency Association (NFPA).
  1.    NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
  2.    NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
  3.    NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
4.    Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
  1.    SMACNA HVAC Duct Construction Standards - Metal and Flexible.
  2.    SMACNA HVAC Air Duct Leakage Test Manual.
5.    Use the latest revision of each standards.

### **1.2.    ACTION AND INFORMATIONAL SUBMITTALS**

1.    Shop Drawings and Data Sheet must cover the following :
  1.    Sealant;
  2.    Sealing tape;
  3.    Prefabricated joints trademark.
2.    Drawings of all ducts must be submitted for approval prior to installation.
3.    Standards for manufacturing metal sheaths and hangers: table of sheet metal gauges used for ducts
4.    Drawings of erection and fabrication of ventilation ducts

### 1.3. QUALITY ASSURANCE

1. Reliability of technical data
  1. Data from catalogs and manufacturers' literature must be reliable, confirmed by tests made by the same manufacturers or on their behalf by independent laboratories and certifying compliance of the requirements of elements codes and standards.

## Part 2 PRODUCTS

### 2.1. SEAL CLASSIFICATION

1. Classification as follows:

Maximum Pressure Pa	SNACNA Seal Class
<u>Pa</u>	<u>(SMACNA)</u>
500	A
250	B
125	C

2. Seal classification
  1. Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape
  2. Class B: longitudinal seams, transverse joints and connections made airtight with sealant, tape or combination thereof.
  3. Class C: transverse joints and connections made air tight with gaskets, sealant, tape or combination thereof. Longitudinal seams unsealed.
  4. Unsealed seams and joints.
3. Seal Classification of ventilation systems: Classe A.

### 2.2. SEALANT

1. Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.
  1. Acceptable product : Duro Dyne 5-2 Foster 30-02.

### 2.3. TAPE

1. Tape: polyvinyl treated, open weave fiberglass tape, [50] mm wide. Ruban isolant fait d'aluminium renforce avec une colle à base d'acrylique de grande efficacité, de 0,11 mm d'épaisseur et de 50 mm de largeur.
  1. Acceptable product : Ayr-Foil, Shurtape Technologies or approved equivalent.

2. "Duct tape" Products with adhesive made from rubber or similar products are not accepted. Les produits « Duct tape » avec adhésif à base de caoutchouc ou produits similaires ne sont pas acceptés.

## **2.4. DUCT LEAKING**

1. In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

## **2.5. FITTING**

1. Fabrication to SMACNA.
2. Radiused elbows
  1. Rectangular: standard radius. centreline radius: 1.5 times width of duct.
  2. Round : centreline radius: 1.5 times diameter
3. Mitred elbows, rectangular.
  1. To 400 mm: with double thickness turning vanes.
  2. Over 400 mm: with double thickness turning vanes.
4. Branches.
  1. Rectangular main and branch: with 45 degrees entry on branch, radius on branch 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.
5. Transition.
  1. Diverging: 20 degrees maximum included angle.
  2. Converging: [30] degrees maximum included angle.
6. Offsets : Elbows as indicated
7. Obstruction deflectors: maintain full cross-sectional area
  1. Maximum included angles: as for transitions.

## **2.6. FIRE STOPPING**

1. EMPTY

## **2.7. GALVANIZED STEEL**

1. Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
2. Thickness, fabrication and reinforcement: to SMACNA.
3. Joints : to SMACNA.

## 2.8. STAINLESS STEEL

1. EMPTY

## 2.9. HANGERS AND SUPPORTS

1. Hanger configuration: : to ASHRAE and SMACNA.
2. Hangers: galvanized steel angle with galvanized steel rods to following table:

<u>Duct size</u>	<u>Angle size</u>	<u>Rod size</u>
(mm)	(mm)	(mm)
Up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	10
1051 to 1500	40 x 40 x 3	10

3. Upper hanger attachments
  1. For concrete: manufactured concrete inserts.
    1. Acceptables product : Grinnell, Myatt
  2. For steel joist:manufactured joist clamp or steel plate washer.
    1. Acceptable product : Grinnell 60, 61 ou 86
  3. For steel beams: manufactured beam clamps
    1. Acceptable product : Grinnell 60 ou équivalent approuvé.

## 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. Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
6. Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

### 3.2. HANGERS

1. Strap hangers: install in accordance with SMACNA.

2. Angle hangers: complete with locking nuts and washers.
3. Hanger spacing: in accordance with SMACNA.

### **3.3. WATERTIGHT DUCT**

1. Provide watertight duct for:
  1. Fresh air intake until the units.
  2. Gooseneck exhaust until the units.
  3. Minimum 3000 mm from duct mounted humidifier in all directions.
  4. As indicated.
2. Form bottom of horizontal duct without longitudinal seams. Seal other joints with duct sealer.
3. Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and discharging to open funnel drain

### **3.4. SEALING AND TAPING**

1. Apply sealant in accordance to manufacturer's recommendations.
2. Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

### **3.5. LEAKAGE TESTS**

1. EMPTY

**END OF SECTION**

**Part 1 GENERAL****1.1. SUMMARY**

1. Content Section
  1. Materials and installation methods associated with accessories for air ducts, including flexible connectors, access doors, spoilers and fitting released.
2. Related requirements
  1. Section 23 05 00 – Common Work Results for HVAC.

**1.2. REFERENCES**

1. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
  1. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

**1.3. ACTION AND INFORMATIONAL SUBMITTALS**

1. Submit in accordance with Section 23 05 00 – Common Work Results for HVAC.
2. Product Data.
  1. Submit manufacturer's instructions, printed product literature and data sheets for :
    1. Flexible sleeves.
    2. Access doors.
    3. Turning Vanes.
    4. Instrument Test
3. Test Reports: Submit test reports issued by recognized independent laboratories, certifying that the products, materials comply with physical specifications and performance criteria.
  1. The technical data from the catalogs and documentation of manufacturers must be reliable, confirmed by tests made by the same manufacturers or on their behalf by independent laboratories and certifying compliance requirements elements codes and standards.
4. Certificates: submit certificates signed by manufacturer certifying that the products and materials comply with physical specifications and performance criteria.
5. Instructions: submit manufacturer's installation instructions.
6. Inspections on site by the manufacturer : submit copies of the reports of these inspections.
7. Documents / Informational submittal: submit operation and maintenance data for incorporation into manual specified in Section 23 05 00 - Common Work Results for HVAC.



**Part 2 PRODUCTS****2.1. GENERAL**

1. Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

**2.2. FLEXIBLE CONNECTIONS**

1. EMPTY

**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 1000 mm: piano hinge and two handles operable from both sides.
  5. Hold open devices.

**2.4. TURNING VANES**

1. EMPTY

**2.5. INSTRUMENTATION TEST PORT**

1. EMPTY

**2.6. 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.
5. Acceptable product : Duro Dyne 1P1 ou 1P2, or approuved equivalent.

**Part 3 EXECUTION****3.1. MANUFACTURER'S INSTRUCTIONS**

1. Compliance: comply with requirements, with manufacturer's written data, including all technical bulletins available, instructions for handling, storage and installation products and indications of datasheets.

**3.2. INSTALLATION**

1. Flexible Connections.
  1. EMPTY
2. Access Doors and Viewing Panels
  1. Size
    1. 300 mm X 300 mm for person size entry.
    2. 150 mm X 150 mm for servicing entry.
    3. As indicated.
  2. Locations
    1. Fire and smoke dampers
    2. Control dampers.
    3. Devices requiring maintenance.
    4. Required by code.
    5. Reheat coils.
    6. Elsewhere as indicated.
3. Instrument Test Ports
  1. EMPTY
4. Turning Vanes
  1. EMPTY

**END OF SECTION**

## **Part 1 GENERAL**

### **1.1. REFERENCES**

1. ANSI/NFPA 96-1991, Vapour Removal from Cooking Equipment.
  1. ANSI/NFPA 96-01, Standard for Ventilation control and Fire Protection of Commercial Cooking Operations.
2. ASTM E90-90, Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
  1. ASTM E 90-90, Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
3. Sheet metal and Air Conditionning Contractors' National Association (SMACNA).

### **1.2. DATA SHEET**

1. Submit data sheet in accordance with the requirements of section 01 33 00 –Submittal Procedures.
2. Data Sheet must cover the following :
  1. Pressure drop.
  2. Face area.
  3. Free area.

### **1.3. RELIABILITY OF TECHNICAL DATA**

1. Data from catalogs and manufacturers' literature must be reliable, confirmed by tests made by the same manufacturers or on their behalf by independent laboratories and certifying compliance of the requirements of elements codes and standards.

### **1.4. TESTS REPORTS**

1. Submit data from an independent laboratory confirming that the acoustic and aerodynamic performance complies with ASTM E90.

## **Part 2 PRODUCT**

### **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 1500 mm.
4. Frame, head, sill and jamb: 100 mm deep one piece extruded aluminum, minimum 3 mm 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 exhaust, 19 mm intake mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.
8. Finish: factory applied enamel. Colour: to Architect approval.
9. Description et size : see specifications on plans.
10. Produits acceptables : see tables and indications on plans.

## **2.2. FIXED LOUVERS EXHAUST**

1. The fan run without motor under the combined effect of wind and differentials pressure, creating a chimney effect that pulls stale air out of the inter-ceiling space.
2. 6 stormproof Tuning Vanes
3. Gauge metal used : 22 & 24 gauge
4. Roof opening : 20''x20''
5. Overall dimensions : 27.5''x27.5''x29.5''H
6. 418 PCM fan rate with a wind of 4 miles/hour (for a fans 12'' x 12'' roof opening)
7. Limited lifetime warranty against manufacturing defects.
8. Color: To Architect choice.

## **Part 3 EXECUTION**

### **3.1. 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 RELATED REQUIREMENTS**

- .1 Section 01 91 13 – General commissioning (CX) requirements
- .2 Section 09 90 00 - Painting.

**1.2 DEFINITIONS**

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

**1.3 GENERAL**

- .1 This section includes common requirements for the various sections of electricity and is a complements of the requirements of other divisions.
- .2 Specifications and mechanical, structure, architecture and civil engineering plans are part of the electricity specifications as if they were reproduced throughout.
- .3 The Contractor shall familiarize himself with the type of construction proposed by carefully examining the plans and specifications for architecture, structure, mechanical and civil engineering.
- .4 No additional compensation will be granted for unforeseen works, but needed by the type of construction.

**1.4 KIND OF PLANS**

- .1 The Consultant reserves the right of interpretation on all the content of the plans and specifications prepared by him. The Contractor shall obtain all necessary clarification for submissions. The Contractor shall submit to the Consultant any anomaly on the plans before starting this part of the work.
- .2 Electricity plans are for qualified individuals in their respective fields. They are partly in the form of diagrams to show the general arrangement and the scope of work. The exact location of ducts, outlets and equipment is dictated by site conditions. The plans are not reproduced to scale.
- .3 Contractors must follow the plans for the installation of their equipment and must also consult the general plans and plans of other disciplines to become familiar with all conditions and check the space needed for their work.
- .4 Every item required for the proper execution of the work having been omitted from the contract, but being clearly understood as necessary is provided as part of this contract.
- .5 Contractors should verify all plans and specifications for the tendering period and notify the Consultant of all differences between them.

**1.5 WORK BY GENERAL CONTRACTOR**

- .1 All openings and screed works opening for pipes in walls, floors and ceilings of 150 mm in diameter and over are the responsibility of the General Contractor. For cons, the

Electrical Contractor must indicate to the General Contractors before the start of work, the location of the drilling required for electrical work to allow the installation of sleeves.

- .2 All the concrete housekeeping pad.
- .3 Masonry, drywall, concrete, drywall and painting required.
- .4 Excavation, backfilling, the bases of concrete, manholes, etc.

## **1.6 SCOPE OF WORK**

- .1 The work includes the supply, installation, connection and necessary tests, but not limited to:
  - .1 Provide, install and connect a new electrical panel and provide the connection to the existing garage.
  - .2 Provide, install and connect all the lighting equipment, as indicated on plans.
  - .3 Provide, install and connect all plugs as shown in the plans.
  - .4 Make connections of mechanical systems.

## **1.7 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/ labels for control items in English and French.
- .4 Use one nameplate / label for both languages.

## **1.8 EQUIVALENCE**

- .1 Manufacturer's name is mentioned only in order to establish a quality standard with regard to hardware and service.
- .2 Where equipment or material is identified by a catalog number, it means that the system was designed with that apparatus and the Contractor shall submit its original submission with the specified device by number.
- .3 However, the Contractor may submit his original submission with a device manufacturer mentioned in the quote, but whose catalog number is not specified. However, the Contractor shall thereafter comply with the provisions of paragraphs 1 to 3 in the following article.

**1.9 SUBSTITUTION**

- .1 Where the Contractor wishes to install a device or material which only the manufacturer's name is mentioned in the quote, it must submit a written request for substitution in three (3) copies, within fifteen (15) days of the signing his contract. The Contractor shall attach to his application three (3) copies of a comparative table of the main characteristics of the specified equipment or material and one proposed. This table should include all the space-related data and the specific characteristics of such equipment or material.
- .2 Where the Contractor wishes to install a device or material, the manufacturer's name is not mentioned in the specifications, it must submit a written request for substitution in three (3) copies, within fifteen (15) days after signing his contract.

In addition to the comparison table described in paragraph .1 above, the Contractor shall attach to his application the following information:

- .1 A copy of the tender for the equipment or specified materials;
- .2 A copy of the tender for the equipment or materials proposed; if economy, the price difference must be delivered to the Owner;
- .3 The reasons for the switch request.

Moreover, the material or the proposed device will be examined taking into account the maintenance facilities and the availability of spare parts.

- .3 In both cases (paragraphs .1 and .2) the decision of the Consultant and the Departmental Representative will be final. If the characteristics of the equipment or substitute materials approved require changes to plans and work to be performed, the Contractor shall pay the costs of these changes, for all the disciplines. If the device or the material proposed by the Contractor is denied, it must provide and install the equipment or material specified by number, all without additional compensation.

**1.10 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit for review single line electrical diagrams under plexiglass and locate next to the electrical panel.
- .3 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 co-ordinated 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 a copy of PDF drawings to Departmental Representative and the Consultant for approval.

- .5 If changes are required, notify Departmental Representative and the Consultant of these changes before they are made.
- .4 Quality Control: in accordance with Section 01 45 00 - Quality Control.
  - .1 Provide CSA certified material.
  - .2 Permits and fees: in accordance with General Conditions of contract.
  - .3 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
  - .4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative and the Consultant.

### **1.11 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license in the province of Québec or apprentices as per the conditions of Provincial Act respecting manpower vocational training and qualification workforce.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

### **1.12 SYSTEM STARTUP**

- .1 Instruct Departmental Representative, Consultant and operating personnel in operation, care and maintenance of systems, system equipment and components.

### **1.13 OPERATING INSTRUCTIONS**

- .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 and are secured to prevent easy removal or peeling.

#### **1.14 CORRECTED DRAWINGS**

- .1 Documents kept on site
  - .1 A set of drawings to show all changes made during the execution of works. This information must include all the changes.
  - .2 Show the location of pipes, wiring and junction boxes.
  - .3 Indicate any changes in diameter of the pipes and the number of single-wire conductors inserted therein.
  - .4 Keep these drawings on site and make them available to those concerned for the purpose of reference and verification.
- .2 "As-built" Drawings
  - .1 Provide two (2) copies of as-built drawings. Identify each drawing in the lower right corner, in letters at least 12 mm high, as follows: "AFTER COMPLETION DRAWINGS: THIS DRAWING HAS BEEN REVISED AND SHOW SYSTEMS AND APPLIANCES AS THEY WERE INSTALLED ". (Signature of Contractor) (date).
  - .2 The "AS BUILT DRAWINGS " are placed in an annex pockets in maintenance and operation manuals.

### **Part 2 PRODUCTS**

#### **2.1 MATERIALS AND EQUIPMENT**

- .1 Materials and equipment must be certified by a recognized Canadian organization. In cases where there is no choice but to provide not approved by a Canadian organization recognized equipment, obtain the prior approval of the Departmental Representative and the Consultant.

#### **2.2 WIRING TERMINATIONS**

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

#### **2.3 EQUIPMENT IDENTIFICATION**

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

NAMEPLATE SIZES			
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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 black letters unless specified otherwise.
- .3 Wording on nameplates labels to be approved by Departmental Representative and Consultant prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Terminal cabinets and pull boxes: indicate system and voltage.

## 2.4 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 or as following article 2.8.

## 2.5 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 3 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.
- .4 Pipes feeding the main leads (panels, secondary offerings, etc.) must indicate the power circuit.

Prime	Auxiliary	
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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

## 2.6 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 indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

## 2.7 ADDITIONAL WORK

- .1 The Contractor shall provide detailed prices for all requests for additional work or less.
- .2 At the request of the Consultant, the Contractor shall provide invoices for the purchase of materials.

## Part 3 EXECUTION

### 3.1 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

### 3.2 NAMEPLATES AND LABELS

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

### 3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
  - .1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.

- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

### **3.4 LOCATION OF OUTLETS**

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.

### **3.5 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1400 mm.
  - .2 Wall receptacles:
    - .1 General: 300 mm.
    - .2 Above top of continuous baseboard heater: 200 mm.
    - .3 Above top of counters or counter splash backs: 175 mm.
    - .4 In mechanical rooms: 1400 mm.
  - .3 Panelboards: as required by Code or as indicated.
  - .4 Telephone and interphone outlets: 300 mm.
  - .5 Wall mounted telephone and interphone outlets: 1500 mm.
  - .6 Fire alarm stations: 1500 mm.
  - .7 Fire alarm bells: 2100 mm.
  - .8 Television outlets: 300 mm.
  - .9 Wall mounted speakers: 2100 mm.
  - .10 Clocks: 2100 mm.
  - .11 Door bell pushbuttons: 1500 mm.

**3.6 CO-ORDINATION OF PROTECTIVE DEVICES**

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

**3.7 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 - 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 Circuits originating from branch distribution panels.
  - .2 Lighting and its control.
  - .3 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Check resistance to ground before energizing.
- .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .4 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.

