

Projet No.: R.082975.001 phase B

**SHERBROOKE RESEARCH AND  
DEVELOPMENT CENTER**

Supply and Installation of a Bioreactor  
PWGSC: R.082975.001

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**Phase B - Specifications**

January 2019

Projet No.: R.082975.001 phase B

**SHERBROOKE RESEARCH AND DEVELOPMENT CENTER**

**2000, RUE COLLÈGE**

**SHERBROOKE (QUÉBEC)**

**J1M 0C8**

**SUPPLY AND INSTALLATION OF A BIOREACTOR – PHASE B**

**PWGSC : R.082975.001**

**DIVISIONS**

**Divisions 01, 06 to 09, 23, 31 to 33, 40, A and D**

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**For tender  
JANUARY 2019**

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*ARCH: Architectural, CONT: Control, instrumentation and alarms, ELEC: Electrical, GEN: General, INFRA: Infrastructural, MEC: Mechanical, PLB : plumbing, STR :Structural.				

## .2 Drawing list

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R082975.001-Title page	TITLE PAGE	NA
R.082975.001-A01-	LEVEL 1 PLAN	SYLVAIN POMERLEAU, ARCHIT
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R.082975.001-S02-DT	DÉTAILS STRUCTURES DE BÉTON	MARC-ANDRÉ LABBÉ, ING.

## .3 Annex document list

Numéro de document	Titre du document
TPSGC rapport VF 20180803 VF Notarius	Geotechnical report
2018-08-14 Executive Summary bioreactor	Geotechnical report summary
	Shop drawing, flare and biogas blower
	Shop drawing, bioreactor
	Shop drawing, hybrid boiler
	Shop drawing, biogas cooling field
Liste équipements.V2	Equipment list

**Partie 2 Products****2.1 NOT USED****Partie 3 Execution****3.1 NOT USED****END OF SECTION**

**Part 1            General****1.1                RELATED REQUIREMENTS**

- .1            Division 01, 06 to 08, 23, 31 to 33, 40, A and D.

**1.2                DEFINITIONS**

- .1            Owner or client: Agriculture and Agri-Food Canada (AAFC).
- .2            Consultant or engineer: Project manager WSP or person assigned by the project manager.
- .3            Departmental representative or representative from the Ministry: person assigned by PWGSC to act on its behalf.

**1.3                GENERAL DESCRIPTION OF THE PROJECT**

This description is for information purposes only, refer to specifications sections and drawings for the description of the work to be carried out.

- .1            Agriculture and Agri-food Canada (AAFC) is conducting research activities on biogas production. The research team is primarily developing low-temperature biological processes for the agricultural sector. AAFC researchers have several laboratory bioreactors to conduct their research. Their goal is to acquire a large-scale bioreactor to demonstrate their technology and to test new techniques and technologies under development.
- .2            The main objective of the bioreactor project is to convert manure from the research centre and from external food residues into biogas and odourless fertilizers. The main steps of the process are described below:
  - .1            Pig manure from the pre-pit basin is transferred to the mixing pit via a valve system and the existing pump, while the solid manure will be routed through a loader and trailer. Food residues will be delivered on site by truck and then introduced into the mixing pit by loader.
  - .2            The inputs are mixed and reheated in the mixing pit and made homogeneous using a mud pump operating in a closed loop to obtain the appropriate particle size.
  - .3            The volume and dryness of the mixture are monitored and adjusted by an operator.
  - .4            The bioreactor is fed in batches of 1 to 14 days. At the end of each batch, the mixed manure is pumped from the mixing pit to the bioreactor at the required level.
  - .5            The bioreactor has an overflow that redirects the contents to the existing liquid storage pit or a portable tanker.
  - .6            During the production process, the biogas is amassed in a gas holder installed on the bioreactor. An air and ferric chloride system is used to control the H<sub>2</sub>S content.

- .7 A blower pressurizes then the biogas which is directed to a field of cooling and drying of biogas. The biogas is then directed to the hybrid boiler or to the flare in case of emergency

#### 1.4 SEQUENCE OF THE PROJECT

- .1 This project will be carried out in two phases, namely phase "A" and phase "B", this estimate covers the requirements for phase "B" only.
- .2 The contract for phase "A" is already awarded and is limited to the following elements:
  - .1 Phase "A" includes the purchase and delivery of the following five (5) equipment:
    - .1 Bioreactor;
    - .2 Gas holder (installed on the bioreactor);
    - .3 Flare;
    - .4 Unit for the treatment of hydrogen sulphide and moisture (to be installed in the bioreactor);
    - .5 Hybrid boiler.
  - .2 Phase "A" also includes the installation of the bioreactor and gas holder including their foundations.
- .3 Phase "B" includes the detailed design, purchase of additional equipment and the installation and connections of all equipment required to permit the operation of the bioreactor as described in section 1.3 and in the requirements of the Biogas process (section 40 00 000). Phase "B" includes:
  - .1 The detailed design of the following elements without limitation:
    - .1 Detailed implementation plan for the installation;
    - .2 Concrete construction:
      - .1 Foundations of the control building and auxiliary equipment (flare, condenser, H<sub>2</sub>S scrubber, etc.);
      - .2 Mixing pit with hydraulic cover;
      - .3 Input handling slab.
    - .3 Regular and emergency electrical fittings and distribution.
    - .4 Process piping systems (slurry, organic matter, etc.), biogas, domestic water, glycol water, etc.
    - .5 Control of equipment, programming of PLC and operator interface.
  - .2 The fittings and commissioning of the bioreactor and gas holder.
  - .3 Installation, fittings, and commissioning of the following components:
    - .1 Flare (provided in phase "A").
    - .2 Equipment for the purification of hydrogen sulphide and dehumidification of biogas (provided in phase "A").
    - .3 Hybrid boiler (provided in phase "A").
    - .4 Any other equipment provided in phase "A" and necessary for the operation of the process.

- .4 The purchase, installation, fittings, and commissioning of the following components:
  - .1 Milling equipment and pumping of the mixing pit.
  - .2 Piping system for slurry, fresh and digested organic matter.
  - .3 Glycol heating piping system.
  - .4 Domestic water piping system;
  - .5 Natural gas piping system;
  - .6 Biogas piping system.
  - .7 Condenser (dry cooler).
  - .8 Control building, mixing pit and bases for all equipment.
  - .9 Any other concrete work.
  - .10 Electrical equipment for regular and emergency power.
  - .11 All instruments required to process control.
  - .12 All automates and operational interfaces required for process control.
  - .13 Any auxiliary equipment necessary for the operation of the bioreactor.
  - .14 Connection to all services and processes.
- .5 The following infrastructure works:
  - .1 Excavation, filling and finishing;
  - .2 Fencing;
  - .3 Trenches between the various equipment;
  - .4 Finishing the access paths.
- .6 Pre-operation verification of all components installed and of all commissioning of equipment without biogas production (water and air/nitrogen).
- .7 Partial assistance to AAFC researchers in the process's escalation.

## **1.5 PROJECT LOCATION AND PRODUCT DELIVERY**

- .1 Agriculture and Agri-food Canada, 2000 rue Collège, Sherbrooke, Quebec.
- .2 The installation work will be carried out at this address south of the G-aisle of the #07 Building (porcine complex).

## **1.6 WORK PERFORMED BY THIRD PARTIES**

- .1 Work to be carried out by pre-selected Contractors or manufacturers.
- .2 Several items purchased by the Departmental Representative during phase A will have to be installed and started by pre-selected manufacturers. For each of these items include in the proposal the amount specified in the price list provided with the administrative documents.
- .3 Elements which must be turned on by pre-selected manufacturers:
  - .1 Boiler commissioning.
  - .2 Commissioning of the flare including the blower.
  - .3 Commissioning of the H<sub>2</sub>S treatment and cooling system of the biogas cooling field.

- .4 Gas holder commissioning.
- .5 Commissioning of the bioreactor including:
  - .1 Priming.
  - .2 Control and instrumentation.
  - .3 Start-up of all auxiliary equipment.
- .4 Work in collaboration with other Contractors and carry out the Consultant's instructions.
- .5 Coordinate work with those of other Contractors. If the performance or outcome of any part of the work covered by this contract depend on the work of another Contractor, report without delay, in writing, to the Consultant, any anomaly or defect likely to harm the good execution of the work.

### **1.7 WORK TO COME**

- .1 The project is designed for the installation of all components described in this scope and more, advise the Consultant and the Departmental Representative of any conflict between the installed products and the proposed design provided in the layout plan of site showing the elements planned for the project and projected for future projects.
- .2 Measures must be taken to allow the future construction of a manure pit as indicated in the layout plans.
- .3 Avoid encroaching on areas required for future developments identified in the layout plans.

### **1.8 WORK SEQUENCE**

- .1 Perform the work in stages to accommodate the Owner's operations during construction.
- .2 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
- .3 Maintain fire access/control.

### **1.9 USE BY CONTRACTOR OF MONITORING FACILITIES**

- .1 Use of the construction site without restriction until substantial completion of work.
- .2 Coordinate the use of the premises under the direction of the Departmental Representative.
- .3 Obtain and pay for the use of additional storage or work areas required for operations under this contract.
- .4 Find additional work or storage areas necessary for the performance of the work under this contract and pay the cost.
- .5 Repair or replace, as directed by the Consultant, for connection to the existing, adjacent work, or for harmonization purposes, the parts of the existing work which have been modified during the construction work.
- .6 Once the work has been completed, the existing work shall be equivalent to or greater than the state it presented before the beginning of work.

**1.10 OWNER'S OCCUPANCY**

- .1 The owner will occupy the surrounding buildings and continue operations around the existing manure tank throughout the construction period.
- .2 Work with the owner in the operational planning to minimize conflicts and facilitate use by the Owner.

**1.11 ITEMS PROVIDED**

- .1 Contractor's responsibilities:
  - .1 The contractor and its subcontractors are responsible for all purchases required for the completion of the project including phases "A" and "B".
  - .2 Make the necessary arrangements for the delivery of workshop drawings, product data sheets, samples, manufacturer's instructions and certificates to Client.
  - .3 Transmit the supplier's list of materials to the Consultant.
  - .4 Arrange and pay for delivery to the site in accordance with the established timetable.
  - .5 Inspect deliveries along with the Consultant, as requested.
  - .6 Submit claims for transport damages.
  - .7 Arrange for the replacement of damaged, defective or missing items.
  - .8 Arrange for the manufacturer's field services. Make the necessary arrangements and provide the manufacturer's guarantees and bonds to the Consultant.
  - .9 Designate bids and delivery date for each product ongoing.
  - .10 Review workshop drawings, product data sheets, samples and other documents. Submit to the Consultant a notice of anomalies or problems found due to non-compliance with contractual documents.
  - .11 Receive and unload the products on site.
  - .12 Inspect deliveries in along with the Owner; Record shortages and damaged or defective items.
  - .13 Handle, unpack and store products on site.
  - .14 Protect the products from damage and exposure to the elements.
  - .15 Assemble, install, connect, adjust and finish the products when required.
  - .16 Carry out the installation inspections required by public authorities.
  - .17 Repair or replace items damaged by the subcontractor at site (under its control).
  - .18 The Contractor shall provide shelter for breaks and meals of its employees and a place to consult the reference planes upon mobilization on site and until completion of start-up.
  - .19 Provide and maintain sanitary facilities available to the Contractor's staff and its subcontractors.

**1.12 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

- .1 Execute work with least possible interference or disturbance to occupants, building operations, public and normal use of premises. Arrange with the Client to facilitate execution of work.