**3.8 CLEANING**

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

**END OF SECTION**

**Part 1 GENERAL****1.1 REFERENCES**

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

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

**Part 2 PRODUCTS****2.1 MATERIALS**

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

**Part 3 EXECUTION****3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
  - .1 Inform Departmental Representative and Consultant of unacceptable conditions immediately upon discovery.

- .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative and Consultant.

### **3.2 INSTALLATION**

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

### **3.3 CLEANING**

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

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 20 Wire and box connectors (0-1000 V).

**1.2 REFERENCES**

- .1 CSA C22.2 no 0.3-09, Test methods for wire and cables.
- .2 CAN/CSA C22.2 n131-07, Câbles type TECK 90

**1.3 PRODUCT DATA**

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, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, RWU90 XLPE.
- .3 Neutral supported cable: one or more phase insulated conductors of Copper and one neutral conductor of Copper steel reinforced, size as indicated. Type: Insulation: Type NS-1 rated 300 V and [Type NSF-2 flame retardant rated 600 V.

**2.2 TECK 90 CABLE**

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
  - .1 Grounding conductor: as indicated.
  - .2 Circuit conductors: as indicated
- .3 Insulation:
  - .1 Thermoset polyethylene, cross-linked, chemically-type RW90, designed for a voltage of 1000 V.
- .4 Inner jacket: polyvinyl chloride.
- .5 Armour: interlocking galvanized steel.
- .6 Overall covering: thermoplastic polyvinyl chloride, [compliant to applicable Building Code classification for this project].
- .7 Fastenings:
  - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
  - .2 Channel type supports for two or more cables.



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

### **2.3 ARMOURED CABLES**

- .1 Conductors: insulated aluminum, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel.  
Connectors: anti short connectors.

## **Part 3 EXECUTION**

### **3.1 FIELD QUALITY CONTROL**

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

### **3.2 GENERAL CABLE INSTALLATION**

- .1 Install cable in trenches in accordance as indicated in the plans.
- .2 Lay cable in cable trays in accordance as indicated in the plans.
- .3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .4 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .5 Conductor length for parallel feeders to be identical.
- .6 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .7 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.
- .8 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only.

**END OF SECTION**

**Part 1 GENERAL****Part 2 PRODUCTS****2.1 SUPPORT CHANNELS**

U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended.

**Part 3 EXECUTION****3.1 INSTALLATION**

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 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.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Fasten exposed conduit or cables to building construction or support system using straps.
  - .1 One-hole [malleable iron] [steel] straps to secure surface conduits and cables 50 mm and smaller.
  - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
  - .3 Beam clamps to secure conduit to exposed steel work.
- .6 Suspended support systems.
  - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .7 For surface mounting of two or more conduits use channels at 5 m on centre spacing.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Professional.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

- .13 Supports and anchorages for the installation of equipment and pipes must conform to the seismic protection of NBC requirements in force. Professional evaluation by a specialist in earthquake protection is required for all fasteners and bracing of all installed systems. Provide a compliance report as well as shop drawings for approval.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 –Common work results for electrical.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)  
CSA C22.1-F06, Canadian Electrical Code, Part 1, 20th Edition.

**Part 2 PRODUCTS****2.1 SPLITTERS**

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals 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.  
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, the permissible current and voltage or as indicated.

**END OF SECTION**

**Part 1 GENERAL****1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)  
CSA C22.1-F06, Canadian Electrical Code, Part 1, 20th Edition.

**Part 2 PRODUCTS****2.1 OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

**2.2 GALVANIZED STEEL OUTLET BOXES**

- .1 One-piece electro-galvanized construction.
- .2 Single or grouped gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

**2.3 MASONRY BOXES**

- .1 Electro-galvanized steel masonry single or multi gang boxes for devices flush mounted in exposed block walls.

**2.4 CONCRETE BOXES**

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

**2.5 CONDUIT BOXES**

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

**2.6 FITTINGS - GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.

- .3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

### **Part 3 EXECUTION**

#### **3.1 INSTALLATION**

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

**END OF SECTION**

**Part 1 GENERAL****1.1 REFERENCES**

Canadian Standards Association (CSA International).

**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 metallic conduit
- .2 Electrical metallic tubing (EMT).
- .3 Rigid pvc conduit: to ACNOR C22.2 No. 211.2-06.
- .4 Flexible metal conduit: liquid-tight flexible metal.

**2.3 CONDUIT FASTENINGS**

- .1 Clamps 1-hole, steel, for securing the apparent ducts whose diameter is equal to or less than 50 mm. Two flanges (2) holes, steel, for securing conduits whose diameter is greater than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 5 m on centre.
- .4 Threaded rods, 6mm diameter, to support suspended channels.

**2.4 CONDUIT FITTINGS**

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

**2.5 EXPANSION FITTINGS FOR RIGID CONDUIT**

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



**2.6 FISH CORD**

- .1 Polypropylene.

**Part 3 EXECUTION****3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 INSTALLATION**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Use electrical metallic tubing (EMT).
- .3 Use flexible metal conduit for lightning fixtures.
- .4 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .5 Mechanically bend steel conduit over 19 mm diameter.
- .6 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .7 Install fish cord in empty conduits.
- .8 Remove and replace blocked conduit sections.
  - .1 Do not use liquids to clean out conduits.
- .9 Dry conduits out before installing wire.

**3.3 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Run conduits in flanged portion of structural steel.
- .3 Group conduits wherever possible on suspended channels.
- .4 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

**3.4 CONCEALED CONDUITS**

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

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

- .1 Locate to suit reinforcing steel.

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

### **3.6 CONDUITS UNDERGROUND**

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

### **3.7 CLEANING**

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

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 06 10 00.

**1.2 REFERENCES**

- .1 CAN/CSA-C22.2 No.31, Switchgear Assemblies.

**1.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate on shop drawings.
  - .1 Dimensioned cable entry and exit locations.
  - .2 Dimensioned position and size of bus.
  - .3 Overall length, height and depth.
  - .4 Dimensioned layout of internal and front panel mounted components.
- .3 Include time-current characteristic curves for circuit breakers and fuses.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Provide maintenance data for service entrance board for incorporation into manual specified in Section 26 05 00 –Common work results for electrical.  
Submit 1copie maintenance data for complete assembly including components.

**Part 2 PRODUCTS****2.1 SERVICE ENTRANCE BOARD**

- .1 Service Entrance Board: to CAN/CSA-C22.2 No.31.
- .2 In the case of a project, all distribution panels must be produced by a single manufacturer. Cubicles: [wall-mounted,] [free standing,] dead front, size as indicated.
- .3 The circuit breakers are to be mounted on the front panels that they are not delivered at the place of work Provision for installation of power supply authority metering in barriered section.
- .4 In the case of panels of 120 / 240V; the bus bars and circuit breakers must be of the minimum breaking capacity of 10 kA at 240 V or as indicated. Distribution section.
- .5 The bus bars must be put in charge successively, and such that the circuit breakers mounted on the odd-numbered channels are placed on the left and those fitted on the circuit even number on the right. Each circuit breaker must be indelible circuit identification number and the number of phases.
- .6 Distribution panels shall have the main bars required and the number of necessary circuits and branch circuit breakers, gauges as indicated.

- .7 All switchboards must have a door system with key lock (lock of the same type). Provide two (2) keys for each distribution panel (the panels outside the electrical room).
- .8 Use aluminum busbars, the neutral bar having the same rating as the main bars.
- .9 The main bar distribution panels must be suitable for bolt-breakers.
- .10 The door panels frame must be mounted with bolts and hinges that are hidden behind the door.
- .11 The door and the door frame distribution panels must be finished in gray baked enamel baked in gray enamel dried in the open air as finite array of indications.

## **2.2 MOULDED CASE CIRCUIT BREAKERS**

- .1 Circuit breakers comply with the requirements of Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Unless otherwise indicated, distribution panels must be fitted with thermal-breakers.
- .3 The main circuit breaker must be installed separately to the bottom or the top of the panel, depending on the location of the cable entry. When the breaker is mounted vertically, the lowering of the lever must cause opening of the circuit.
- .4 Provide interlocks fire alarm systems, emergency lighting, and access control or as indicated on plans.
- .5 Bypass molded case circuit breakers are the type bolted with suitable connectors.
- .6 The circuit breakers will possess a toggle mechanism unstable central position ensuring the opening and the sudden closing of contacts. The circuit breakers will be equipped with thermal tripping and mechanical elements on each pole. Bipolar pole circuit breakers and will be common trigger all poles.

## **2.3 GROUNDING**

- .1 Copper ground bus extending full width of cubicles and located at bottom.

## **2.4 FINISHES**

- .1 Apply finishes in accordance with Section 26 05 00 - Common Work Results for Electrical.
  - .1 Service entrance board exterior: gray.

## **2.5 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Nameplates:
  - .1 White plate, black letters, size 7.
  - .2 Complete board labelled: 120/240V."
  - .3 Branch disconnects labelled: plates marked as indicated in the plans.

**Part 3            EXECUTION****3.1        INSTALLATION**

- .1        Install the panels in the spaces provided, as indicated, and mount securely, plumb, square and alignment with adjacent surfaces. Provide all required materials.
- .2        Assemble distribution panels projecting from a plywood backboard. As far as possible, grouped on a common backboard. Check factory made connections for mechanical security and electrical continuity.
- .3        Rise the distribution panels to the height required in Section 226 05 00 - Common Work Results for Electrical.
- .4        Connect all circuits to load elements.
- .5        Connect neutral conductors to common neutral bus, each of the neutral conductors bearing the appropriate designation.

**END OF SECTION**

**Part 1 GENERAL****1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 26 05 00 –Common work results for electrical.

**Part 2 PRODUCTS****2.1 SWITCHES**

- .1 15A, 120 V specifications according to plans
- .2 Manually-operated general purpose AC switches with following features:
  - .1 Terminal holes approved for No. 10 AWG wire.
  - .2 Silver alloy contacts.
  - .3 Urea or melamine moulding for parts subject to carbon tracking.
  - .4 Suitable for back and side wiring.
  - .5 Toggle : white, shatterproof thermoplastic, top quality.
- .3 Switches: rocking nominal intensity by full load in case of lighting equipment and related to 80% of charge in the engine case.
- .4 Switches of one manufacturer throughout project.

**2.2 RECEPTACLES**

- .1 Sockets: double, CSA Type R 5-15, 125 V, 15 A, grounded in "U" with the following characteristics:
  - .1 Front and rear body nylon thermoplastic superior quality.
  - .2 For side and back connection gauge n 10 AWG.
  - .3 Breakable links for conversion into separate outlets.
  - .4 Connection ports from the rear, four screw terminals for side connection.
  - .5 Triple sliding contacts and contact grounding riveted.
- .2 Other outlets designed for eligible current and voltage, as indicated.
- .3 In one installation, use only sockets made by a single manufacturer.
- .4 Acceptable Products: as indicated in the plans.
- .5 For the entire installation, use only taken from a single manufacturer.

**2.3 COVER PLATES**

- .1 Equip all wiring devices cover plates.
- .2 For the entire installation, use only cover plates manufactured by a single manufacturer.
- .3 Stainless steel plates for any room.

- .4 Molded cover plates aluminum, weatherproof, double spring doors with seals for double sockets as indicated.

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

### **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 in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .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.
- .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.

### **3.3 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 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 24 02 – Connection tables.

**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 26 05 00 –Common work results for electrical..
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Include time-current characteristic curves.
- .4 Certificates:
  - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit [3] copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
    - .1 Production certificate of origin must be submitted to Departmental Representative and Consultant for approval.
  - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
  - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative and Consultant. Unless complying with this requirement, Departmental Representative and Consultant reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.

**Part 2 PRODUCTS****2.1 BREAKERS GENERAL**

- .1 Moulded-case circuit breakers:
  - .1 For switching cabinets, removable individually or bolted to the bus bars of the quick-closing type and snap-in automatic and manual laborers with compensation for an ambient temperature of 40 ° C in the switchboards.
- .2 Common-trip breakers: with single handle for multi-pole applications.
- .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 Current breaks (Ac) circuit breakers will be used as indicated in the plans.

**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.

**3.2 INSTALLATION**

- .1 Install circuit breakers as indicated.

**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.

**END OF SECTION**

**Part 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 –Common work results for electrical.

**1.2 REFERENCES**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
  - .2 ANSI C82.4-02 (R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
  - .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International)
- .5 Underwriters' Laboratories of Canada (ULC)

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 26 05 00 –Common work results for electrical..
- .2 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 where specified, for approval by Consultant.

**Part 2 PRODUCTS****2.1 LAMPS**

- .1 As indicated in luminaire schedule.

**2.2 BALLASTS**

- .1 As indicated in luminaire schedule.

**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 INSTALLATION**

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

**3.2 WIRING**

- .1 Connect luminaires to lighting circuits:
  - .1 Install flexible or rigid conduit for luminaires as indicated and standards.

**3.3 LUMINAIRE ALIGNMENT**

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

**3.4 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 GENERAL****1.1 SCOPE OF WORK**

- .1 Excavation and backfilling of this construction contract include all work that is necessary for the proposed construction, whatever the selected construction method.
- .2 The excavation work includes clearing, removal and transportation of all materials encountered, of any kind, including bushes, trees, stumps, debris, abandoned pipeline services, old foundations, paving, earth, rock, etc. to allow the construction of all works to specified lines and levels.
- .3 Backfilling include the supply and installation of backfill and compaction to the level indicated on the drawings.
- .4 In addition, the Contractor must include in the bid price, cleaning and proper extraction of water, final grading and finishing by hand excavation, for the implementation of concrete or other materials. The Contractor must read in detail the geotechnical study because it attempts to demonstrate the presence of water under the ground level.
- .5 The Contractor must also include in the bid price, the excavation supports and protective work necessary to ensure the safety of workers and surrounding structures (buildings, sidewalks, pipes, poles, etc.)
- .6 Included, excavation and backfilling required for the construction of footings, walls, floor slabs, wells, ditches, pits, bases of equipment, sidewalks, bollards, buried pipes electricity or mechanical and any other works of the same type that are shown on the drawings of all disciplines : structural, architectural, landscaping, mechanical or electrical.
- .7 Localized excavation and backfilling outside the walls of the new building are included in this section. If work specifications for outdoor arrangements are more restrictive, they will take precedence over these specifications.

**1.2 RELATED SECTIONS**

- .1 General requirements apply to the work described in this section
- .2 Construction-demolition waste management and disposal - Section 01 74 21
- .3 Section 01 35 21 - LEED Requirements
- .4 4. Geotechnical studies:
  - .1 A geotechnical study was conducted for the terminal nearby and the report is tagged with the file number G08358-B-rap-001, dated February 2009 (see Appendix A).

**1.3 DEFINITIONS**

- .1 The following definitions apply throughout this section of the quote
  - .1 Professional: consultant in structure or its representative on site during work execution.
  - .2 Plans: unless otherwise annotated, drawings sealed and signed by the professional in structure and issued for execution of works.

- .3 Laboratory: expert in quality control of materials and geotechnical designated by the client. The laboratory is, as such, empowered to issue directives to which the Contractor must comply.

#### 1.4 REFERENCES

- .1 This quotation refers to the latest edition and revision of codes and standards.
  - .1 ASTM C117, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
  - .7 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.
  - .8 CSA A23.1 - A.23.2: "Concrete materials and methods of concrete construction, test methods and standard practices for concrete"

#### 1.5 GENERAL REQUIREMENTS

- .1 Work site visit with terrain topography examination: natural and artificial obstacles, access roads and other local conditions that could affect the execution of such work.
- .2 Comply with provincial and municipal regulations governing the execution of the work described in this section of the estimate, especially those related to environmental protection and shoring of excavations.
- .3 Submit Schedule C, within the Section 01 35 21 - LEED Requirements, duly filled in block letters for each of the products described in this section, and at the same time as data sheets and shop drawings. No specifications or shop drawings will be considered if Annex C is not included and duly completed. Datasheets and shop drawings will be automatically rejected.
- .4 The work is governed by a waste management plan in accordance with Section 01 74 21 - Construction-demolition waste management and disposal. The work of this section must be carried out respecting the requirements of the plan which will be implemented by the Contractor. All subcontractors must comply.

#### 1.6 SOIL TYPE

- .1 Geotechnical study report, near the land where the work will be performed, must be annexed to the contract documents of the Contractor.

**1.7 LINES AND LEVELS**

- .1 Prior to the start of works, position and fix all landmark terminal required for locating and delimiting the area and depth of the excavations that will be executed.
- .2 Replace or immediately rectify any landmark terminal that has been removed or moved before the excavation and concrete work for which it is required have been completed and approved by the Professional.

**1.8 PERMITS AND REGULATIONS**

- .1 The Contractor must obtain all necessary permits. The Contractor must comply with all laws and regulations in force and in particular those related to the use of explosives, shoring of the excavation and protection of the environment.

**1.9 PROTECTION OF PUBLIC SERVICES AND STRUCTURES**

- .1 The Contractor must take good care of all utilities (water, sewer, gas, electricity, telephone, sidewalks, paving, etc.) underground or elevated that his work can affect. All utilities have the support and protection required. These utilities may belong to private companies or public bodies.
- .2 The Contractor is responsible for any damage that may happen to them as a result of construction operations. He must make the necessary checks with public bodies, private companies that own the damaged utility. The location of the pipes on the plans is generally rough and field audits should be conducted to accurately locate underground services.
- .3 If necessary, excavation near conduits and underground structures must be made by hand. These conduits and underground structures should not be backfilled before the Professional has inspected them.
- .4 Pavement or sidewalks must be sawn to the boundary of the excavation prior to the actual excavation work. It is not allowed to break a pavement, a curb or sidewalk using the bucket of an excavating machine or with another similar method.

**1.10 EXISTING PERIPHERAL STRUCTURES**

- .1 Take every precaution to avoid damaging the landscaping, buildings and other man-made structures on the periphery of the site. If necessary, make all repairs to the satisfaction of the owner and assume all costs.
- .2 Before starting work, accompanied by the client company and the Contractor's insurer, make a complete inspection of buildings and other surrounding structures that could be damaged during the execution of the work. If necessary, submit to the Professional, a written report including photos or a video showing all existing defect that has been identified and could possibly be the subject of a claim for damages.

**1.11 BUILDING MAINTENANCE**

- .1 Prevent airborne dust on site and avoid burning combustible debris from the excavation or demolition or any other source.
- .2 The removal of undesirable materials must be done every day.

- .3 Avoid pile up of debris in places where they can threaten the stability of excavation slopes or restrain the natural drainage of the work site.
- .4 Protect the excavation slope against erosion, landslides and other phenomena of natural or accidental source that may damage or delay the normal progress of work.

#### **1.12 SECURITY MEASURES**

- .1 Strictly comply with the requirements of Article 3.15: Excavations and trenches of the Safety Code for the construction work, 2.1 S, r.6 published by the Québec Official Publisher.

#### **1.13 WORK SUPERVISION**

- .1 Professional will conduct an evaluation of soil quality at the bottom of excavations and evaluation of foundation embankments quality. The Contractor must at all times cooperate with the Professional and make available equipment on site so that he can quickly and effectively perform his job. The Contractor must cooperate during backfilling to allow the Professional to verify the compactness of the materials used and their quality.
- .2 The Contractor must not claim any supplement to contract amount because of delays caused by the Professional intervention to carry out its quality control work during the execution of backfilling.

#### **1.14 AUTHORIZATION OR APPROVAL OF THE PROFESSIONAL**

- .1 In accordance with the requirements of this section, the permission or approval of the Professional must not be regarded as having been obtained until he has been notified in writing or recorded in the minutes ratified by all persons attending meeting and where Professional was also attending.
- .2 The Professional may delegate a laboratory to represent him in evaluation in regard to the quality of materials and work. The laboratory is, as such, empowered to issue directives to which the Contractor must comply.

### **Part 2 PRODUCTS**

#### **2.1 ORIGIN AND APPROVAL OF MATERIALS**

- .1 Before starting work, the Contractor must inform the Professional of the origin of borrowed materials he intends to use.
- .2 The Contractor must provide recent reports of particle size analysis and qualitative testing, performed by a recognized laboratory, certifying that all materials meet the requirements of the quote.
- .3 Professional reserves the right to perform at the client's expense, by a recognized laboratory, particle size analysis and qualitative tests certifying that all materials meet the specification requirements and the Contractor must cooperate to provide required samples.
- .4 Borrowed materials must not contain anything likely to swell.



- .5 The Contractor must not use any material before it is approved in writing by the Professional.

## 2.2 GRANULAR MATERIALS

### .1 Quality

At least 95% of the results of tests conducted by a laboratory or laboratories must meet the following specifications:

<b>Trials</b>	<b>Granual Material</b>	<b>Granual Material</b>	<b>Sand or gravel</b>
Petrographic max. number	200	300	400
Durability MgSO4 (% max.)	20	25	35
Los Angeles (% max.)	50	50	50
Micro-Deval (% max.)	33	36	45
Fragmentation (% min.)	50	50	-
Organic materials (% max.)	0,8	0,8	0,8

#### .1 Petrographic number

BNQ-2560-900 "Determination of petrographic number of coarse aggregate"; the maximum is 175 instead of 200 in the case of a non-paved road surface.

#### .2 Durability

BNQ-2560-450 "Aggregates - Determination of resistance to disintegration by a magnesium sulfate solution" (5 cycles); specified losses apply respectively to the coarse aggregate and fine aggregate.

#### .3 Los Angeles

BNQ-2560-400 "Aggregates - Determination of abrasion resistance using the device Los Angeles"; the maximum is 32 instead of 50, in the case of crushed stone from limestone quarries.

#### .4 Micro-Deval

BNQ-2560-070 "Aggregates - Determination of the wear by attrition coefficient using the Micro-Deval apparatus"; the maximum is 30 instead of 33 in the case of a layer of unpaved rolling.

#### .5 Fragmentation

The percentage shown is the percentage by weight of comminuted particles having at least one face fractured by crushing and retained on the sieve of 5 mm.

#### .6 Organic materials

The standard test is based on the book "aggregates Technology" on page 329, ed. 1983 (Aïtcin, Jolicœur and Mercier).

.7 Standards

The standard testings BNQ 2560-900-and-BNQ 2560-450 are replaced by the BNQ 2560-070-standard for aggregates from limestone quarries.

.2 Granulometry

.1 Crushed stone MG 56 (60-0) (complying with NQ Standard 2560-114, Civil Works - aggregates)

Sieve	Percentage passing (% weight)
80,00 mm	100
56,00 mm	82-100
31,50 mm	55-85
5,00 mm	25-50
1,25 mm	11-30
0,325 mm	4-18
0,080 mm	2-7

.2 Crushed stone MG 20 (20-0) (complying with NQ Standard 2560-114, Civil Works - aggregates)

Sieve	Percentage passing (% weight)
31,50 mm	100
20,00 mm	90-100
14,00 mm	68-93
5,00 mm	35-60
1,25 mm	19-38
0,325 mm	9-17
0,080 mm	2-7

.3 Crushed stone BC 5-20

Sieve	Percentage passing (% weight)
28,0 mm	100
20,0 mm	90-100
10,0 mm	25-60
5,0 mm	0-10
2,5 mm	0-5

## .4 Sand or gravel

Sieve	Percentage passing (% weight)
31,5 mm	100
5,0 mm	35-100
0,080 mm	0-10

## .5 Geotextile

1. geotextiles must be rot-proof, insensitive to the action of acids and bases and unassailable by microorganisms and insects, and must meet the following requirements:

Trials	Requirements	Standards
Tensile strength in length and minimum width (N)	350	CAN / CGSB – 4.2 – 12.2
Bursting strength (Mullen) minimum (kPa)	2200	CAN / CGSB – 4.2 – 11.1
Minimum tensile force (N)	750	CAN / CGSB – 4.2 - 9.2
Minimum thickness	2 mm	CAN / CGSB – 4.2 – 37

## 1. Peripheral drain

1. The corrugated and perforated thermoplastic conduits must comply with the following requirements:
  1. Conduits of 100 mm, 150 mm, 200 mm and 250 mm in HDPE compliant to BNQ 3624-122, class 400.
  2. Conduits of 300 mm in HDPE compliant to BNQ 3624-110, class 300.

**Part 3 EXECUTION****3.1 FOUNDATION AREA**

- .1 The bottom of the excavation must be cleaned by hand. Foundation bedding must be horizontal but may form several levels separated by siding as vertical as possible.
- .2 Any excavation deeper than what is shown on the drawings is the responsibility of the Contractor as well as the measures determined by the Professional to correct the situation.
- .3 The Contractor must take the necessary precautions to prevent softening of natural soil under foundations and embankments. If in regard to the Professional's opinion, the bedding becomes unsuitable, the Contractor must further excavate to achieve an acceptable support. The additional excavation and incidental remedies are made at the expense of the Contractor.

- .4 The Contractor is not allowed to excavate to a depth greater than what is specified in the drawings; if doubtful soil is discovered during the inspection of the Professional and/or the laboratory, he will notify in writing of the solution.

### **3.2 EXCAVATION**

- .1 Take the necessary precautions not to disturb soil below the level of pile heads, footings, slabs on ground or other structure. Remove any disturb soil from bedding.
- .2 Immediately remove from site, all excavated material that will not be reused.

### **3.3 EXCAVATION FOR SLABS ON GROUND AND PAVED SURFACES**

- .1 Unless otherwise specified, the Contractor must make the necessary excavations to avoid setting up compacted granular backfill on organic soil or topsoil. Bedding must be natural ground, undisturbed, free of organic matter and also accepted by the Professional. The excavation will be deep enough to allow the establishment of granular backfill thickness specified on the drawings.
- .2 Refer to section 3.9 for additional information concerning the slabs on ground and paved surfaces.

### **3.4 DRYDOWN OF EXCAVATIONS**

- .1 If necessary, build and maintain in operation an adequate network of ditches connected to header tanks. The location of such tanks must be approved by the Professional.
- .2 Install in the working collection pits and pumps with sufficient capacity to quickly drain the water that accumulates.
- .3 The Contractor must, at its expense, maintain excavations free of water, snow and ice as long as they have not been backfilled.

### **3.5 REMOVAL OF EXCAVATED MATERIAL**

- .1 Immediately remove from site, all excavated material that will not be reused later as backfill.
- .2 It is prohibited to file or store excavation material on pavement, sidewalks, alleys, on any other public property, or already built structures.

### **3.6 DRAINAGE**

- .1 The Contractor must provide and arrange ditches for pumps, drains, pipes and all other means necessary to remove water from trenches, excavations and other parts of the work and must, where necessary, evacuate all surface and ground waters, whether from natural sources, seepage, leakage or flow of sewage pipes, drains or other man-made structures.
- .2 The Contractor must also keep dry excavations and other portions of the work until the permanent works of drainage to be built is completed.
- .3 The Contractor must properly control, divert and evacuate all surface water that may enter the locations where the work is performed under contract until provisional acceptance.

**3.7 PROTECTION AGAINST FROST**

- .1 If work is performed in cold weather, make sure the excavations as soon as they are completed, are effectively protected against freezing in order to build on unfrozen ground, free of snow and ice and to avoid damage by frost effect to the already built or neighboring structures; cover the bottom with an insulating material of suitable thickness or use any other method approved by the Professional.
- .2 The Contractor must, at his expense, protect against frost excavations until the pile heads, stringers, walls and similar elements have been completely casted and backfilled.

**3.8 INSPECTION AND ACCEPTANCE**

- .1 Before casting or backfilling, the Contractor must ensure that the Professional or the laboratory has inspected and accepted the subgrade and the works that will be hidden by the embankment or the structural elements.
- .2 The Contractor must notify the Professional at least 24 hours before the backfill of any material; the Contractor must provide his cooperation to facilitate the inspection.

**3.9 CONSTRUCTION OF EMBANKMENTS**

- .1 Backfill materials must be implemented in a way that no exaggerated effort or damage will be caused to works.
- .2 When backfilling is necessary on either side of a foundation wall, it must be made simultaneously on both sides.
- .3 Where the filling on one side, it must be done only after all elements that ensure stability of the wall are in place.
- .4 Before backfilling, the Contractor must ensure that the Professional has inspected and accepted the subgrade and the works that will be hidden by the embankment.
- .5 When work begins, check that the surfaces to backfill remained clean, dry and free of snow and ice and there was no softening or subsequent soil disturbance; it is prohibited to build embankments on the frozen ground.
- .6 Ensure that backfill material is not frozen and contains neither snow nor ice, and debris.
- .7 The materials must be deposited in layers of up to 300 mm thick. Each layer must be densified separately using mechanical devices capable of providing the specified densities.
- .8 The cover over and around conduits should be done with care so that no damage or movement is caused to conduits and prevent thereafter, sagging of the slab, floor or other structure located above.
- .9 All conduits buried within the works, backfill from minimum 150 mm under the grade of the pipe to the height of the axis with sand or gravel dust. Backfill the remainder of the excavation with a granular material, crushed stone, complying with the abovementioned standards, compacted to the specified density.
- .10 If devices or other drains are requested on the plans, backfilling around these drains, 50 mm below 200 mm on each side and 300 mm above, must be made of crushed stone, clean, consistent with caliber BC 5-20 from Ministry of Transportation.

- .11 Unless otherwise stated in the drawings, the embankment immediately below the slab on grade or under the asphalt will have a minimum thickness of 150 mm and will be crushed stone caliber 20 MG
- .12 The soil to be compacted must achieve a minimum density of 95% according to Proctor changed in the last 150 mm from the upper layer.
- .13 After densification, the sand borrowed material, gravel or crushed stone must reach a density of 95% following the modified Proctor test (ASTM D-1557), the entire thickness of each layer, unless indications contrary to the plans.

### **3.10 OTHER BACKFILLING WORK**

- .1 Other backfilling work includes all those required outside of the foundation walls.
- .2 As the space above the trenches of the peripheral walls or other trenches must be paved, underlying embankments, from the undisturbed natural ground, must be made as those inside, if not otherwise indicated on landscaping plans.

### **3.11 POSITIONNING OF GEOTEXTILE**

- .1 Where indicated on drawings, position a geotextile membrane and take the necessary steps to keep it in position until the embankment is added.
- .2 Overlap geotextile joints to a length of 1000 mm.

### **3.12 COMPACTION TESTS**

- .1 The client may perform compaction tests by a laboratory of his choice. The cost of these tests is paid for by the client.
- .2 This inspection does not relieve any responsibility of the Contractor of his obligations to perform the work according to the plans and specifications; it is not a guarantee that they were executed according to plans and specifications.

**END OF SECTION**

**Part 1        GENERAL**

Appendix A provides the geotechnical study, case number G08358-B-rap-001, dated February 2019.

The geotechnical study is available for inspection at the office of the Departmental Representative.



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Le 17 février 2009

Madame Ann-Marie-Connelly, ing.  
**Dessau inc.**  
1032, 3<sup>e</sup> Avenue Ouest  
Val-d'Or (Québec) J9P 1T6

Notre dossier n° : 1931-P  
Référence n° : G08358-B-rap-001

**Objet : Étude géotechnique  
Réaménagement de l'aérogare  
Waskaganish, Québec**

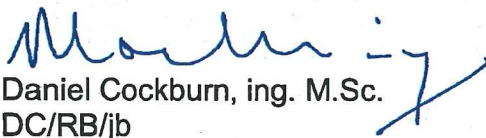
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Madame,

Vous trouverez ci-joint le rapport d'étude géotechnique effectuée par le Groupe Qualitas inc. dans le cadre du projet mentionné en titre.

Espérant le tout à votre entière satisfaction, nous vous prions d'agréer, Madame, l'expression de nos sentiments les meilleurs.

**GROUPE QUALITAS INC.**

  
Daniel Cockburn, ing. M.Sc.  
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p.j.





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## **ÉTUDE GÉOTECHNIQUE**

**Réaménagement du secteur de l'aérogare**  
**Waskaganish, Québec**

**DOSSIER N° : 1931-P**  
**RÉFÉRENCE N° : G08358-B-rap-001**

**FÉVRIER 2009**

**DISTRIBUTION : Mme Ann-Marie Connelly, ing. (Dessau) (5 copies)**

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## **1 INTRODUCTION**

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Les services professionnels du Groupe Qualitas inc. (Qualitas) ont été retenus par Dessau inc. (Dessau) pour le compte de Travaux publics et Services gouvernementaux Canada (TPSGC), afin d'effectuer une étude géotechnique dans le cadre du projet de réaménagement de l'aérogare de Waskaganish. Cette étude a été effectuée en accord avec les termes des propositions de service du 9 et 12 décembre 2008.

Le but de l'étude géotechnique était de déterminer la nature et les propriétés des sols présents sur le site, en vue de guider Dessau dans la préparation des plans et devis pour diverses infrastructures, soit :

- l'édifice de l'aérogare;
- les conduites d'égout et d'aqueduc;
- les aires de stationnement.

Le présent rapport comprend une description de la méthode de travail utilisée lors de la reconnaissance, les résultats de l'étude, ainsi que les commentaires et recommandations d'ordre géotechnique relatifs aux travaux projetés.

Ce rapport a été préparé spécifiquement et seulement pour Dessau et TPSGC. Toute modification au projet doit être soumise à Qualitas, afin que soient examinées la portée et la pertinence de la reconnaissance géotechnique et des recommandations contenues dans ce rapport. La portée de l'étude est présentée à l'annexe 1.

## **2 MÉTHODE DE LA RECONNAISSANCE**

---

### **2.1 FORAGES**

Les travaux sur le terrain ont été effectués du 25 janvier au 1<sup>er</sup> février 2009. Ils ont été effectués sous la surveillance constante d'un technicien expérimenté en géotechnique de Qualitas. Ils ont consisté en l'exécution de 6 forages repartis comme suit :

**TABLEAU 1**  
**ÉTENDUE DES TRAVAUX**

<b>FORAGE N°</b>	<b>ENDROIT</b>
F-1	Aérogare
F-2	Tablier
F-3	Stationnement
F-4, F-5 et F-6	Services municipaux

Les 6 forages ont été exécutés à l'aide d'une foreuse hydraulique à tarières évidées de marque Diedrich, modèle D-50, montée sur un chenillard.

Le forage F-1 a été avancés par rotation simultanée de tubes de calibre NW et d'un trépan à molettes, alors que les forages F-2 à F-6 ont été avancés par rotation de tarières à centre évidé. Les forages ont atteint des profondeurs généralement comprises entre 3,05 m et 4,27 m, sauf pour le forage F-1 qui a atteint la profondeur de 37,18 m.

Les échantillons de sol ont été prélevés au moyen d'un carottier fendu normalisé de 51 mm de diamètre extérieur et de 610 mm de longueur, conformément aux exigences de la norme NQ 2501-140 décrivant l'essai de pénétration standard



(SPT). Cette procédure permet d'obtenir l'indice de pénétration « N » qui indique l'état de compacité des sols pulvérulents.

De plus, la résistance au cisaillement non drainé de l'argile intacte a été mesurée dans les forages F-1, F-4, F-5 et F-6, généralement à des intervalles de 1,0 m, à l'aide d'un scissomètre « Nilcon ». Les résultats de ces mesures apparaissent dans la colonne appropriée sur les rapports de forage de l'annexe 2.

Un piézomètre à pointe poreuse de type Casagrande a été installé dans le forage F-1, dans le dépôt de till sous-jacent le dépôt d'argile, afin de permettre des mesures ultérieures du niveau de l'eau souterraine. Des tubes de plastique, perforés à leur extrémité inférieure, ont été installés dans les forages F-2, F-3 et F-6, avant le retrait des tarières, dans le même but.