**1.13 EXISTING SERVICES**

- .1 Advise the Departmental Representative and public service utilities of the planned interruption of services and obtain the required permission.
- .2 When the work involves drilling, or connecting to existing services, give a 48 hour notice to the Departmental Representative for the necessary disruption of mechanical or electrical service during the work. Minimize the duration of interruptions. Carry out the work as directed by the competent authorities by disturbing as little as possible pedestrians, vehicles and tenants.
- .3 Provide other routes for movement of personnel, pedestrians and vehicles.
- .4 Provide temporary power supply (via generator or other) necessary for the completion of work until the temporary electrical panel is connected as required in section D5000.
- .5 Establish the location and scope of service lines in the work area before beginning work.
- .6 Submit the schedule and obtain approval from the Departmental Representative for any cut-off or closure of the active service or facility, including power and communication services. Respect the approved timetable and provide a notice to the parties concerned.
- .7 Provide temporary services when requested by the Departmental Representative or the Consultant to maintain the essential systems of the building and operations.
- .8 Provide an adequate bridge over the trenches that cross the sidewalks or roads to allow normal circulation.
- .9 When unknown services are encountered, immediately notify the consultant and confirm the findings in writing.
- .10 Protect, move or maintain existing active services. When inactive services are encountered, seal or end in a manner approved by the competent authorities.
- .11 Record the locations of maintained, rerouted and abandoned service lines.

**1.14 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy of each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addendum.
  - .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            Divisions 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2                ACCESS AND EGRESS**

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

**1.3                USE OF SITE AND FACILITIES**

- .1            Execute work with least possible interference or disturbance to normal use of premises. Decide with the Departmental Representative to facilitate work as stated.
- .2            Maintain existing services to building and provide for personnel and vehicle access.
- .3            Where security is reduced by work provide temporary means to maintain security of property and persons.
- .4            Protect the structures by temporary means until permanent closures are completed.

**1.4                ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

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

**1.5                EXISTING SERVICES**

- .1            Notify, the 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 to the Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3            Provide for pedestrian personnel and vehicular traffic.

**1.6                SPECIAL REQUIREMENTS**

- .1            Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.
- .2            Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3            Keep within limits of work and avenues of ingress and egress.
- .4            Deliver materials outside of peak traffic hours 08:00 to 05:00 pm unless otherwise approved by the Departmental Representative.

**1.7 SECURITY**

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 For reasons of biosecurity and confidential information, access within the building #7 (porcine complex) has certain limitations:
  - .1 Any worker who must access the building shall first have completed an antecedent check as required by AAFC.
  - .2 At each entrance and exit of the building, the workers must follow the procedure of cleaning (shower) and dressing through the Danish corridor.

**1.8 BUILDING SMOKING ENVIRONMENT**

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

**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        Divisions 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2                ADMINISTRATIVE**

- .1        Schedule and administer project meetings throughout the progress of the work at the request of the Consultant.
- .2        Contractor's representative, subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.
- .3        Provide physical space and decide for meetings.

**1.3                PRECONSTRUCTION MEETING**

- .1        Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2        The Departmental Representative, Contractor, major subcontractors, field inspectors and supervisors will be in attendance.
- .3        The time will be defined following the grant and the meeting will take place on the project site.

**1.4                PROGRESS MEETINGS**

- .1        Provide, during project, on-site meetings every two weeks. Depending on needs and advancement, meetings may be by phone.
- .2        Contractor, major subcontractors involved in Work, Departmental Representative and Client are to be in attendance.

**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 Divisions 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2 DEFINITIONS**

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

**1.3 REQUIREMENTS**

- .1 Ensure master plan and detail schedules are practical and remain within specified contract duration.
- .2 Plan to complete work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that award of contract or time of beginning, rate of progress, interim certificate and final certificate as defined times of completion are of essence of this contract.

**1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Provide the required documents and samples in accordance with section 01 33 00 - Documents and samples to be submitted.
- .2 Submit project schedule to the Departmental Representative no later than five (5) working days after the first meeting following the award of the contract.

**1.5 PROJECT MILESTONES**

- .1 Project milestones are the intermediate objectives set out in the implementation schedule (all periods indicated are working days and weeks):
- .2 Project milestones form interim targets for Project (all periods are working days and weeks):
  - .1 Submit detail engineering plans for comments (99%) no later than four (4) weeks after the award of the contract.
  - .2 Submit revised detail engineering plans (100%) no later than one (1 week after receipt of comments).
  - .3 Submit the required workshop drawings in section 01 33 00 no later than five (5) weeks after the award of the contract.
  - .4 The mobilization of the construction site must be completed 30 days after date of contract award.
  - .5 The excavation of the mixing pit and base of the building shall be completed no later 45 days after date of contract award.
  - .6 The provisional certificate of completion (substantial completion) of the work shall be issued no later than 100 days after date of contract award.
  - .7 Pre-operating verifications and start-up without organic matter must be completed 110 days after date of award.

**1.6 MASTER PLAN**

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 The Departmental Representative will review and return to Contractor the revised schedules within 5 working days.
- .3 If the calendar is found to be unworkable, revise the schedule and re-submit it no later than five (5) business days after receipt.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

**1.7 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.

- .3 Permits.
- .4 Mobilization.
- .5 Excavation.
- .6 Slab on grade.
- .7 Backfill.
- .8 Building footings.
- .9 Interior Architecture (Walls, Floors and Ceiling).
- .10 Plumbing.
- .11 Lighting.
- .12 Electrical.
- .13 Piping.
- .14 Controls.
- .15 Heating, Ventilating, and Air Conditioning.
- .16 Testing and Commissioning.
- .17 Supplied equipment long delivery items.

## **1.8 PROJECT SCHEDULE REPORTING**

- .1 Update the implementation schedule prior to meetings so that it reflects the changes to activities, the completion of activities, and the activities being implemented.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

## **1.9 PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

## **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       Divisions 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2           ADMINISTRATIVE**

- .1       Submit to the Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension because of such default will be allowed.
- .2       Do not proceed with Work that requires submittal of documents and samples 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 the documents and samples before handing them over to the Departmental Representative. Through this pre-verification, the contractor confirms that the requirements for the work have been or will be determined and verified, and that each of the documents and samples submitted has been reviewed and found to conform to the requirements of the work and Contractual Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6       Notify to the Departmental Representative, in writing at time the documents and sample are submitted, deviations from requirements of Contract Documents stating reasons for deviations.
- .7       Verify field measurements and affected adjacent Work are co-ordinated.
- .8       The fact that the documents and samples submitted are reviewed by the Departmental Representative does not in any way relieve the Contractor from the responsibility of transmitting complete and accurate exhibits.
- .9       The fact that the documents and samples submitted are reviewed by the Departmental Representative does not in any way relieve the Contractor from the responsibility of transmitting parts that comply with the requirements of the Contract Documents.
- .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 Canada.