Les rapports individuels des forages sont joints à l'annexe 2.

## **2.2 LOCALISATION ET NIVELLEMENT**

La position des 6 forages a été déterminée par TPSGC et les coordonnées nord (y) et est (x) ont été tirées du relevé dont le fichier informatique « *sondage.dwg* » a été transmis à Qualitas le 22 décembre 2008. Les forages ont par la suite été implantés par le personnel de Qualitas à l'aide d'un appareil portatif de positionnement GPS.

Le niveau de la surface du terrain à l'emplacement des forages F-1, F-2 et F-3 a été relevé par Qualitas à partir d'un repère de nivellement (RN-1) de niveau géodésique 24,15 m identifié sur le relevé « *sondage.dwg* ». Il correspond au coin sud-est de la dalle du réservoir de carburant pour avions situé au nord-est du tablier existant.

La localisation des forages est présentée sur le dessin *Localisation des forages* de l'annexe 3.

### **2.3 TRAVAUX EN LABORATOIRE**

Les échantillons recueillis dans les forages ont été transportés au laboratoire de géotechnique de Qualitas pour y être soumis au programme d'essais géotechniques résumé au tableau 2.

**TABLEAU 2**  
**ESSAIS EN LABORATOIRE**

TYPE	NOMBRE
Teneur en eau	25
Limites d'Atterberg	8
Analyse granulométrique par tamisage et lavage au tamis de 80 µm	3
Analyse granulométrique par sédimentométrie	1

Les résultats des analyses granulométriques sont présentés sur les figures de l'annexe 3. Les résultats des limites d'Atterberg et des teneurs en eau sont présentés sur les abaques de plasticité à l'annexe 3 et également dans la colonne appropriée des rapports de forage de l'annexe 2.

Les échantillons provenant des forages, et n'ayant pas été utilisés pour les essais de laboratoire, seront conservés jusqu'au mois de juillet 2009. Après cette date, ils seront éliminés à moins d'avis contraire de la part de Dessau ou de TPSGC.

### 3 RÉSULTATS DE L'ÉTUDE

#### 3.1 NATURE ET PROPRIÉTÉS DES MATÉRIAUX

La description détaillée des sols rencontrés dans les 6 forages effectués dans le cadre de cette étude est présentée sur les rapports individuels de forage à l'annexe 2. Les caractéristiques des principales unités stratigraphiques sont décrites dans les paragraphes qui suivent. La stratigraphie rencontrée dans les 6 forages est résumée au tableau 3.

**TABLEAU 3**  
**RÉSUMÉ DE LA STRATIGRAPHIE**

FORAGE N°	NIVEAUX SUPÉRIEURS ET ÉPAISSEURS DES HORIZONS DE SOL (m)									
	Chaussée		Tourbe		Sable		Argile		Till	
	Niv. Sup.	Épais.	Niv. Sup.	Épais.	Niv. Sup.	Épais.	Niv. Sup.	Épais.	Niv. Sup.	Épais.
F-1	24,00	1,20 <sup>(1)</sup>	22,80	0,63	22,17	0,61	29,60	10,44	- 8,0	> 5,18
F-2	-	-	23,57	1,52	22,05	0,61	21,44	> 0,92	-	-
F-3	-	-	23,53	1,22	-	-	22,31	> 1,83	-	-
F-4	-	-	N/D	1,83	-	-	N/D	> 2,75	-	-
F-5	-	-	N/D	1,07	-	-	N/D	> 3,20	-	-
F-6	-	-	N/D	1,22	-	-	N/D	> 3,05	-	-
Note 1 : Épaisseur approximative N/D : Niveau géodésique non déterminé										

##### 3.1.1 Chaussée

Le forage F-1 a été effectué dans le secteur au nord-est de l'aérogare existante et, à cet endroit, il a traversé la chaussée de la route d'accès. Compte tenu de l'état gelé des matériaux, aucun échantillon n'a pu être prélevé et, par conséquent, la composition de la structure de chaussée n'a pas pu être déterminée.

### **3.1.2 Tourbe**

Directement à partir de la surface, ou sous la chaussée routière au droit du forage F-1, les 6 forages ont traversé un horizon de tourbe compressible ayant des épaisseurs comprises entre un minimum de 0,63 m (F-1) et un maximum de 1,52 m (F-2 et F-4). La tourbe contient localement des morceaux de bois.

Selon le système de classification de Von Post, il s'agit d'une tourbe de classe H-2 et H-3, soit une tourbe pratiquement non décomposée ou peu décomposée, à structure fibreuse évidente.

La teneur en eau naturelle a été déterminée sur 6 échantillons de tourbe et, dans 5 cas sur 6, des valeurs généralement comprises entre 300 % et 520 % ont été mesurées. Exceptionnellement dans le forage F-2, une valeur beaucoup plus faible de 34 % a été mesurée.

### **3.1.3 Sable et silt**

Directement sous la couverture de tourbe, les forages F-1, F-2 et F-4 ont rencontré un mince dépôt naturel granulaire dont l'épaisseur est respectivement de 0,61 m, 0,61 m et 0,31 m.

La nature de ce dépôt est celle d'un sable fin à moyen uniforme et silt avec des traces de gravier. Selon le système unifié de classification (ASTM-D 2487), il s'agit d'un SM.

Une analyse granulométrique par tamisage et lavage au tamis 80  $\mu\text{m}$  a été effectuée sur un échantillon représentatif provenant de ce dépôt. La courbe granulométrique est présentée sur la figure 1 de l'annexe 3.

L'indice de pénétration « N » a été mesuré à une seule occasion dans ce dépôt et une valeur de 16 a été enregistrée, ce qui indique une compacité moyenne à cet endroit.



### 3.1.4 Argile silteuse

Un dépôt d'argile silteuse avec des traces de sable a été rencontré dans les 6 forages, à partir des profondeurs et niveaux indiqués au tableau 3.

Seulement le forage F-1 a complètement traversé le dépôt qui, à cet endroit, possède une épaisseur de 29,60 m. Les 5 autres forages ont été arrêtés dans l'argile, après l'avoir pénétrée sur des épaisseurs comprises à entre 0,92 m et 3,20 m.

Les propriétés du dépôt d'argile silteuse ont été mesurées tant en chantier qu'en laboratoire. Les résultats des essais de laboratoire sont présentés au tableau 4.

**TABLEAU 4**  
**CARACTÉRISTIQUES PHYSIQUES DE L'ARGILE SILTEUSE**

SONDAGE ET ÉCHANTILLON	PROFONDEUR (m)		TENEUR EN EAU w (%)	LIMITES DE CONSISTANCE			INDICE DE LIQUIDITÉ I <sub>L</sub>	CLASSIFICATION ASTM D 2487
	de	à		Limite de liquidité w <sub>L</sub> (%)	Limite de plasticité w <sub>p</sub> (%)	Indice de plasticité I <sub>p</sub> (%)		
F-1, CF-3	2,44	3,05	27	27	16	10	1,0	CL
F-1, CF-4	3,05	3,66	26	-	-	-	-	-
F-1, CF-5	4,27	4,88	33	-	-	-	-	-
F-1, CF-6	7,32	7,92	31	23	15	9	1,9	CL
F-1, CF-7	10,36	10,97	32	-	-	-	-	-
F-1, CF-8	14,94	15,54	31	-	-	-	-	-
F-1, CF-11	28,65	29,26	34	-	-	-	-	-
F-2, CF-5	2,44	3,05	27	30	17	13	0,8	CL
F-3, CF-4	1,83	2,44	25	30	16	14	0,7	CL
F-3, CF-5	2,44	3,05	26	-	-	-	-	-
F-4, CF-5	2,44	3,05	34	28	16	12	1,5	CL
F-4, CF-6	3,05	3,66	30	-	-	-	-	-
F-4, CF-7	3,81	4,27	33	26	16	11	1,6	CL
F-5, CF-3	1,22	1,83	24	-	-	-	-	-

**TABLEAU 4 (suite)**  
**CARACTÉRISTIQUES PHYSIQUES DE L'ARGILE SILTEUSE**

SONDAGE ET ÉCHANTILLON	PROFONDEUR (m)		TENEUR EN EAU w (%)	LIMITES DE CONSISTANCE			INDICE DE LIQUIDITÉ I <sub>L</sub>	CLASSIFICATION ASTM D 2487
	de	à		Limite de liquidité w <sub>L</sub> (%)	Limite de plasticité w <sub>p</sub> (%)	Indice de plasticité I <sub>p</sub> (%)		
F-5, CF-5	2,44	3,05	30	-	-	-	-	-
F-5, CF-6	3,05	3,66	31	25	15	10	1,6	CL
F-6, CF-3	1,22	1,83	25	-	-	-	-	-
F-6, CF-5	2,44	3,05	27	-	-	-	-	-
F-6, CF-7	3,66	4,27	37	25	16	9	2,3	CL

Ces résultats indiquent qu'il s'agit d'une argile de plasticité faible (CL).

Des profils de résistance au cisaillement du dépôt argileux ont été déterminés dans les forages F-1, F-4, F-5 et F-6.

Le dépôt présente une mince « croûte » superficielle, de consistance généralement raide, d'une épaisseur d'environ 1 m. Sous cette « croûte », les valeurs de la résistance au cisaillement de l'argile dans son état intact ont généralement varié entre 24 kPa et 50 kPa. Ces valeurs sont indicatives d'une argile de consistance généralement ferme.

En se basant sur la relation proposée par Leroueil et al<sup>1</sup>, la pression de préconsolidation ( $\sigma'_p$ ) peut être estimée en fonction de la résistance au cisaillement ( $c_u$ ) et de l'indice de plasticité ( $I_p$ ). À partir des résultats obtenus dans le forage F-1, l'écart de préconsolidation ( $\sigma'_p - \sigma'_{vo}$ ) serait de l'ordre de 50 kPa. Ainsi, le dépôt d'argile est légèrement surconsolidé.

<sup>1</sup> Leroueil, S., Tavenas, F., Le Bihan, J.-P. « *Propriétés caractéristiques des argiles de l'est du Canada* », Revue canadienne de géotechnique, vol. 20, n° 4, novembre 1983, p. 681 à 705.

### **3.1.5 Till**

Un dépôt de till a été rencontré dans le forage F-1 à partir d'une profondeur de 32,0 m, soit du niveau -8,00 m. L'épaisseur du dépôt à cet endroit est supérieure à 5,18 m.

Des échantillons représentatifs du dépôt ont été soumis à 2 analyses granulométriques par tamisage et lavage au tamis de 80 µm et à une analyse granulométrique par sédimentométrie. Les résultats sont présentés sous forme graphique à la figure 2 de l'annexe 3.

Les résultats de ces analyses granulométriques indiquent que la composition de la matrice (particules < 35 µm) de ce dépôt est, dans la partie supérieure, celle d'un silt et argile avec des traces de sable et de gravier (ML), alors que plus en profondeur, elle est celle d'un sable silteux avec des traces de gravier et d'argile (SM).

La présence de cailloux et de blocs n'a pas été observée dans le dépôt de till lors de l'exécution du forage. Toutefois, compte tenu de l'origine glaciaire du dépôt de till, il est probable que des cailloux et des blocs soient présents ailleurs dans le dépôt.

La valeur de l'indice « N » a été mesurée à 2 occasions dans le dépôt. Dans la partie supérieure du dépôt une valeur de 29 a été enregistrée, alors que plus en profondeur une valeur de 138 et un refus à l'enfoncement ont été notés. Ces données témoignent de la compacité moyenne à très dense du dépôt.

## **3.2 EAU SOUTERRAINE**

Les observations de l'eau souterraine ont été faites dans le piézomètre hydraulique de type Casagrande du forage F-1 et les tubes d'observation installés dans les trous des forages F-2, F-3 et F-6. Le tableau 5 indique les niveaux d'eau enregistrés le 1<sup>er</sup> février 2009.



**TABLEAU 5**  
**NIVEAU DE L'EAU SOUTERRAINE (2009-02-01)**

FORAGE N°	INSTRUMENT	PROFONDEUR (M)	NIVEAU (M)
F-1	Piézomètre	8,97	15,03
F-2	Tube ouvert	1,36	22,21
F-3	Tube ouvert	1,66	21,87
F-6	Tube ouvert	0,60	N/D

À l'examen du tableau 5, il ressort qu'il existe une différence appréciable entre le niveau d'eau mesuré dans les tubes ouverts installés dans les couches superficielles sus-jacentes au dépôt d'argile et celui mesuré dans le piézomètre installé dans le dépôt de till sous-jacent à l'argile.

Ces résultats sont indicatifs que le régime d'eau souterraine n'est pas hydrostatique, mais qu'il est plutôt soumis à l'effet d'un gradient descendant.

Il est important de souligner que le niveau de l'eau peut fluctuer et se situer à des profondeurs différentes selon les années, les saisons et les conditions climatiques (pluies abondantes, fonte des neiges, période de sécheresse, etc.).

## **4 COMMENTAIRES ET RECOMMANDATIONS**

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### **4.1 REMARQUES GÉNÉRALES**

À partir des informations tirées des 6 forages effectués au site à l'étude, le profil stratigraphique est principalement constitué d'un horizon de tourbe d'environ 1,0 à 1,5 m d'épaisseur, reposant sur un mince dépôt discontinu de sable et silt avec des traces de gravier. Au droit du forage F-1 (aérogare), la chaussée de la route existante a été traversée au-dessus de la tourbe. D'autre part, à des profondeurs comprises entre 1,1 m et 2,4 m, les 6 forages ont rencontré un épais dépôt d'argile silteuse de consistance généralement ferme. Au droit du forage F-1, ce dépôt possède une épaisseur de 29,6 m. Un dépôt de till, d'épaisseur supérieure à 5,2 m, a été rencontré, dans le forage F-1, à partir de la profondeur de 32,0 m, soit du niveau -8,0 m.

Le 1<sup>er</sup> février 2009, le niveau de la nappe perchée se situait à des profondeurs comprises entre 0,6 m et 1,7 m sous la surface du terrain. D'autre part, le niveau de l'eau mesuré au forage F-1 dans le piézomètre installé dans le dépôt de till sous-jacent l'argile, se situait à environ 9,0 m de profondeur. Ces résultats indiquent que le régime d'eau souterraine n'est pas hydrostatique, mais qu'il est plutôt soumis à l'effet d'un gradient descendant.

Selon les informations transmises par Dessau, le projet comporte 3 volets différents, soit :

- une aérogare;
- des services municipaux (égouts et aqueduc);
- des stationnements en bordure de l'aérogare.

Afin de faciliter la lecture du rapport, la section 4.2 traite de l'aérogare, la section 4.3 de la mise en place des conduites, alors que la section 4.4 est consacrée aux recommandations pour la structure de la chaussée des stationnements.

## **4.2 NOUVELLE AÉROGARE**

### **4.2.1 Remarques générales**

Selon les informations transmises le 12 février 2009 par les architectes Régis Côté & Associés, l'aérogare projetée consiste en un édifice d'environ 15 m sur 40 m, comportant un seul étage au niveau du rez-de-chaussée. À cette étape du projet, les charges transmises aux fondations ne sont pas encore connues.

### **4.2.2 Préparation du site**

Dans un premier temps, le remblai routier et la couche de tourbe devront être excavés complètement sous toute la superficie occupée par l'édifice projeté et ceci jusqu'à la surface du dépôt naturel de sable et silt sous-jacent.

Au droit des forages F-2 et F-3, le 1<sup>er</sup> février 2009, le niveau de l'eau a été rencontré à des profondeurs de 1,4 m et 1,7 m, soit dans l'horizon de tourbe ou à la surface de l'argile. À ce propos, le drainage constitue un élément crucial dans les opérations de préparation du site. Pour ce faire, un système de drainage efficace, pouvant consister par exemple en des fossés périphériques, devra être prévu afin de maintenir à sec la surface de travail et rabattre le niveau de l'eau jusqu'à la surface du dépôt d'argile. De plus, une couronne devra être maintenue sur la surface décapée, afin de faciliter l'écoulement des eaux vers les fossés.

Suite à l'excavation des matériaux impropres à la construction, le niveau du terrain pourra être rehaussé jusqu'à son niveau final prévu à l'aide de matériaux granulaires de remblai mis en place en couches d'une épaisseur d'au plus 300 mm et compactés au moins à 95 % du Proctor modifié. Ces matériaux doivent consister en des matériaux de type MG 20 ou MG 112.

Toutefois, compte tenu du faible écart de préconsolidation dans le dépôt d'argile silteuse, **il est primordial que le niveau supérieur du remblai soit tel que le niveau final de la dalle sur sol de l'édifice ne soit pas supérieur au niveau**



géodésique 24,50 m, afin de ne pas induire de contraintes additionnelles dans le dépôt d'argile qui pourraient occasionner des tassements de consolidation importants. Ces tassements pourraient alors être préjudiciables au bon comportement des fondations de l'édifice.

#### **4.2.3 Catégorie d'emplacement du site en fonction de la réponse sismique**

La catégorie d'emplacement en fonction de la réponse sismique doit être déterminée selon les critères du tableau 4.1.8.4 du *Code national du bâtiment – Canada 2005*. En tenant compte des critères indiqués à ce tableau, le site peut être classé de catégorie « E ».

#### **4.2.4 Fondations**

##### **4.2.4.1 Protection contre le gel**

Toutes les fondations exposées à l'action du gel devront être enfouies à une profondeur minimale de 2,3 m sous la surface finie du sol afin de les protéger contre les effets néfastes du gel. Néanmoins, les fondations exposées aux effets du gel peuvent être implantées moins profondément que 2,3 m dans la mesure où elles sont protégées à l'aide d'un isolant thermique comme du polystyrène. Pour la conception d'un tel isolant, il est suggéré de se référer aux recommandations du chapitre 15 du *Manuel canadien d'ingénierie des fondations* (seconde édition, 1994), en utilisant une valeur de l'indice moyen de gel de 2 200 °C/jours.