- .3 Workshop drawings shall indicate the materials to be used and the methods of construction, fixation or anchorage to be employed, and shall contain the wiring diagrams, connections details, the relevant explanatory notes and any other information necessary for the execution of the work. Where works or elements are connected or linked to other works or other elements, indicate on the drawings that there was coordination of the prescriptions, irrespective of the section under which the adjacent works or elements will be provided and installed. Make references to the quotation and draft drawings.
- .4 Allow 8 days to the Departmental Representative to review each submission.
- .5 Adjustments made on shop drawings by the Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as the Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify the Departmental Representative in writing of revisions other than those requested.
- .7 Documents submitted must be accompanied by a letter of transmittal containing the following information:
  - .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 Materials and fabrication details.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Characteristics such as power, flow or capacity;
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.

- .9 Single line and schematic diagrams.
- .10 Relationship to adjacent work.
- .9 After the Departmental Representative's review, distribute copies.
- .10 Submit one electronic copy of shop drawings for each requirement requested in specification Sections and as the Departmental Representative may reasonably request.
- .11 If no workshop drawings are required due to the use of a standard manufacturing product, submit electronic copies of the manufacturer's technical data sheets or documentation prescribed in technical sections of the quotation and required by the Departmental Representative.
- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative:
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in 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 the Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies of operation and maintenance data as prescribed in the technical sections of specifications.
- .15 Supplement standard information to provide details applicable to project.
- .16 If upon review by the Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .17 The review of shop drawings by Public Works and Government Services Canada (PSPC) is for sole purpose of ascertaining conformance with general concept:
  - .1 This review shall not mean that PSPC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

**1.4 SAMPLES**

- .1 Notify the Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .2 Where colour, pattern or texture is criterion, submit full range of samples.
- .3 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

**1.5 DOCUMENTS TO BE SUBMITTED**

- .1 The following documents must be submitted with the retail engineering:
  - .1 STRUCTURE:
    - .1 Site implementation plan.
    - .2 Plan of the mixing pit detailing the position of all equipment and instruments.
    - .3 Plan of the input handling slab.
    - .4 Workplan of sludge and rain collection well of the handling slab and detail of the return valves to the pit and drain.
  - .2 ELECTRICITY:
    - .1 Plan of connection to the regular and emergency power panel.
    - .2 Regular 600 V electrical distribution plan.
    - .3 Emergency electrical distribution plan 600 V.
    - .4 Electrical distribution Ppan 120 V.
  - .3 INSTRUMENTATION AND CONTROL:
    - .1 Index of instruments.
    - .2 Operator interface page.
- .2 The following documents must be submitted with the workshop drawings:
  - .1 The list and deadline of the required workshop drawings will be provided during the project start-up meeting:
    - .1 ARCHITECTURE:
      - .1 Building Workshop Design.
      - .2 Technical data sheet of door and window.
      - .3 Technical data sheet of insulation
      - .4 Workshop drawing of exterior, interior and floor coatings
      - .5 Shop drawing of piping and wiring passing through control building and swine complex walls.
      - .6 Color samples for finishing elements.
    - .2 STRUCTURE:
      - .1 Concrete formulas.
      - .2 Workshop drawing of the handling slab.
      - .3 Control building workshop design.
      - .4 Drawing of slabs on floor of outdoor equipment.

- .5 Workshop drawing of the mixing pit.
- .3 INFRASTRUCTURE:
  - .1 Workshop drawing of the pig manure bypass well.
  - .2 Trench workshop design.
  - .3 Fence workshop drawing and fencing accessories.
  - .4 Shop drawings.
- .4 MECHANICAL:
  - .1 Instrumentation and piping plan (P&ID) showing the diameters of pipe, valves, instruments and equipment required by the process.
  - .2 Technical data sheet of the mud pump.
  - .3 Drawing of the biogas cooling field installation.
  - .4 Workshop drawing of manure piping.
  - .5 Workshop drawing of piping brackets.
  - .6 Plan of the door of the mixing pit;
  - .7 Technical data sheet of the hydraulic unit.
  - .8 Data sheet of mobile fire extinguishers.
- .5 MECHANICAL HVAC:
  - .1 Heating and ventilation equipment.
  - .2 Technical data sheet of condenser.
  - .3 Technical data sheet for the glycol filling unit.
  - .4 Plan of the glycol water heating system.
- .6 ELECTRICITY:
  - .1 Plan for the establishment of the airline.
  - .2 Lighting items.
- .7 INSTRUMENTATION AND CONTROL:
  - .1 Index of instruments.
  - .2 Design of the alarm and intrusion alert system workshop.
  - .3 List of alarms.
  - .4 Plan of panels.
  - .5 Panel input/output list.
  - .6 Control sequence.
  - .7 Operator interface.

<b>Part 2</b>	<b>Products</b>
<b>2.1</b>	<b>NOT USED</b>
.1	Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

**Partie 1      General**

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

**1.1            RELATED REQUIREMENTS**

- .1      Divisions 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2            REFERENCES**

- .1      Province of Québec
  - .1      Loi sur la santé et la sécurité du travail L.R.Q., c. S-2.1 (Act respecting occupational health and safety).
  - .2      Code de sécurité pour les travaux de construction L.R.Q., c. S-2.1, r.4 (Safety code for the construction industry).