##### **4.2.4.2 Capacité portante nette admissible**

Aucun empattement ne doit être implanté sur les matériaux de remblai ou sur l'horizon de tourbe sous-jacent. Ainsi, tel que mentionné à la section 4.2.2, ces matériaux doivent être excavés complètement jusqu'au niveau supérieur du dépôt naturel de sable et silt observé dans le forage F-1.

Le dépôt naturel de sable et silt rencontré dans le forage est susceptible au remaniement. En conséquence, afin de prévenir le remaniement du fond de l'excavation, il est recommandé que le godet de la rétrocaveuse soit muni d'une plaque au lieu de dents.

Les empattements de l'édifice projeté pourront prendre appui directement sur le dépôt naturel de sable et silt. Une contrainte nette admissible de 40 kPa pourra être utilisée pour la conception d'empattements carrés ou continus implantés à une profondeur de 2,3 m sous le niveau du sol.

Toutefois, puisque cette valeur risque de ne pas être suffisante, il est recommandé de construire les empattements dans le remblai de matériaux granulaires compactés tel que décrit à la section 4.2.2 du rapport. À cet effet, le dessus de l'empattement devra être implanté à un niveau égal ou supérieur à 23,00 m, soit à une profondeur de 1 m ou moins sous la surface finie du site.

Les fondations implantées dans le remblai de matériaux granulaires compactés au moins à 95 % du Proctor modifié pourront être dimensionnées en utilisant les valeurs de capacité portante nette admissible indiquées au tableau 6.

**TABLEAU 6**  
**CAPACITÉ PORTANTE NETTE ADMISSIBLE**

LARGEUR DE L'EMPATTEMENT T B (m)	CONTRAINTES NETTES ADMISSIBLES (kPa)	
	Empattements continus	Empattements carrés
0,6	200	-
0,9	140	200
1,2	110	200
1,5	100	180
2,0	-	130
2,6	-	100



La contrainte nette admissible d'un sol est la contrainte que peut subir ce sol en excès du poids actuel des terres. La valeur de contrainte nette admissible incorpore un facteur de sécurité minimal de 3 contre un risque de rupture et admet des tassements maximums inférieurs à 25 mm.

D'autre part, pour éviter un poinçonnement éventuel des sols et pour tenir compte des défauts d'excentricité des charges, les empattements continus doivent avoir une largeur d'au moins 0,6 m et les empattements carrés ou rectangulaires, des côtés d'au moins 0,9 m.

#### **4.2.5 Dalle sur sol**

La dalle sur sol pourra reposer directement sur le remblai de matériaux MG 20 ou MG 112 mis en place et compactés tel que recommandé à la section 4.2.2 du rapport. Il est important de rappeler que le dessus de la dalle sur sol ne devra pas être supérieur au niveau géodésique 24,50 m.

#### **4.2.6 Pentes d'excavation**

Il est recommandé que les pentes des excavations temporaires requises pour la mise en place des fondations respectent les exigences du *Code de sécurité pour les travaux de construction* (2001, S-21, r.6) de la CSST. Puisqu'il s'agit de pentes d'excavation temporaires, leur stabilité ainsi que la sécurité des travailleurs, des ouvrages à construire et des structures existantes sont sous l'entière responsabilité de l'entrepreneur.

À titre indicatif, il est suggéré que des inclinaisons de 1 V : 1,5 H soient utilisées par le concepteur à des fins de calcul de volume, dans la mesure où le niveau de l'eau est rabattu jusqu'au niveau supérieur du dépôt d'argile et contrôlé.

Il est important de souligner que les pentes d'excavation mentionnées sont destinées à l'usage du concepteur uniquement, pour les calculs de volumes et d'estimation des coûts de construction.

Les parois des excavations doivent être vérifiées régulièrement afin de détecter tout élément susceptible de s'en détacher et constituer un danger pour les travailleurs. De plus, la circulation des véhicules et équipements ainsi que la mise en tas de matériaux excavés, doivent être évités sur une distance en crête des talus au moins égale à la profondeur des excavations.

#### **4.2.7 Remblayage autour des murs de fondation**

Il est recommandé que le remblayage des excavations pour les fondations à l'intérieur du périmètre du bâtiment projeté soit effectué à l'aide de matériaux MG 20 ou MG 112. Ces matériaux doivent être mis en place en couches d'une épaisseur d'au plus 300 mm et être compactés au moins à 90 % du Proctor modifié.

Le remblayage de chaque côté des murs de fondation devra être fait simultanément.

### **4.3 SERVICES MUNICIPAUX**

#### **4.3.1 Remarques générales**

Selon les renseignements fournis par Dessau, des conduites d'égout et d'aqueduc seront mises en place entre l'aérogare et le réseau municipal de la rue Smokey Hill, soit sur une distance d'environ 600 m. À cette étape du projet, aucune donnée n'est disponible quant à la profondeur des conduites. Pour fin de rédaction, l'hypothèse que le radier de la conduite la plus profonde soit situé à environ 3,0 m de profondeur a été posée.

#### **4.3.2 Assèchement des excavations**

Le 1<sup>er</sup> février 2009, le niveau de l'eau souterraine mesuré dans les forages se situait entre 0,6 m et 1,7 m sous la surface du sol. Ainsi, d'une façon générale, le niveau de l'eau sera rencontré par les excavations requises pour atteindre le niveau d'implantation des conduites.

À ce propos, l'assèchement des excavations constitue un élément important dans les opérations de préparation du site. Pour ce faire, un système de pompage efficace, adapté à la stratigraphie des lieux (tourbe et dépôt de sable) et aux conditions prévalant au moment des travaux, devra être prévu afin de maintenir à sec la surface de travail. D'autre part, compte tenu de la faible perméabilité du dépôt d'argile silteuse, les infiltrations d'eau dans les excavations devraient toutefois être négligeables dans ce dépôt.

#### **4.3.3 Pentes d'excavation**

Les excavations requises pour la mise en place des conduites pourrait atteindre des profondeurs maximum de l'ordre de 3,3 m. Ainsi, les excavations seront effectuées principalement dans la tourbe, le dépôt de sable et silt et dans celui d'argile silteuse de consistance généralement molle à ferme.

Il est recommandé que les pentes des excavations temporaires requises pour la mise en place des conduites respectent les exigences du « *Code de sécurité pour les travaux de construction (2001, S-21, r.6)* » de la CSST. En effet, compte tenu que la méthode de travail qui sera utilisée est présentement inconnue et qu'il s'agit d'excavations temporaires, la stabilité des pentes et la sécurité des travailleurs, des ouvrages à construire ainsi que des structures existantes sont sous l'entière responsabilité de l'entrepreneur.

À titre indicatif, dans la tourbe et le dépôt naturel de sable et silt, les pentes pourraient être profilées avec une inclinaison de 1 V : 1,5 H dans la mesure où le niveau de l'eau souterraine est rabattu jusqu'à la surface du dépôt d'argile silteuse, tel que recommandé à la section 4.2.2. Dans le dépôt d'argile silteuse, les pentes pourraient être profilées quasi verticalement.

Ces pentes d'excavation sont données à titre indicatif uniquement pour guider la conception des excavations temporaires, notamment pour le calcul des volumes d'excavation et l'évaluation des coûts de construction. Elles sont valables pour des



conditions à court terme, c'est-à-dire pour une excavation devant rester ouverte pour une période d'au plus 2 à 3 jours.

**Dans le cas où l'entrepreneur désire utiliser des pentes plus abruptes que celles recommandées par la CSST, une attestation de la part d'un ingénieur, membre de l'OIQ, est requise. Celui-ci devra statuer sur la stabilité des pentes proposées en fonction de la méthode de travail de l'entrepreneur et des conditions prévalant au moment des travaux.**

Toutefois, compte tenu que la méthode de travail qui sera utilisée est présentement inconnue et qu'il s'agit d'une excavation temporaire, la stabilité de celle-ci et la sécurité des travailleurs, des ouvrages à construire et, le cas échéant, des structures existantes à proximité, sont sous l'entière responsabilité de l'entrepreneur.

Il est possible que l'inclinaison des pentes doive être adoucie suite à l'apparition de fissures en surface ou de tout autre signe d'instabilité. Les parois des excavations devront donc être inspectées régulièrement afin de déceler tout élément susceptible de s'en détacher et constituer un danger pour les travailleurs. De plus, la circulation de véhicules et équipements ainsi que la mise en tas de matériaux excavés doivent être évitées en bordure de l'excavation et ce, sur une distance de la crête au moins égale à la profondeur de l'excavation.

#### **4.3.4 Mise en place des conduites**

Les matériaux utilisés pour l'assise et l'enrobage des conduites, ainsi que la mise en place de ceux-ci, doivent respecter les exigences de la norme BNQ 1809-300/2004 intitulée *Travaux de construction – Clauses techniques générales – Conduites d'eau potable et d'égout*.

#### **4.3.5 Remblayage des tranchées**

Si le tracé des conduites se situe complètement hors de l'emprise de la route d'accès, les tassements n'auront pas d'incidence. Ainsi, la tranchée pourra être remblayée en vrac avec les matériaux d'excavation.

Par contre, aux endroits où la conduite se situe sous une chaussée, les matériaux devront être compactés.

Seuls les sols granulaires provenant des excavations, notamment du dépôt de sable et silt, pourront être utilisés pour le remblayage jusqu'au niveau de la ligne d'infrastructure de la rue.

Cependant, dans le cas de ces matériaux, leur compactage adéquat pourrait s'avérer difficile, sinon impossible lorsque ces matériaux sont saturés. Le cas échéant, un assèchement du matériau peut s'avérer nécessaire.

D'autre part, les matériaux excavés du dépôt d'argile silteuse ne pourront pas être réutilisés pour le remblayage des tranchées, puisqu'en général, la teneur en eau est trop élevée pour permettre une mise en place adéquate. En effet, pour pouvoir être réutilisés, la teneur en eau devrait être telle que l'indice de liquidité de l'argile silteuse soit inférieur à 0,4. Or, en général, l'indice de liquidité varie entre 0,7 et 2,3, ce qui rend ce matériau inutilisable.

Ainsi, un matériau d'emprunt ordinaire (matériau compactable dépourvu de sol organique), devra être utilisé. Ces matériaux devront être mis en place en couches d'une épaisseur maximale de 300 mm et être compactés au moins à 90 % du Proctor modifié.

#### **4.3.6 Transitions**

Dans le cas où les matériaux de remblai seraient de géativité différente par rapport au sol encaissant, il est recommandé d'aménager des transitions longitudinales et transversales dans les tranchées sous les chaussées pour minimiser les effets de

soulèvements différentiels dus au gel. Les transitions pourront être conçues selon les normes du ministère des Transports du Québec (MTQ), telles que contenues dans le *Recueil des normes pour ouvrages routiers* du MTQ, « Tome II – Construction routière ».

#### 4.4 CHAUSSEE DES STATIONNEMENTS

La structure de chaussée proposée est présentée au tableau 7. L'hypothèse a été posée que le stationnement revêtu d'enrobé bitumineux dans un avenir assez rapproché. Cette structure tient compte, d'une part, de l'indice normal de gel et de l'expérience acquise dans le nord du Québec en relation avec la pénétration admissible du gel sous la ligne de l'infrastructure et, d'autre part, de la nature des sols d'assise au niveau de l'infrastructure et de la circulation anticipée sur la chaussée.

**TABLEAU 7**  
**STRUCTURE DE CHAUSSEE PROPOSEE**

ÉLÉMENT DE CHAUSSEE	MATÉRIAU	ÉPAISSEUR (mm)
Revêtement :		
• couche de roulement	EC-10 (bitume PG 52-40)	30
• couche de base	ESG-14 (bitume PG 52-40)	55
Fondation supérieure	MG 20	200
Sous-fondation	MG 112	1 100
<b>ÉPAISSEUR TOTALE :</b>		<b>1 385</b>

L'épaisseur totale de la structure de chaussée formée de matériaux non-gélifs, soit 1 385 mm, satisfait aux critères de protection partielle contre le gel recommandés par le ministère des Transports du Québec (MTQ) pour une chaussée construite sur une infrastructure gélive et située dans une région où l'indice de gel normal est de plus de 1 700 °C-jours, comme à Waskaganish.



Toutefois, il est reconnu que les sols argileux dont l'indice de liquidité est supérieur à 0,9, comme ceux présents sur le projet, sont susceptibles d'être déstructurés lorsque soumis pour la première fois aux cycles de gel et dégel. Ces sols subissent des pertes élevées de capacité de support, ce qui entraîne aussi des tassements.

À cet effet, il est recommandé que le revêtement ne soit mis en place que 3 à 5 ans après la construction du stationnement.

Dans le cas contraire, la chaussée devrait être construite avec une pleine protection contre le gel, ce qui comporterait une épaisseur de matériaux non gélifs de l'ordre de 3 à 4 m.

Les sols sous la ligne d'infrastructure doivent être scellés à l'aide d'un rouleau lisse de capacité suffisante.

Les matériaux de la fondation (MG 20) et de la sous-fondation (MG 112) doivent satisfaire aux exigences de la norme NQ 2560-114/2002. Il est à noter que les spécifications de la partie II de ladite norme s'appliquent après le transport, la mise en œuvre et le compactage des granulats, conformément aux exigences du *Cahier des charges et devis généraux* (CCDG). Ces matériaux doivent être mis en place en couches d'une épaisseur maximale de 300 mm. Les matériaux MG 20 doivent être compactés au moins à 98 % du Proctor modifié (CANBNQ 2501-255) alors que les matériaux de la sous-fondation doivent être compactés au moins à 90 % du Proctor modifié sauf pour la couche supérieure de 150 mm d'épaisseur qui doit être compactée au moins à 95 % du Proctor modifié.

Les enrobés bitumineux doivent respecter les exigences de la norme 4202 du MTQ. Les bitumes doivent être conformes à la norme 4101 du MTQ.

La mise en place des matériaux des chaussées doit être conforme aux normes et exigences du MTQ, telles que contenues dans le *Cahier des charges et devis généraux* (CCDG).

Des transitions avec les chaussées existantes doivent être aménagées pour atténuer les comportements différentiels.

## 5 VALIDITÉ DES RECOMMANDATIONS

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Les conditions de sol décrites dans le présent rapport ont été déterminées à l'emplacement exact des forages seulement. Les conditions entre les forages ou en périphérie des forages peuvent varier et toute interpolation ou extrapolation des résultats pourrait s'avérer inappropriée.

Toute modification au projet ou aux conditions de terrain rencontrées en cours d'exécution des travaux et ayant des conséquences d'un point de vue géotechnique doit être signalée à Qualitas, afin que des révisions, modifications ou confirmations des recommandations de rapport puissent être réévaluées et confirmées ou modifiées par écrit.

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# **ANNEXE 1**

## **PORTÉE DE L'ÉTUDE**

## PORTÉE DE L'ÉTUDE

### **1. UTILISATION DU RAPPORT**

**A. Modifications au projet :** les données factuelles, les interprétations et les recommandations contenues dans ce rapport ont trait au projet spécifique tel que décrit dans le rapport et ne s'appliquent à aucun autre projet ni autre site. Si le projet est modifié du point de vue conception, dimensionnement, emplacement ou niveau, Groupe Qualitas inc. devra être consultée de façon à confirmer que les recommandations déjà données demeurent valides et applicables.

**B. Nombre de sondages :** les recommandations données dans ce rapport n'ont pour but que de servir de guide à l'ingénieur en conception. Le nombre de sondages pour déterminer toutes les conditions souterraines qui peuvent affecter les travaux de construction (coûts, techniques, matériel, échancier), devrait normalement être plus élevé que celui pour les besoins du dimensionnement. Les entrepreneurs qui soumissionnent ou qui sous-traitent le travail, devraient compter sur leurs propres études ainsi que sur leurs propres interprétations des résultats factuels des sondages, pour apprécier de quelle façon les conditions souterraines peuvent affecter leur travail.

### **2. RAPPORTS DE SONDAGE ET INTERPRÉTATION DES CONDITIONS SOUTERRAINES**

**A. Description des sols et du roc :** les descriptions des sols et du roc données dans ce rapport proviennent de méthodes de classification et d'identification communément acceptées et utilisées dans la pratique de la géotechnique. La classification et l'identification du sol et du roc font appel à un jugement. Ces descriptions peuvent être différentes de celles que ferait un autre géotechnicien possédant des connaissances similaires des règles de l'art en géotechnique.

**B. Conditions des sols et du roc à l'emplacement des sondages :** les rapports de sondage ne fournissent que des conditions du sous-sol à l'emplacement des sondages seulement. Les limites entre les différentes couches sur les rapports de sondage sont souvent approximatives, correspondant plutôt à des zones de transition, et ont donc fait l'objet d'une interprétation. La précision avec laquelle les conditions souterraines sont indiquées, dépend de la méthode de sondage, de la fréquence et de la méthode d'échantillonnage ainsi que de l'uniformité du terrain rencontré. L'espacement entre les sondages, la fréquence d'échantillonnage et le type de sondage sont également le reflet de considérations budgétaires et d'échancier qui sont hors du contrôle de Groupe Qualitas inc..

**C. Conditions des sols et du roc entre les sondages :** les formations de sol et de roc sont variables sur une plus ou moins grande étendue. Les conditions souterraines entre les sondages peuvent varier par rapport aux conditions rencontrées à l'endroit des sondages. Toute interprétation des conditions présentées entre les sondages comporte des risques. Ces interprétations peuvent conduire à la découverte de conditions différentes de celles qui étaient prévues. Groupe Qualitas inc. ne peut être tenu responsable de la découverte de conditions de sol et de roc différentes de celles décrites ailleurs qu'à l'endroit des sondages effectués.

**D. Niveaux de l'eau souterraine :** les niveaux de l'eau souterraine donnés dans ce rapport correspondent seulement à ceux observés à l'endroit et à la date indiqués dans le rapport. Ces conditions peuvent varier de façon saisonnière ou suite à des travaux de construction sur le site ou sur des sites adjacents. Ces variations sont hors du contrôle de Groupe Qualitas inc..