**1.3            DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1      Submit documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Submit to Departmental Representative, the site-specific prevention program, as outlined in the article “GENERAL REQUIREMENTS”, at least 10 days prior to the start of work.
- .3      Departmental Representative will review Contractor’s site-specific prevention program and provide comments to Contractor within 10 days after receipt of the document. Revise plan as appropriate and resubmit to Departmental Representative within 5 days after receipt of comments from Departmental Representative. Departmental Representative reserves the right not to authorize the start of work on the construction site as long as the content of the prevention program is not satisfactory. The Contractor shall then update his prevention program and resubmit it to the Departmental Representative if the scope of work changes or if the working methods of the Contractor differ from his initial plans or for any other applicable new condition.
- .4      Departmental Representative’s review of Contractor’s site-specific prevention program should not be construed as approval of the program and does not reduce the Contractor’s overall responsibility for construction Health and Safety during the work.
- .5      Submit copies of Contractor’s authorized representative’s construction site health and safety inspection reports to Departmental Representative, once a week.
- .6      Submit to Departmental Representative within 24 hours a copy of any inspection report, correction notice or recommendation issued by Federal, Provincial and Territorial health and safety inspectors.
- .7      Submit to Departmental Representative within 24 hours an investigation report for any accident involving injury and any incident exposing a potential hazard.

- .8 The investigation report shall contain at least the following:
  1. date, time and place of accident;
  2. name of sub-contractor involved in the accident;
  3. number of persons involved and condition of wounded;
  4. witness identification;
  5. detailed description of tasks performed at the time of the accident;
  6. equipment being used to accomplish the tasks performed at the time of the accident;
  7. corrective measures taken immediately after the accident;
  8. causes of the accident;
  9. preventive measures that have been put in place to prevent a similar accident.
- .9 Submit to Departmental Representative WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittals. Contractor must also keep one copy of these documents on the construction site.
- .10 Medical Surveillance: where prescribed by legislation, regulation or prevention program, submit certification of medical surveillance for construction site personnel prior to commencement of Work, and submit additional certifications for any new construction site personnel to Departmental Representative.
- .11 Submit to Departmental Representative an on-site Emergency Response Plan at the same time as the prevention program. The Emergency Response plan must contain the elements listed in the article "GENERAL REQUIREMENTS" of this section.
- .12 Submit to Departmental Representative copies of all training certificates required for the application of the prevention program, in particular (if applicable) for the following:
  - .1 first aid in the workplace and cardiopulmonary resuscitation;
  - .2 work likely to release asbestos dust (mandatory for all work where asbestos is present);
  - .3 work in confined spaces (mandatory for all work in confined spaces);
  - .4 lockout-tagout procedures (mandatory for all work requiring lockout);
  - .5 safely operating forklift trucks (mandatory for all forklift usage);
  - .6 safely operating elevating work platforms (mandatory for the use of all elevating platforms);
  - .7 any other requirement of Regulations or the safety program.

In addition, the certifications of the *Cours de santé et sécurité générale pour les chantiers de construction* (General Health and Safety Training for Construction Sites) shall be available on demand on the construction site.
- .13 Engineer's plans and certificates of compliance: Contractor must submit to the Departmental Representative and to the *Commission des normes, de l'équité, de la santé et de la sécurité du travail* (CNESST) a copy signed and sealed by engineer of all plans and certificates of compliance required pursuant to the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry) or by any other legislation or regulation or by any other clause in the specifications or in the contract. The Contractor must also submit a certificate of conformity signed by an engineer once the

facility for which these plans were prepared has been completed and before a person uses the facility. A copy of these documents must be available on site always.

#### **1.4 FILING OF NOTICE OF CONSTRUCTION SITE OPENING**

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

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

- .2 The Contractor shall assume the role of being the Principal Contractor in the limits of the construction site and elsewhere where he must execute work within the framework of this project. The Contractor shall recognize the responsibility of being the Principal Contractor of the project and identify himself as such in the notice of the construction site opening he provides to the CNESST.
- .3 The Contractor shall accept to divide and identify the construction site adequately to define time and space at all times throughout the course of the project.

#### **1.5 HAZARD ASSESSMENT**

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

#### **1.6 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.
- .2 Contractor's representative with decision power must attend any meetings at which construction site safety and health issues are to be discussed.
- .3 If it is anticipated that there will be 25 workers or more on the construction site at any given time, the Contractor shall set up a worksite committee and hold meetings as required by the *Code de sécurité pour les travaux de construction* (S-2.1, r. 4) (Safety code for the construction industry). A copy of the minutes of the meetings of the committee shall be provided to the Departmental Representative no later than 5 days after the committee meeting.

#### **1.7 REGULATORY REQUIREMENTS**

- .1 Do the Work in accordance with Section 01 41 00 - Regulatory Requirements.
- .2 Comply with all legislation, regulations and standards applicable to the construction site and its related activities.
- .3 Comply with specified standards and regulations to ensure safe operations on a site containing hazardous or toxic materials.
- .4 Always use the most recent version of the standards specified in the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry), notwithstanding the date indicated in that *Code*.

**1.8 COMPLIANCE REQUIREMENTS**

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

**1.9 RESPONSIBILITIES**

- .1 The Contractor must acknowledge and assume all the tasks and obligations which customarily devolve upon a principal Contractor under the terms of the *Loi sur la santé et la sécurité du travail* (L.R.Q., ch. S-2.1) (Act Respecting Occupational Health and Safety) and the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry).
- .2 The Contractor must be responsible for health and safety of persons on construction site, safety of property on construction site and for the protection of persons adjacent to construction site and the environment to the extent that they may be affected by conduct of the work.
- .3 No matter the size or location of the construction site, the Contractor must clearly define the limits of the construction site by physical means and respect all specific regulation requirements applicable in this regard. The means chosen to define the limits of the construction site must be submitted to the Departmental Representative.
- .4 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific prevention Plan.

**1.10 WORK PERFORMED BY EXTERNAL CONTRACTORS**

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

**1.11 GENERAL REQUIREMENTS**

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

The safety program must include at least the following:

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

- .3 total costs, schedule and projected workforce curves;
- .4 flow chart of safety and health responsibilities;
- .5 physical and material layout of the construction site;
- .6 risk assessment for each stage of the work, including preventive measures and the procedures for applying them;
- .7 identification of the preventive measures relative to the specific risks inherent to the worksite indicated in the article "RISKS INHERENT TO THE WORKSITE";
- .8 identification of preventive measures for health and safety of employees and / or public works site as indicated in the article "SPECIFIC REQUIREMENTS FOR THE HEALTH AND SAFETY OF OCCUPANTS AND PUBLIC";
- .9 training requirements;
- .10 procedures in case of accident/injury;
- .11 written commitment from all parties to comply with the safety program;
- .12 construction site inspection checklist based on the preventive measures;
- .13 emergency response plan which shall contain at least the following:
  - .1 construction site evacuation procedures;
  - .2 identification of resources (police, firefighters, ambulance services, etc.);
  - .3 identification of persons in charge of the construction site;
  - .4 identification of the first-aid attendants;
  - .5 communication organizational chart (including the person responsible for the site and the Departmental Representative);
  - .6 training required for those responsible for applying the plan;
  - .7 any other information needed, in the light of the construction site's characteristics.

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

- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted in the prevention program and may request resubmission with correction of deficiencies or concerns.
- .3 In addition to the prevention program, during the course of the work the Contractor shall elaborate and submit to the Departmental Representative specific written procedures for any work having a high-risk factor of accident (for example: demolition procedures, specific installation procedures, hoisting plan, procedures for entering a confined space, procedures for interrupting electric power, etc.) or at the request of the Departmental Representative.
- .4 The Contractor shall plan and organize work to eliminate the danger at source or ensure collective protection, thereby minimizing the use of personal protective equipment.
- .5 Equipment, tools and protective gear which cannot be installed, fitted or used without compromising the health or safety of workers or the public shall be deemed inadequate for the work to be executed.

- .6 All mechanical equipment (for example, but not limited to: hoisting devices for persons or materials, excavators, concrete pumps, concrete saws) shall be inspected before delivery to the construction site. Before using any mechanical equipment, the Contractor shall obtain a certificate of compliance signed by a qualified mechanic dated less than a week prior to the arrival of each piece of equipment on the construction site; the certificate shall remain on the construction site and transmitted to the Departmental Representative on demand.
- .7 Ensure all inspections (daily, periodic, annual, etc.) for the hoisting devices for persons or materials required by the current standards are carried out and be able to provide a copy of the inspection certificates to the Departmental Representative on demand.
- .8 The Departmental Representative can always, if he suspects a malfunction or the risk of an accident, order the immediate stop of any piece of equipment and require an inspection by a specialist of his choice.
- .9 The Departmental Representative must be consulted for the location of storing gas cylinders and tanks on the construction site.

#### **1.12 RISKS INHERENT TO THE WORKSITE**

- .1 In addition to the risks related to the tasks to be carried out, personnel responsible for the execution of the work on the construction site will be exposed to the following risks, inherent to the area where the work will be executed.

At the worksite there is the presence of the following:

- .1 slurry and manure pit with risk of hydrogen sulphide poisoning;
- .2 confined spaces;
- .3 underground services (electric, gas, vapour, water system, etc.);
- .4 trees and landscaping to preserve and protect;
- .5 barbed wire fences;
- .6 agricultural activities during the period of work.

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

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

- .1 The worksite is occupied by employees and/or the public during the following times: [specify the times] although these people do not have access to the Contractor's site. The Contractor shall consider the following specific requirements for the protection of employees and / or the public:

- .1 Limited access to the site.
- .2 Identification of hazardous areas.

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

**1.14 UNFORESEEN HAZARDS**

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

**1.15 PERSON IN CHARGE OF HEALTH AND SAFETY**

- .1 If the construction site meets the requirements of article 2.5.3 of the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the construction industry), the Contractor needs to hire a competent person authorized as a safety officer and appoint this person full time from the beginning of the work. This person's tasks shall solely be dedicated to the management of health and safety on the construction site. This safety officer must have the following qualifications:
  - .1 have a safety officer certificate issued by the CNESST.
  - .2 have site-related working experience of at least 5 years specific to the activities associated with the present project.
  - .3 have working knowledge of occupational health and safety regulations in the workplace.
  - .4 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 the construction site to perform work.
  - .5 be responsible for implementing, enforcing in detail and monitoring site-specific Contractor's Health and prevention program.
  - .6 be on construction site always during execution of work;
  - .7 inspect the work and ensure compliance with all regulatory requirements and those indicated in the contract documents or the site-specific prevention program.
  - .8 Keep a daily log of actions taken and submitting a copy to Departmental Representative each week.

The safety officer's certificate shall be submitted to the Departmental Representative before the start of the work.

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

**1.16 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on construction site in accordance with Acts and Regulations of the Province, and in consultation with Departmental Representative.
- .2 At a minimum, the following information and documents must be posted in a location readily accessible to all workers:
  - .1 notice of construction site opening;
  - .2 identification of principal Contractor;
  - .3 company SST policy;
  - .4 site-specific prevention program;
  - .5 emergency plan;
  - .6 minutes of worksite committee meetings;
  - .7 names of worksite committee representatives;
  - .8 names of the first-aid attendants;
  - .9 action reports and correction notices issued by the CNESST.

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

- .1 Inspect the construction site and complete the construction site inspection checklist and submit it to the Departmental Representative in accordance with the article "ACTION AND INFORMATIONAL SUBMITTALS" in this section.
- .2 Immediately take all necessary measures to correct any situations deemed non-compliant during the inspections mentioned in the previous paragraph or noticed by the authorities having jurisdiction or the Departmental Representative or his agent.
- .3 Submit to Departmental Representative written confirmation of all measures taken to correct the situation in case of non-compliance in matters pertaining to health and safety.
- .4 The Contractor shall give the safety officer or, where there is no safety officer, the person assigned to safety and health responsibilities, full authority to order cessation and resuming of work as and when deemed necessary or desirable in the interests of safety and health. This person should always act so that the safety and health of the public and construction site workers and environmental protection take precedence over cost and scheduling considerations.
- .5 The Departmental Representative or his agent may order cessation of work if the Contractor does not make the corrections needed to conditions deemed non-compliant in matters pertaining to health and safety. Without limiting the scope of the preceding articles, the Departmental Representative may order cessation of work if, in his view, there is any hazard or threat to the safety or health of construction site personnel or the public or to the environment.