### **3. SUIVI DE L'ÉTUDE ET DES TRAVAUX**

**A. Vérification en phase finale :** tous les détails de conception et de construction ne sont pas connus au moment de l'émission du rapport. Il est donc recommandé que les services de Groupe Qualitas inc. soient retenus pour apporter toute la lumière sur les conséquences que pourraient avoir les travaux de construction sur l'ouvrage final.

**B. Inspection durant l'exécution :** il est recommandé que les services de Groupe Qualitas inc. soient retenus pendant la construction, pour vérifier et confirmer d'une part que les conditions souterraines sur toute l'étendue du site ne diffèrent pas de celles données dans le rapport et d'autre part, que les travaux de construction n'aient pas un effet défavorable sur les conditions du site.

### **4. CHANGEMENT DES CONDITIONS :** les conditions de sol décrites dans ce rapport sont celles observées au moment de l'étude. À moins d'indication contraire, ces conditions forment la base des recommandations du rapport. Les conditions de sol peuvent être modifiées de façon significative par les travaux de construction (trafic, excavation, etc.) sur le site ou sur les sites adjacents. Une excavation peut exposer les sols à des changements dus à l'humidité, au séchage ou au gel. Sauf indication contraire, le sol doit être protégé de ces changements ou remaniements pendant la construction.

Lorsque les conditions rencontrées sur le site diffèrent de façon significative de celles prévues dans ce rapport, dues à la nature hétérogène du sous-sol ou encore à des travaux de construction, il est du ressort du client et de l'utilisateur de ce rapport de prévenir Groupe Qualitas inc. des changements et de fournir à Groupe Qualitas inc. l'opportunité de réviser les recommandations de ce rapport. Reconnaître un changement des conditions de sol demande une certaine expérience. Il est donc recommandé qu'un ingénieur géotechnicien expérimenté soit dépêché sur le site afin de vérifier si les conditions ont changé de façon importante.

### **5. DRAINAGE :** le drainage de l'eau souterraine est souvent requis aussi bien pour des installations temporaires que permanentes du projet. Une conception ou exécution impropre du drainage peut avoir de sérieuses conséquences. Groupe Qualitas inc. ne peut en aucun cas prendre la responsabilité des effets du drainage à moins que Groupe Qualitas inc. ne soit spécifiquement impliqué dans la conception détaillée et le suivi des travaux de construction du système de drainage.

### **6. CONDITIONS ENVIRONNEMENTALES :** dans certains cas, les terrains sur lesquels Groupe Qualitas inc. effectue des reconnaissances peuvent avoir subi des déversements de contaminants ou encore la nappe phréatique peut contenir des polluants provenant d'un site à l'extérieur des terrains à étudier. De telles conditions requièrent une étude de caractérisation environnementale. La présente étude géotechnique n'a pas été effectuée en fonction d'une telle étude. Il convient de souligner que les lois et les règlements relatifs à l'environnement peuvent avoir des effets importants sur la viabilité, l'orientation et les coûts d'un projet. Ces lois et règlements sont susceptibles d'amendement et devront être vérifiés et pris en compte au moment de la conception et la préparation du projet.

# **ANNEXE 2**

## **RAPPORTS DE FORAGE**



# NOTES EXPLICATIVES

## RAPPORT DE SONDAGE

(page 1 de 2)

Un rapport de sondage permet de résumer la stratigraphie des sols et du roc, leurs propriétés ainsi que les conditions d'eau souterraine. Cette note a pour but d'expliquer la terminologie, les symboles et abréviations utilisés.

### COUPE STRATIGRAPHIQUE

#### 1. PROFONDEUR – NIVEAU

La profondeur et le niveau des différents contacts stratigraphiques sont donnés par rapport à la surface du terrain à l'endroit des sondages au moment de leur exécution. Les niveaux sont indiqués en fonction d'un système indiqué dans l'entête du rapport de sondage.

#### 2. DESCRIPTION DES SOLS

Les sols sont décrits selon leur nature et leurs propriétés géotechniques.

Les dimensions des particules constituant un sol sont les suivantes :

NOM	DIMENSION (mm)
Argile	< 0,002
Silt	0,002 - 0,08
Sable	0,08 - 5
Gravier	5 - 80
Caillou	80 - 300
Bloc	> 300

La proportion des divers éléments de sol, définis selon la dimension des particules, est donnée d'après la terminologie descriptive suivante :

TERMINOLOGIE DESCRIPTIVE	PROPORTION DE PARTICULES (%)
Traces	1 - 10
Un peu	10 - 20
Adjectif (ex. : sableux, silteux)	20 - 35
Et (ex. : sable et gravier)	> 35

#### 2.1 COMPACITÉ DES SOLS PULVÉRULENTS

La compacité des sols pulvérulents est évaluée à l'aide de l'indice de pénétration « N » obtenu par l'essai de pénétration standard :

COMPACITÉ	INDICE DE PÉNÉTRATION « N » (coups / 300 mm)
Très lâche	< 4
Lâche	4 - 10
Compacte ou moyenne	10 - 30
Dense	30 - 50
Très dense	> 50

#### 2.2 CONSISTANCE ET PLASTICITÉ DES SOLS COHÉRENTS

La consistance des sols cohérents est évaluée à partir de la résistance au cisaillement. La résistance au cisaillement non drainé de l'argile intacte ( $c_u$ ) et de l'argile remaniée ( $c_r$ ) est mesurée en chantier ou en laboratoire.

CONSISTANCE	RÉSISTANCE AU CISAILEMENT, $c_u$ (kPa)
Très molle	< 12
Molle	12 - 25
Ferme	25 - 50
Raide	50 - 100
Très raide	100 - 200
Dure	> 200

PLASTICITÉ	LIMITE DE LIQUIDITÉ, $W_L$ (%)
Faible	< 30
Moyenne	30 - 50
Élevée	> 50

#### 3. DESCRIPTION DU ROC

Le roc est décrit en fonction de sa nature géologique, de ses caractéristiques structurales et de ses propriétés mécaniques.

L'indice de qualité du roc (RQD) est obtenu par la sommation des longueurs de carotte égales ou supérieures à 100 mm par rapport à la course du carottier de calibre NX ou NQ dans le roc. Le résultat s'exprime en pourcentage :

CLASSIFICATION	INDICE DE QUALITÉ RQD (%)
Très mauvaise qualité	< 25
Mauvaise qualité	25 - 50
Qualité moyenne	50 - 75
Bonne qualité	75 - 90
Excellente qualité	90 - 100

JOINTS	ESPACEMENT MOYEN (mm)
Très rapprochés	0 - 60
Rapprochés	60 - 200
Moyennement espacés	200 - 600
Espacés	600 - 2000
Très espacés	> 2000

RÉSISTANCE	RÉSISTANCE À LA COMPRESSION SIMPLE, $q_u$ (MPa)
Extrêmement faible	< 1
Très faible	1 - 5
Faible	5 - 25
Moyennement forte	25 - 50
Forte	50 - 100
Très forte	100 - 250
Extrêmement forte	> 250

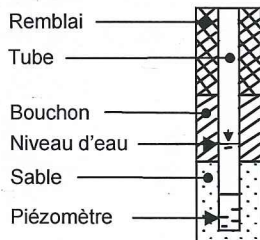
## NOTES EXPLICATIVES

### RAPPORT DE SONDAGE

(page 2 de 2)

#### NIVEAU D'EAU

La colonne « Niveau d'eau » indique le niveau de l'eau souterraine mesuré dans un tube d'observation, un piézomètre, un puits d'observation ou directement dans un sondage. La date du relevé est également indiquée dans cette colonne. Le croquis ci-contre illustre les différents symboles utilisés.



#### ÉCHANTILLONS

##### 1. TYPE ET NUMÉRO

La colonne « Type et numéro » correspond à la numérotation de l'échantillon. Il comprend deux lettres identifiant le type d'échantillonnage, suivi d'un chiffre séquentiel. Les types d'échantillonnage sont les suivants :

CF : Carottier fendu	EL : Lavage
CG : Carottier grand diamètre	ET : Tarière
TM : Tube à paroi mince	VR : Vrac (puits)
CR : Carottier diamanté	

##### 2. ÉTAT

La profondeur, la longueur et l'état de chaque échantillon sont indiqués dans cette colonne. Les symboles suivants illustrent l'état de l'échantillon :



##### 3. RÉCUPÉRATION

La récupération de l'échantillon correspond à la longueur récupérée de l'échantillon par rapport à la longueur de l'enfoncement de l'échantillonneur, exprimée en pourcentage.

#### ESSAIS IN SITU ET EN LABORATOIRE

Les résultats des essais effectués en chantier et en laboratoire sont indiqués dans les colonnes « Essais in situ et en laboratoire » à la profondeur correspondante.

La liste d'abréviations suivante sert à identifier ces essais.

#### ABRÉVIATIONS

A	Absorption, L/min-m (essai d'eau sous pression)
AC	Analyses chimiques
C	Essai de consolidation
C <sub>c</sub>	Coefficient de courbure
C <sub>u</sub>	Coefficient d'uniformité
c <sub>u</sub>	Résistance au cisaillement à l'état intact, mesurée au scissomètre de chantier, kPa
c <sub>r</sub>	Résistance au cisaillement à l'état remanié, mesurée au scissomètre de chantier, kPa
c <sub>us</sub>	Résistance au cisaillement à l'état intact, mesurée au pénétromètre à cône (cône suédois), kPa
c <sub>rs</sub>	Résistance au cisaillement à l'état remanié, mesurée au pénétromètre à cône (cône suédois), kPa
c <sub>up</sub>	Résistance au cisaillement à l'état intact, mesurée au scissomètre portatif, kPa
c <sub>rp</sub>	Résistance au cisaillement à l'état remanié, mesurée au scissomètre portatif, kPa
D <sub>r</sub>	Densité relative des particules solides
E <sub>M</sub>	Module pressiométrique, kPa ou MPa
G	Analyse granulométrique par tamisage et lavage
I <sub>L</sub>	Indice de liquidité
I <sub>p</sub>	Indice de plasticité, %
k <sub>c</sub>	Coefficient de perméabilité (conductivité hydraulique) mesuré en chantier, m/s
k <sub>L</sub>	Coefficient de perméabilité (conductivité hydraulique) mesuré en laboratoire, m/s
N <sub>dc</sub>	Indice de pénétration (essai de pénétration dynamique au cône, DCPT)
N	Indice de pénétration (essai de pénétration standard, SPT)
P <sub>80</sub>	Analyse granulométrique par lavage au tamis 80 µm
P <sub>L</sub>	Pression limite de l'essai pressiométrique, kPa
P <sub>r</sub>	Essai Proctor
PV	Poids volumique, kN/m <sup>3</sup>
PV'	Poids volumique déjaugé, kN/m <sup>3</sup>
q <sub>c</sub>	Résistance de pointe, kPa (essai de pénétration statique portatif au cône, CPT)
q <sub>u</sub>	Résistance à la compression simple de la roche, MPa
S	Analyse granulométrique par sédimentométrie
S <sub>t</sub>	Sensibilité (c <sub>u</sub> /c <sub>r</sub> )
w	Teneur en eau, %
w <sub>L</sub>	Limite de liquidité, %
w <sub>p</sub>	Limite de plasticité, %



CLIENT : Dessau inc.

PROJET : Réaménagement de l'aérogare / Airport Expansion

ENDROIT : Waskaganish, Québec / Waskaganish, Quebec

DOSSIER : 1931-P

**FORAGE: F-1**

DATE: 2009-01-26 au 2009-01-29

COUPE STRATIGRAPHIQUE			ÉCHANTILLONS			ESSAIS IN-SITU ET EN LABORATOIRE												
PROFONDEUR (m)	NIVEAU (m) GÉODÉSIQUE	DESCRIPTION	NIVEAU D'EAU 2009-02-01	TYPE ET NUMERO	ÉTAT	RÉCUPÉRATION (%)	N ou RQD (%)	LIMITES DE CONSISTANCE				AUTRES ESSAIS	● N <sub>dc</sub> (coups/300 mm) ▲ c <sub>u</sub> (kPa) △ c <sub>r</sub> (kPa) ▼ c <sub>us</sub> (kPa) ◆ c <sub>up</sub> (kPa) ▽ c <sub>rs</sub> (kPa) ◇ c <sub>rp</sub> (kPa)					
								w <sub>p</sub> (%)	w <sub>L</sub> (%)	w (%)			20	40	60	80	20	40
1.20	22.80	<b>STRUCTURE DE CHAUSSÉE / PAVEMENT</b>  <b>TOURBE</b> et morceaux de bois (PT) / <b>PEAT MOSS</b> and wood debris (PT).  <b>SABLE</b> et silt, traces de gravier (SM). Compacité moyenne. / Compact <b>SAND</b> and silt, traces of gravel (SM).  <b>ARGILE SILTEUSE</b> de plasticité faible (CL). Présence d'une « croûte » superficielle de consistance raide jusqu'à une profondeur d'environ 3,5 m. Consistance molle à ferme par la suite. / Low plasticity <b>SILTY CLAY</b> (CL). Presence of a "crust" of stiff consistency to a depth of approximately 3.5 m; clay of soft to firm consistency afterwards.																
1.83	22.17		CF-1	✕	71	-												
2.44	21.56		CF-2	✕	17	16												
			CF-3	✕	79	6												
				CF-4	✕	71	5											
				CF-5	✕	75	-											
				CF-6	✕	100	-											
				CF-7	✕	100	-											
												</						

REMARQUES: Le 26 janvier, le sol était gelé jusqu'à une profondeur de 1,7 m / On January 26, soil was frozen to a depth of 1.7 m.  
R : refus à l'enfoncement du carottier fendu / Refusal to the penetration of the split spoon sampler.

MÉTHODE DE FORAGE: Rotation simultanée de tubes NW et d'un trépan à molettes; scissomètre Nilcon / Simultaneous rotation of NW casing and of a tricone; Nilcon vane.

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PROJET : Réaménagement de l'aérogare / Airport Expansion

ENDROIT : Waskaganish, Québec / Waskaganish, Quebec

DOSSIER : 1931-P

**FORAGE: F-1**

DATE: 2009-01-26 au 2009-01-29

COUPE STRATIGRAPHIQUE		NIVEAU D'EAU 2009-02-01	ÉCHANTILLONS		ESSAIS IN-SITU ET EN LABORATOIRE			
PROFONDEUR (m)	NIVEAU (m) GÉODÉSIQUE		TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou RQD (%)	LIMITES DE CONSISTANCE $w_p$ (%) $w_L$ (%) $w$ (%)	AUTRES ESSAIS
	9.00							
16.0			CF-8	⊗	100	-	31	<ul style="list-style-type: none"> <li>● <math>N_{dc}</math> (coups/300 mm)</li> <li>▲ <math>c_u</math> (kPa)</li> <li>△ <math>c_r</math> (kPa)</li> <li>▼ <math>c_{us}</math> (kPa)</li> <li>◆ <math>c_{up}</math> (kPa)</li> <li>▽ <math>c_{rs}</math> (kPa)</li> <li>◇ <math>c_{rp}</math> (kPa)</li> </ul>
17.0								
18.0								
19.0								
20.0			CF-9	⊗	100	-		
21.0								
22.0								
23.0								
24.0								
25.0			CF-10	⊗	100	-		
26.0								
27.0								
28.0								
29.0			CF-11	⊗	100	4	34	
30.00	-6.00							

REMARQUES: Le 26 janvier, le sol était gelé jusqu'à une profondeur de 1,7 m / On January 26, soil was frozen to a depth of 1.7 m.  
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MÉTHODE DE FORAGE: Rotation simultanée de tubes NW et d'un trépan à molettes; scissomètre Nilcon / Simultaneous rotation of NW casing and of a tricone; Nilcon vane.



CLIENT : Dessau inc.

PROJET : Réaménagement de l'aérogare / Airport Expansion

ENDROIT : Waskaganish, Québec / Waskaganish, Quebec

DOSSIER : 1931-P

**FORAGE: F-1**

DATE: 2009-01-26 au 2009-01-29

COUPE STRATIGRAPHIQUE			ÉCHANTILLONS				ESSAIS IN-SITU ET EN LABORATOIRE				
PROFONDEUR (m)	NIVEAU (m)	DESCRIPTION	NIVEAU D'EAU 2009-02-01	TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou RQD (%)	LIMITES DE CONSISTANCE	AUTRES ESSAIS	● N <sub>dc</sub> (coups/300 mm)    ▲ C <sub>u</sub> (kPa) △ C <sub>r</sub> (kPa)    ▼ C <sub>us</sub> (kPa) ◆ C <sub>up</sub> (kPa) ▽ C <sub>rs</sub> (kPa) ◇ C <sub>rp</sub> (kPa)	
	GÉODÉSIQUE							W <sub>p</sub> (%)    W <sub>L</sub> (%) W (%)			20   40   60   80
	-6.00										
31		<b>ARGILE SILTEUSE / SILTY CLAY .</b>  <b>TILL</b> : silt et argile, traces de sable et de gravier (ML), devenant, vers une profondeur d'environ 34 m, un sable silteux avec des traces de gravier et d'argile (SM). Compacité moyenne à très dense. / Compact to very dense silt and clay, traces of sand and gravel (ML). Towards a depth of about 34 m, the deposit becomes a silty sand, traces of gravel and clay (SM).									
32	32.00		-8.00								
33											
34				CF-12	⊗	100	29		G		
35				CF-13	⊗	25	R				
36											
37	37.18	-13.18		CF-14	⊗	92	138		G		
38		Fin du forage / End of borehole.									
39											
40											
41											
42											
43											
44											

REMARQUES: Le 26 janvier, le sol était gelé jusqu'à une profondeur de 1,7 m / On January 26, soil was frozen to a depth of 1.7 m.  
 R : refus à l'enfoncement du carottier fendu / Refusal to the penetration of the split spoon sampler.

MÉTHODE DE FORAGE: Rotation simultanée de tubes NW et d'un trépan à molettes; scissomètre Nilcon / Simultaneous rotation of NW casing and of a tricone; Nilcon vane.



CLIENT : Dessau inc.

PROJET : Réaménagement de l'aérogare / Airport Expansion

ENDROIT : Waskaganish, Québec / Waskaganish, Quebec

DOSSIER : 1931-P

**FORAGE: F-2**

DATE: 2009-01-30 au 2009-01-30

COUPE STRATIGRAPHIQUE				ÉCHANTILLONS				ESSAIS IN-SITU ET EN LABORATOIRE			
PROFONDEUR (m)	NIVEAU (m)	GÉODÉSIQUE	DESCRIPTION	NIVEAU D'EAU 2009-02-01	TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou RQD (%)	LIMITES DE CONSISTANCE	AUTRES ESSAIS	<div>● N<sub>dc</sub> (coups/300 mm) ▼ C<sub>us</sub> (kPa) ▽ C<sub>rs</sub> (kPa) ▲ C<sub>u</sub> (kPa) △ C<sub>r</sub> (kPa) ◆ C<sub>up</sub> (kPa) ◇ C<sub>rp</sub> (kPa)</div>
	W <sub>p</sub> (%)								W <sub>L</sub> (%) W (%)		
1.36 1.52	22.21 22.05		TOURBE (PT) / PEAT MOSS (PT).		CF-1	⊗	63	7	34	G	
					CF-2	■	0	5			
2.13	21.44		SABLE et silt, traces de gravier (SM) / SAND and silt, traces of gravel (SM).		CF-3	⊗	50	3			
					CF-4	⊗	71	9			
3.05	20.52		ARGILE SILTEUSE de plasticité faible (CL) et de consistance raide / Low plasticity SILTY CLAY (CL) of stiff consistency.		CF-5	⊗	92	4	17 30 27		
			Fin du forage / End of borehole.								

REMARQUES:

MÉTHODE DE FORAGE: Rotation de tarières à centre évidés / Hollow stem auger drill.

CLIENT : Dessau inc.

PROJET : Réaménagement de l'aérogare / Airport Expansion

ENDROIT : Waskaganish, Québec / Waskaganish, Québec

DOSSIER : 1931-P

**FORAGE: F-3**

DATE: 2009-01-30 au 2009-01-30

COUPE STRATIGRAPHIQUE			ÉCHANTILLONS			ESSAIS IN-SITU ET EN LABORATOIRE				
PROFONDEUR (m)	NIVEAU (m)	DESCRIPTION	NIVEAU D'EAU 2009-02-01	TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou RQD (%)	LIMITES DE CONSISTANCE	AUTRES ESSAIS	<div>● N<sub>dc</sub> (coups/300 mm) ▼ C<sub>us</sub> (kPa) ▽ C<sub>rs</sub> (kPa) ▲ C<sub>u</sub> (kPa) △ C<sub>r</sub> (kPa) ◆ C<sub>up</sub> (kPa) ◇ C<sub>rp</sub> (kPa)</div>
	GÉODÉSIQUE							<div>W<sub>p</sub> (%)      W<sub>L</sub> (%)                     W (%)</div> <div>20 40 60 80</div>		
	23.53									
1.22	22.31	TOURBE (PT) / PEAT MOSS (PT).		CF-1		0	2			
1.66	21.87	ARGILE SILTEUSE de plasticité faible (CL) et de consistance raide / Low plasticity SILTY CLAY (CL) of stiff consistency.		CF-2		0	1			
2.30	20.48			CF-3		67	4			
3.05				CF-4		63	4			
3.30				CF-5		33	1			
4.00		Fin du forage / End of borehole.								
5.00										
6.00										
7.00										
8.00										
9.00										
10.00										
11.00										
12.00										
13.00										
14.00										
15.00										

REMARQUES:

MÉTHODE DE FORAGE: Rotation de tarières à centre évidés / Hollow stem auger drill.

CLIENT : Dessau inc.

PROJET : Réaménagement de l'aérogare / Airport Expansion

ENDROIT : Waskaganish, Québec / Waskaganish, Quebec

DOSSIER : 1931-P

**FORAGE: F-4**

DATE: 2009-01-31 au 2009-01-31

COUPE STRATIGRAPHIQUE			ÉCHANTILLONS			ESSAIS IN-SITU ET EN LABORATOIRE			
PROFONDEUR (m)	NIVEAU (m)	DESCRIPTION	NIVEAU D'EAU	TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou RQD (%)	LIMITES DE CONSISTANCE $w_p$ (%) $w_L$ (%) $w$ (%)	AUTRES ESSAIS
								20 40 60 80	$N_{dc}$ (coups/300 mm) $c_u$ (kPa) $c_r$ (kPa) $c_{us}$ (kPa) $c_{up}$ (kPa) $c_{rs}$ (kPa) $c_{rp}$ (kPa)
1		<b>TOURBE</b> et morceaux de bois (PT) / <b>PEAT MOSS</b> and wood debris (PT).		CF-1	X	29	14		w = 306 %
1.52				CF-2	X	8	2		w = 393 %
2		<b>ARGILE SILTEUSE</b> de plasticité faible (CL). Présence d'une « croûte » superficielle de consistance raide jusqu'à une profondeur d'environ 2,6 m, consistance ferme par la suite / Low plasticity <b>SILTY CLAY</b> (CL). Presence of a "crust" of stiff consistency to a depth of approximately 2.6 m; clay of firm consistency afterwards.		CF-3	X	50	2		
2.6				CF-4	X	75	7		
3				CF-5	X	67	-	16 28 34	▲57
4				CF-6	X	29	-	30	▲28
4.27				CF-7	X	88	-	16 26 33	▲30 ▲26
5									
6		Fin du forage / End of borehole.							
7									
8									
9									
10									
11									
12									
13									
14									
15									

REMARQUES:

MÉTHODE DE FORAGE: Rotation de tarières à centre évidés; scissomètre Nilcon / Hollow stem auger drill; Nilcon vane.



CLIENT : Dessau inc.

PROJET : Réaménagement de l'aérogare / Airport Expansion

ENDROIT : Waskaganish, Québec / Waskaganish, Quebec

DOSSIER : 1931-P

**FORAGE: F-5**

DATE: 2009-01-31 au 2009-01-31

COUPE STRATIGRAPHIQUE			ÉCHANTILLONS			ESSAIS IN-SITU ET EN LABORATOIRE			
PROFONDEUR (m)	NIVEAU (m)	DESCRIPTION	NIVEAU D'EAU	TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou RQD (%)	LIMITES DE CONSISTANCE $w_p$ (%) $w_L$ (%) $w$ (%)	AUTRES ESSAIS
								20 40 60 80	$N_{dc}$ (coups/300 mm) $c_u$ (kPa) $c_r$ (kPa) $c_{us}$ (kPa) $c_{up}$ (kPa) $c_{rs}$ (kPa) $c_{rp}$ (kPa)
1.07		<b>TOURBE (PT) / PEAT MOSS (PT).</b>		CF-1		0	1		
		<b>ARGILE SILTEUSE</b> de plasticité faible (CL). Présence d'une « croûte » superficielle de consistance raide jusqu'à une profondeur d'environ 2,6 m, consistance ferme par la suite / Low plasticity <b>SILTY CLAY</b> (CL). Presence of a "crust" of stiff consistency to a depth of approximately 2.6 m; clay of firm consistency afterwards.		CF-2		46	1		w = 479 %
				CF-3		88	6	24	
				CF-4		71	6		
				CF-5		79	-	30	42
				CF-6		67	-	1525 31	25
				CF-7		100	-		26
4.27		Fin du forage / End of borehole.							26

REMARQUES:

MÉTHODE DE FORAGE: Rotation de tarières à centre évidés; scissomètre Nilcon / Hollow stem auger drill; Nilcon vane.

CLIENT : Dessau inc.

PROJET : Réaménagement de l'aérogare / Airport Expansion

ENDROIT : Waskaganish, Québec / Waskaganish, Quebec

DOSSIER : 1931-P

**FORAGE: F-6**

DATE: 2009-01-30 au 2009-01-31

COUPE STRATIGRAPHIQUE			ÉCHANTILLONS		ESSAIS IN-SITU ET EN LABORATOIRE					
PROFONDEUR (m)	NIVEAU (m)	DESCRIPTION	NIVEAU D'EAU 2009-02-01	TYPE ET NUMÉRO	ÉTAT	RÉCUPÉRATION (%)	N ou RQD (%)	LIMITES DE CONSISTANCE	AUTRES ESSAIS	● N <sub>dc</sub> (coups/300 mm) ▲ C <sub>u</sub> (kPa) ▼ C <sub>us</sub> (kPa) ◆ C <sub>up</sub> (kPa) ▽ C <sub>rs</sub> (kPa) ◇ C <sub>rp</sub> (kPa)
								W <sub>p</sub> (%)    W <sub>L</sub> (%) W (%)		
0.60		<b>TOURBE</b> et morceaux de bois (PT) / <b>PEAT MOSS</b> and wood debris (PT).  <b>ARGILE SILTEUSE</b> de plasticité faible (CL). Présence d'une « croûte » superficielle de consistance raide jusqu'à une profondeur d'environ 2,6 m, consistance ferme par la suite / Low plasticity <b>SILTY CLAY</b> (CL). Presence of a "crust" of stiff consistency to a depth of approximately 2.6 m; clay of firm consistency afterwards.		CF-1		0	4		w = 520 %	
1.22			CF-2		8	13				
			CF-3		38	4	25			
			CF-4		67	10				
			CF-5		42	-	27			▲41
			CF-6		54	-				▲36
4.27			CF-7		63	-	1625 37			▲29 ▲28
		Fin du forage / End of borehole.								

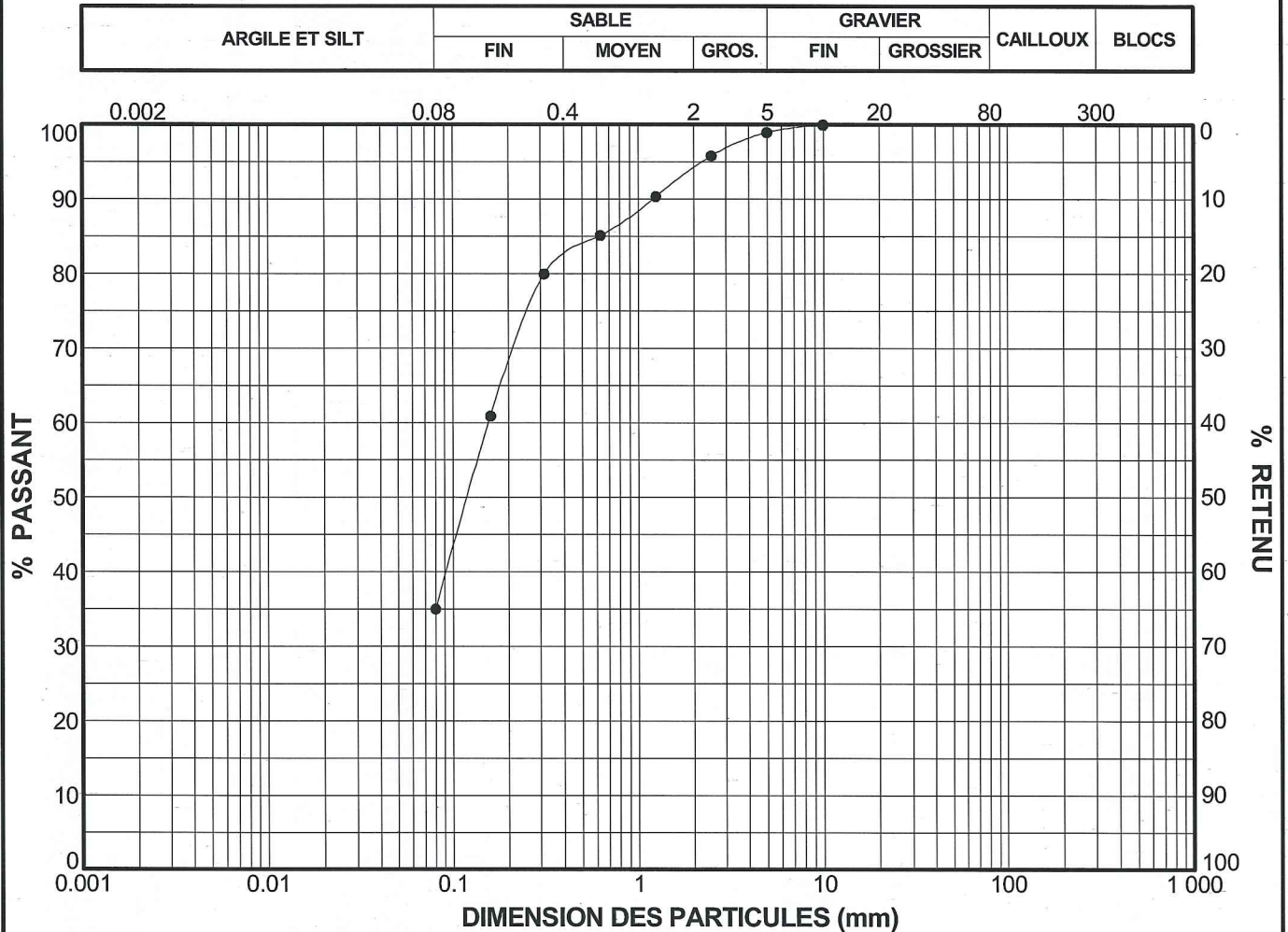
REMARQUES:

MÉTHODE DE FORAGE: Rotation de tarières à centre évidés; scissomètre Nilcon / Hollow stem auger drill; Nilcon vane.

# **ANNEXE 3**

## **ESSAIS DE LABORATOIRE**

CLIENT : Dessau inc.  
PROJET : Réaménagement de l'aérogare / Airport Expansion  
ENDROIT : Waskaganish, Québec / Waskaganish, Quebec  
DOSSIER : 1931-P



	Sondage	Éch.	Profondeur (m)	Gravier (%)	Sable (%)	Silt et argile (%)	Description
●	F-2	CF-4	1.83 à 2.44	1	64	35	Sable fin à moyen uniforme et silt, traces de gravier (SM).

REMARQUES:

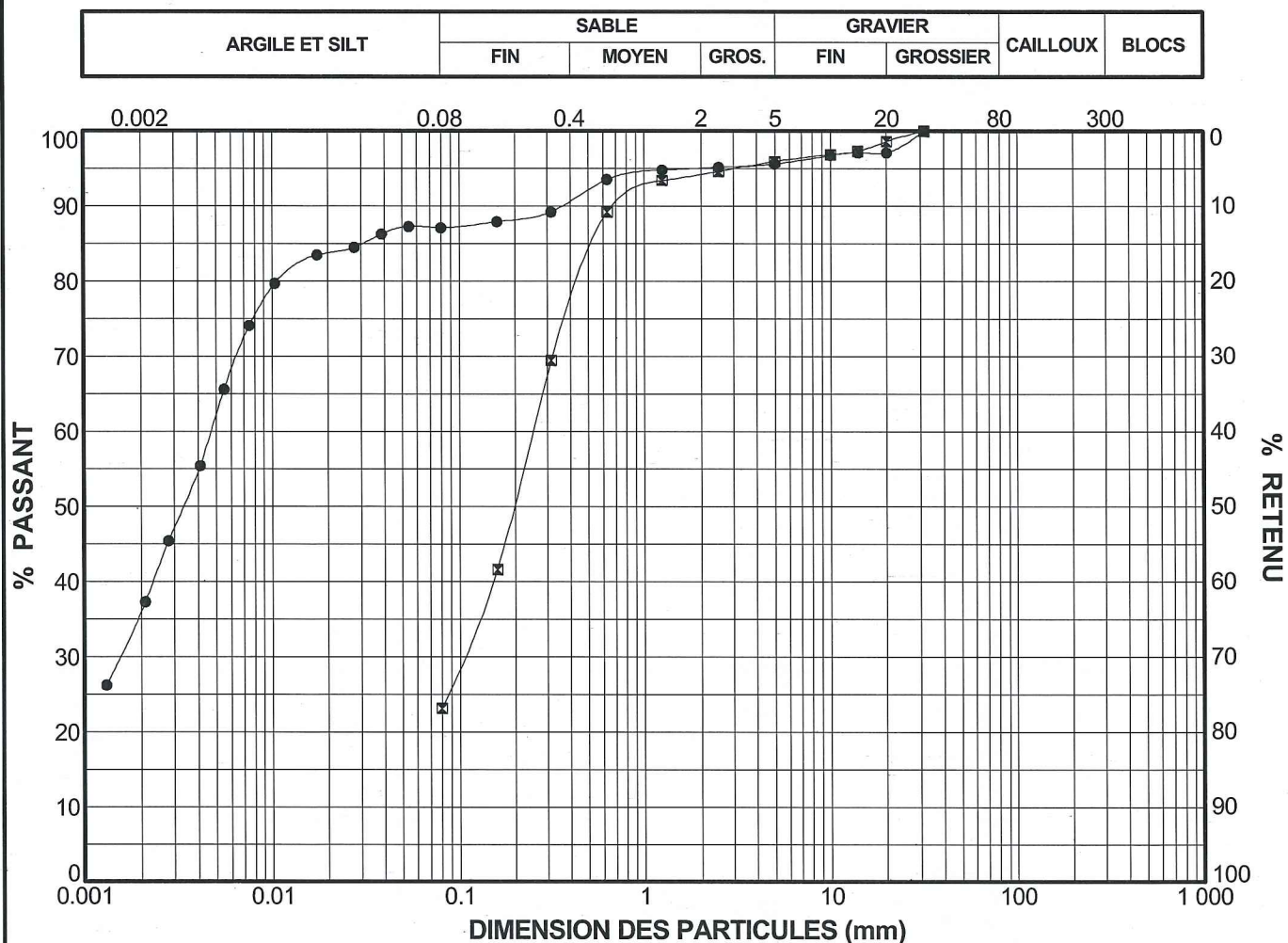


CLIENT : Dessau inc.