**1.18 PREVENTION OF VIOLENCE**

- .1 Health and safety management of Public Works and Government Services Canada construction sites includes the implementation of measures designed to protect the psychological health of all persons who access the construction site where the work is

taking place. Consequently, in addition to physical violence, verbal abuse, intimidation and harassment are not tolerated on the construction site. Any person who demonstrates such actions or behaviors will receive a warning and/or could be definitely expelled from the construction site by the Departmental Representative.

### **1.19 BLASTING**

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

### **1.20 CARTRIDGE DEVICES**

- .1 Use cartridge devices only with the written permission of the Departmental Representative.
- .2 A person who uses a stud gun shall hold a training certificate and meet all the requirements of section 7 of the *safety Code for construction work* (S-2.1, R. 4).
- .3 Any other cartridge device shall be used according to the manufacturer's instructions and according to the applicable standards and regulations.

### **1.21 USE OF PUBLIC ROADS**

- .1 Where it is necessary to encroach on a public road for operational reasons or to ensure the security of the workers, the occupants or the public (for example: the use of scaffolding, cranes, excavation work, etc.), the Contractor shall obtain at his own expense any authorizations and permits required by the competent authority.
- .2 The Contractor shall install at his own expense any signage, barricades or other devices needed to ensure the safety and security of the public and the Contractor's own facilities.

### **1.22 LOCKOUT-TAGOUT**

- .1 For all work on electrically or otherwise energized equipment, the Contractor shall draw up and implement a general lockout-tagout procedure and submit it to the Departmental Representative.
- .2 Supervisors and all workers concerned by work requiring lockout-tagout must have received training on lockout-tagout procedures by a recognized organization; Contractor shall submit training certificates to the Departmental Representative.
- .3 Before starting the lockout-tagout procedure of a piece of equipment on an occupied site, Contractor must coordinate his work with the representative of the site if the interruption of the power sources can have an impact on the operations of the site or on its occupants.
- .4 Contractor must designate a qualified person as responsible for the lockout-tagout and must make sure that that person prepares a lockout-tagout data sheet for each piece of equipment involved. The lockout-tagout data sheet must be submitted to the Departmental Representative at least 48 hours before the beginning of the work. The Departmental Representative will review the data sheet with the representative of the site if the work takes place in an existing building. The data sheets for lockout-tagout must contain at least the following information:
  - .1 description of work to carry out;
  - .2 identification, description and location of the circuit and/or piece of equipment to lockout-tagout;

- .3 identification of energy sources that feeds the piece of equipment;
- .4 identification of each cutout point;
- .5 sequence of lockout-tagout and the release of residual energy as well as the sequence of unlocking;
- .6 list of material needed for the lockout-tagout;
- .7 method of verification of zero energy implementation;
- .8 name and signature of the person who prepared the data sheet.

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

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

### 1.23 ELECTRICAL WORK

- .1 Contractor shall ensure that all electrical work is executed by qualified employees in accordance with the provincial regulation respecting vocational training and qualification.
- .2 Contractor shall respect all requirements of standard CSA Z462 *Workplace Electrical Safety Standard*.
- .3 No repairs or alterations shall be carried out on any live equipment except where complete disconnection of the equipment is not feasible.
- .4 Contractor shall respect all requirements prescribed in paragraph "LOCKOUT-TAGOUT" in this section.
- .5 Contractor shall advise in writing the Departmental Representative of all the work that cannot be done with de-energized equipment and obtain his authorization. Contractor shall demonstrate to the Departmental Representative that it is impossible to do the work with de-energized equipment and provide all the information necessary to request and obtain an energized electrical work permit (indicate working procedures, arc flash hazard analysis, protective perimeter, protective equipment, etc.) before the beginning of the work, excluding for the exceptions indicated in standard CSA Z462 Workplace electrical safety.
- .6 The energized electrical work permit on must contain at least the following elements:
  - a) description of the circuit and equipment and its location;
  - b) justification for having to do the work in an energized condition;
  - c) description of safe work practices to apply;
  - d) results of the shock hazard analysis;
  - e) limit of the protective perimeter against electric shocks;
  - f) results of the arc flash hazard analysis;
  - g) description of the arc flash protection boundary;
  - h) description of the personal protective equipment required;

- i) description of the means to limit access to unqualified persons;
- j) proof that an information session has been carried out;
- k) approval signature of the energized electrical work (by a person in authority or by the owner).

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

#### **1.24 ASBESTOS EXPOSURE**

.1 Not applicable to the scope of work.

#### **1.25 FUNGAL CONTAMINATION**

.1 Not applicable to the scope of work.

#### **1.26 EXPOSURE TO SILICA**

.1 Not applicable to the scope of work.

#### **1.27 ABRASIVE BLAST STRIPPING**

- .1 Prior to the beginning of any abrasive blasting work, the Contractor shall:
- .1 Provide a written work procedure that meets the requirements of section 3.20 of the safety Code for construction work, S-2.1, R. 4.
  - .2 Demonstrate that it has on hand all the equipment and equipment necessary for the observance of the procedure and the safe execution of the work.
  - .3 All sandblasting and stripping work must be done with an abrasive containing less than 1% silica.

#### **1.28 LEAD-BASE PAINT REMOVAL**

.1 Not applicable to the scope of work.

#### **1.29 EXPOSURE TO ANIMAL'S FECAL DROPPINGS**

- .1 Prior to all work where workers are likely to come in contact with materials contaminated by animal's fecal droppings, the Contractor must:
- .1 Provide a written procedure for the work which respects all the requirements of the *Code de sécurité pour les travaux de construction* S-2.1, r- 4, (Safety code for the construction industry), as well as the requirements indicated in the document "*Des fientes de pigeons dans votre lieu de travail: méfiez-vous*" (Pigeon droppings in your workplace: Beware" published by the CNESSST ([http://www.csst.qc.ca/publications/100/Documents/DC100\\_1331\\_1web2.pdf](http://www.csst.qc.ca/publications/100/Documents/DC100_1331_1web2.pdf))
  - .2 Demonstrate that he has all the material and equipment required on hand to respect the procedure and for safely conducting the work.