PROJET : Réaménagement de l'aérogare / Airport Expansion

ENDROIT : Waskaganish, Québec / Waskaganish, Quebec

DOSSIER : 1931-P

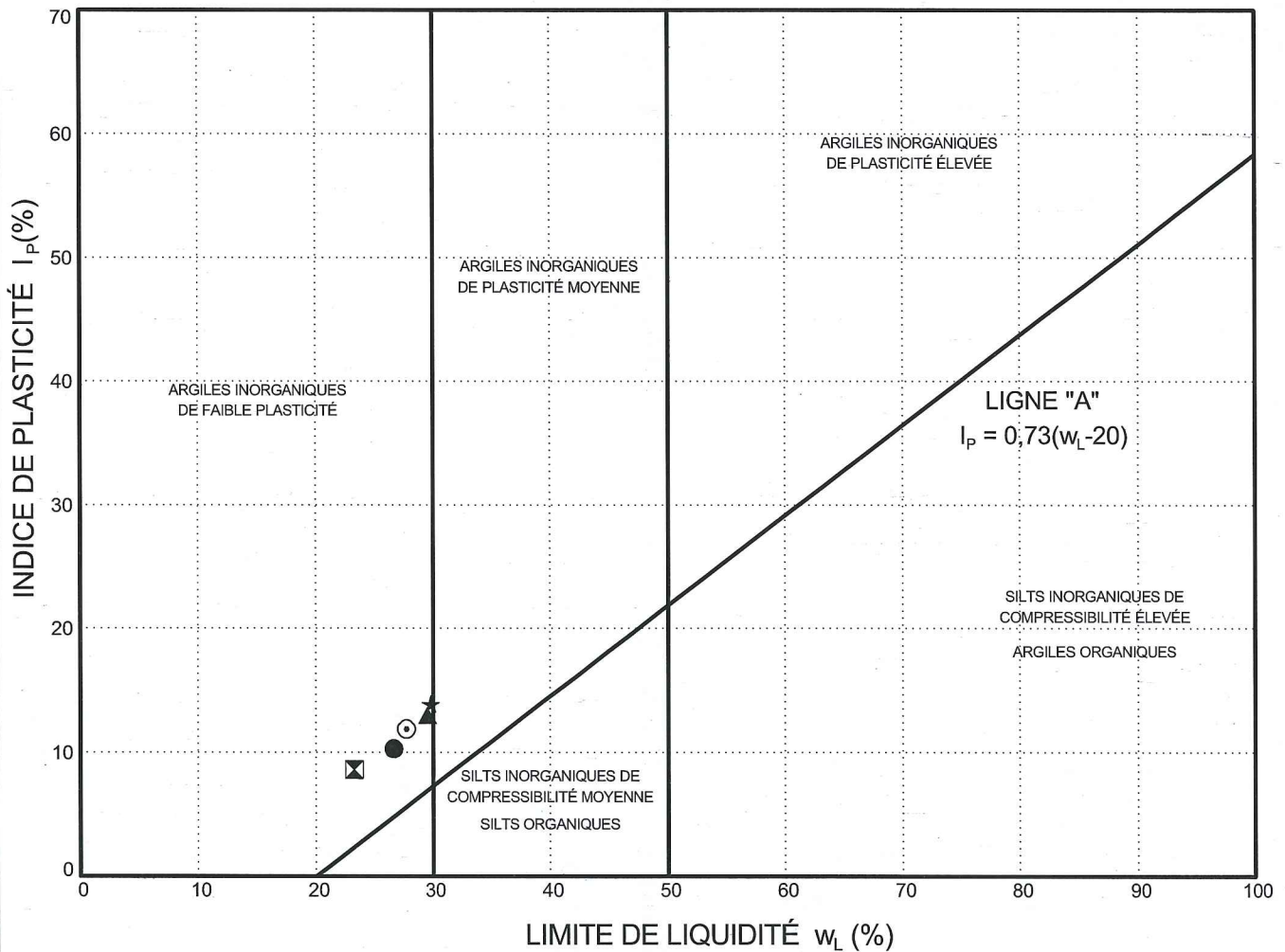


	Sondage	Éch.	Profondeur (m)	Gravier (%)	Sable (%)	Silt et argile (%)	Description
●	F-1	CF-12	33.22 à 33.83	4	9	51 36	Till : silt et argile, traces de sable et de gravier (ML).
□	F-1	CF-14	36.57 à 37.18	4	73	23	Till : sable silteux, traces de gravier (SM).

REMARQUES:



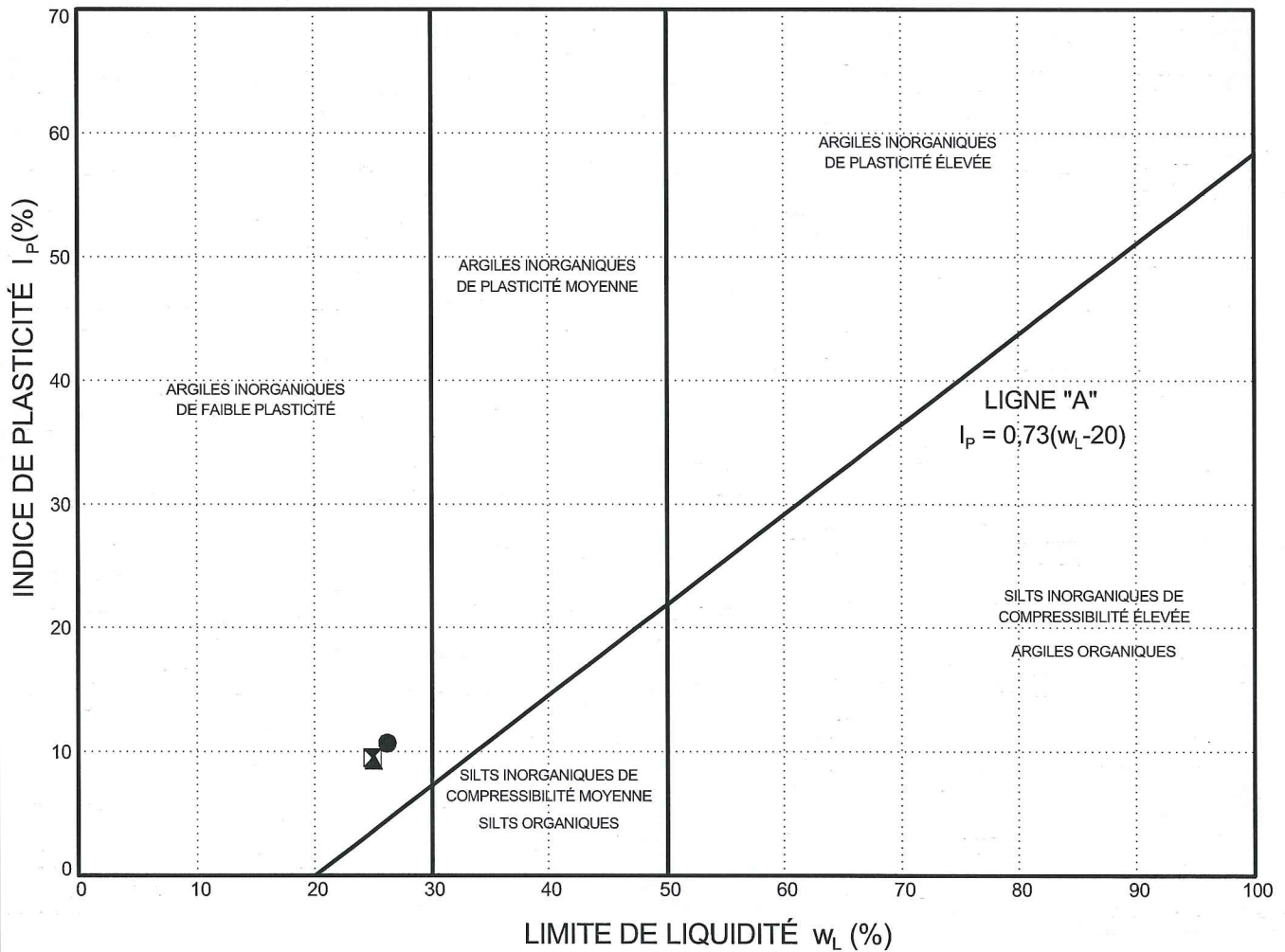
CLIENT : Dessau inc.  
PROJET : Réaménagement de l'aérogare / Airport Expansion  
ENDROIT : Waskaganish, Québec / Waskaganish, Quebec  
DOSSIER : 1931-P



	Sondage	Éch.	Prof. (m)	w (%)	$w_L$ (%)	$w_p$ (%)	$I_p$ (%)	$I_L$	DESCRIPTION
●	F-1	CF-3	2.44 à 3.05	27	27	16	10	1.0	Argile silteuse de plasticité faible (CL).
⊠	F-1	CF-6	7.32 à 7.92	31	23	15	9	1.9	Argile silteuse de plasticité faible (CL).
▲	F-2	CF-5	2.44 à 3.05	27	30	17	13	0.8	Argile silteuse de plasticité faible (CL).
★	F-3	CF-4	1.83 à 2.44	25	30	16	14	0.7	Argile silteuse de plasticité faible (CL).
⊙	F-4	CF-5	2.44 à 3.05	34	28	16	12	1.5	Argile silteuse de plasticité faible (CL).

Remarque:

CLIENT : Dessau inc.  
PROJET : Réaménagement de l'aérogare / Airport Expansion  
ENDROIT : Waskaganish, Québec / Waskaganish, Quebec  
DOSSIER : 1931-P

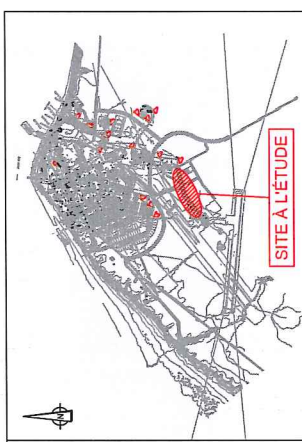
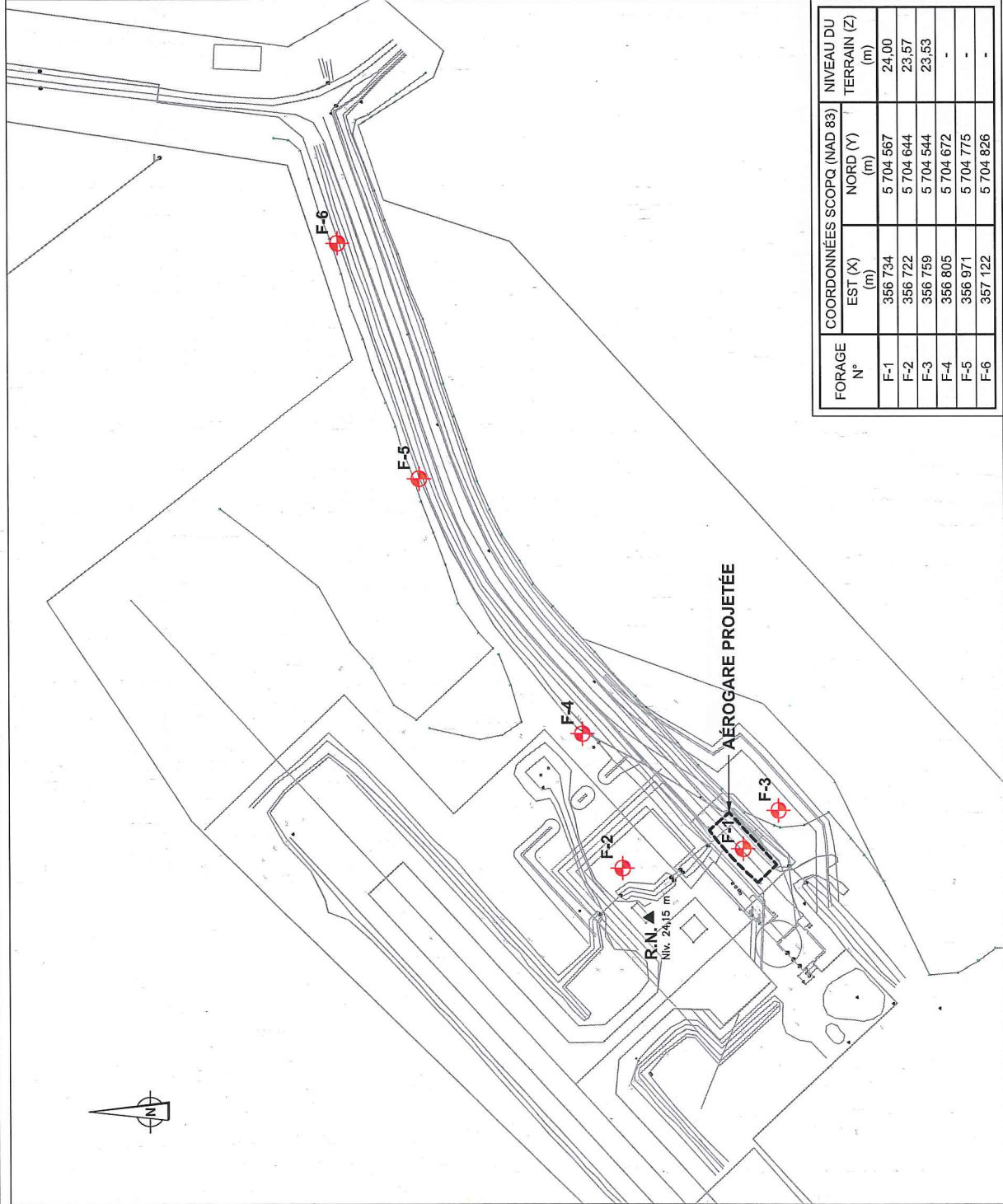


	Sondage	Éch.	Prof. (m)	w (%)	$w_L$ (%)	$w_p$ (%)	$I_p$ (%)	$I_L$	DESCRIPTION
●	F-4	CF-7	3.66 à 4.27	33	26	16	11	1.6	Argile silteuse de plasticité faible (CL).
■	F-5	CF-6	3.05 à 3.66	31	25	15	10	1.6	Argile silteuse de plasticité faible (CL).
▲	F-6	CF-7	3.66 à 4.27	37	25	16	9	2.3	Argile silteuse de plasticité faible (CL).

Remarque:

# **ANNEXE 4**

## **DESSIN - LOCALISATION DES FORAGES**



PLAN CLÉ

**LÉGENDE:**

**F-1** Forage et numéro

**R.N.** ▲  
Niv. 24,15 m  
Repère de nivellement de niveau  
géodésique 24,15 m. Coin sud-ouest  
de la dalle du réservoir



TITRE : Localisation des forages

CLIENT : Dessau Inc.

PROJET : Réaménagement de l'aérogare

ENDROIT : Waskaganish, Québec

ÉCHELLE : 0 25 50 75 100 m 1 : 2500

DATE : Février 2009  
DOSSIER : 1931-P  
DESSIN : 1 de 1  
1931-P-01 (G03535-9)

FORAGE N°	COORDONNÉES SCOPQ (NAD 83)			NIVEAU DU TERRAIN (Z) (m)
	EST (X) (m)	NORD (Y) (m)		
F-1	356 734	5 704 567		24,00
F-2	356 722	5 704 644		23,57
F-3	356 759	5 704 544		23,53
F-4	356 805	5 704 672		-
F-5	356 971	5 704 775		-
F-6	357 122	5 704 826		-

**Part 1 GENERAL**

Appendix B provides the price schedule to complete.

	Amount	Total
<b><u>Division 1 – General requirements</u></b>		
Organization of construction including costs of mobilization and demobilization of equipment.		_____ \$
Construction Management		_____ \$
Construction insurances		_____ \$
Guarantees		_____ \$
Construction/Demolition waste management and disposal		_____ \$
Final cleaning		_____ \$
Geotechnical study		_____ \$
Other (specify) _____		_____ \$
	<b>Sub-total – Division 1</b>	<b>_____ \$</b>
<b><u>Division 3 – Concrete</u></b>		
Forming	_____ \$	
Concrete reinforcing	_____ \$	
Concrete pooring	_____ \$	
Sealer and hardener for concrete floor	_____ \$	
Other (specify) _____	_____ \$	
	<b>Sub-total – Division 3</b>	<b>_____ \$</b>
<b><u>Division 5 – Metals</u></b>		
Prefabricated arched building	_____ \$	
Fabricated metals	_____ \$	
Other (specify) _____	_____ \$	
	<b>Sub-total – Division 5</b>	<b>_____ \$</b>

	Amount	Total
<b><u>Division 7 – Thermal and moisture protection</u></b>		
Sheet metal flashing and trim	_____	\$
Joint sealing	_____	\$
Other (specify) _____	_____	\$
	<b>Sub-total – Division 7</b>	_____ \$
<b><u>Division 8 – Openings</u></b>		
Doors and metal frames	_____	\$
Sectional metal doors	_____	\$
Door hardware	_____	\$
Other (specify) _____	_____	\$
	<b>Sub-total – Division 8</b>	_____ \$
<b><u>Division 15 – Mechanical</u></b>		
<b>Ventilation</b>		
Ventilation work	_____	\$
Other (specify) _____	_____	\$
	<b>Sub-total – Division 15</b>	_____ \$
<b><u>Division 16 – Electrical</u></b>		
Distribution	_____	\$
Outlets and services	_____	\$
Lighting and controls	_____	\$
Other (specify) _____	_____	\$
	<b>Sub-total – Division 16</b>	_____ \$

	Amount	Total
<b><u>Division 31 – Earthwork</u></b>		
Excavation	_____	\$
Backfill	_____	\$
Insulation of fondations	_____	\$
Autres (spécifier) _____	_____	\$
	<b>Sub-total – Division 31</b>	<b>_____ \$</b>
	Sub-total Divisions 1 to 31:	_____ \$
	Administration & profit:	_____ \$
	Total amount before taxes:	_____ \$
	GST (5 %):	_____ \$
	QST (9.975 %):	_____ \$
<b>Total amount bid:</b>		