**1.30 RESPIRATORY PROTECTION**

- .1 Contractor must ensure that all workers who must wear a respirator as part of their duties have received training for that purpose as well as fit testing of their respirator, in accordance with CSA Standard Z94.4 *Selection, use and care of respirators*. Submit the certificates of the fit testings to the Departmental Representative on demand.

**1.31 FALL PROTECTION**

- .1 Plan and organize work to eliminate the risk of fall at the source or ensure collective protection, thereby minimizing the use of personal protective equipment. When personal fall protection is required, workers must use a safety harness that complies with CSA standard CAN/CSA Z-259.10 M90. A safety belt must not be used as fall protection.
- .2 Every person using an elevating platform (scissors, telescopic mast, articulated mast, rotative mast, etc.) must have a training regarding this equipment.
- .3 The use of a safety harness is mandatory for all elevating platforms with telescopic, articulate or rotative mast.
- .4 Define the limits of the danger zone around each elevating platform.
- .5 All openings in a floor or roof must be surrounded by a guardrail or provided with a cover fixed to the floor able to withstand the loads to which it could be exposed, regardless of the size of the opening and the height of the fall it represents.
- .6 Everyone who works within two metres from a fall hazard of three metres or more must use a safety harness in accordance with the requirements of the regulation, unless there is a guardrail or another device offering an equivalent safety.
- .7 Despite the requirements of the regulation, the Departmental Representative may require the installation of a guardrail or the use of a safety harness for specific situations presenting a risk of fall less than three (3) metres.

**1.32 SCAFFOLDINGS**

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

**Foundation:**

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

**Assembly, bracing and mooring:**

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

**Protection against falls during assembly:**

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

**Platforms:**

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

**Guardrails:**

- .1 A guardrail shall be installed on every landing.
- .2 Cross braces shall not be considered as guardrails.

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

**Access:**

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

**Protection of the public and occupants:**

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

**Engineering plans:**

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

**1.33 CONFINED SPACES**

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

**Information on confined spaces existing on the construction site:**

- .1 The following presents a non-exclusive list of the confined spaces that the Contractor will likely have to access during this project:
  - a. Manure pit;
  - b. Bioreactor tank;
  - c. Gas holder or storage tank for biogas.
- .2 The Contractor shall take into consideration each of these confined spaces and must also add to this list the confined spaces that he is likely to build/install during this project.

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

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

**Training:**

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

**Risk assessment of confined spaces:**

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

- g. ignition sources such as open flames, lighting, welding and cutting, static electricity or sparks.
    - h. all other circumstances, such as the presence of vermin, rodents or insects.
  2. These risk assessments must be done by the person in charge of the health and safety of the work in confined spaces. They must be submitted to the Departmental Representative for analysis at least 10 days before the proposed date for the work in confined spaces and they must also include the following information:
    - a. location of the confined space;
    - b. description of the confined space;
    - c. dimensions of the confined space;
    - d. number, location and dimensionS of the openings;
    - e. content of the confined space (material, substances, etc.)
    - f. date of the assessment;
    - g. name and signature of the person who conducted the assessment and the name of his employer.
  3. The Contractor must repeat the same process for each of the confined spaces that he will build/install during this project.

**Confined spaces entry permits:**

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

- f. name of person who issued the permit and the name of his employer;
  - g. name of the confined space safety watcher and the name of his employer;
  - h. name of the workers who must enter the confined space and the name of each one's employer.
2. In cases where the site representative requires the use of a confined space entry permit specific to his site, the Contractor must comply with the requirements of that permit.

**Medical surveillance:**

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

**Requirements while working in confined spaces:**

1. Before each entry into a confined space, the person in **charge** of the health and safety for the work in confined spaces shall take readings of oxygen concentration, flammable gases and all toxic gases likely to be present and record these readings on the entry permit required earlier.
2. No worker can access the confined space if the following requirements are not respected:
  - a. the concentration of oxygen shall be greater than or equal to 19.5% and less than or equal to 23%;
  - b. the concentration of inflammable gases or vapours shall be less than or equal to 10% of the lower explosion limit;
  - c. the concentration of other gases must not exceed the standards prescribed in annex I of the Règlement sur la santé et la sécurité du travail (S-2.1, r.13) (Occupational Health and Safety Regulation).
3. If the oxygen and gas concentrations measured respect the regulatory values, the person in charge of the health and safety for the work in confined spaces must ensure that all preventive measures indicated on the permit are in place and then must complete the entry permit (date, time, signatures, etc.) before issuing the permit and allow entry into the confined space.
4. A permit is only valid for one work shift; the Contractor must submit a new permit for each extra shift.
5. During the work inside the confined space, the gas concentration must be measured continuously and the gas detector must be installed at ~~the level of the~~ breathing area of the workers. If the conditions inside the confined space are such that the workers might not hear/see the detector's alarm, the Contractor must find a way for the confined space safety watcher to watch the concentration measures while maintaining the measurements at the level of the breathing zone of the workers.
6. If the work is organized in a way that the workers are scattered far away from each other in a large confined space, the Contractor needs to provide additional gas detectors.
7. The Contractor must provide the gas detectors and maintain them in good condition. He must be able to show that the gas detectors used have been calibrated and adjusted by the person in charge of the health and safety for the work in confined spaces or by a qualified person, in

accordance with the manufacturer's recommendations. The Departmental Representative can always have the accuracy of the measuring devices checked. In the event of the failure of a detection device, the work must be stopped immediately and all workers must leave the confined space.

8. The manufacturer's manual of the gas detectors must be available on the construction site.
9. The Contractor shall provide a ventilation system to keep concentrations of contaminants below the regulatory limits.
10. If work generating contaminants are performed (welding, use of products, etc.), the Contractor must, if needed, install an aspiration system for the contaminants so that the regulatory values of air quality can be maintained always.
11. If a detecting device alarm goes off, all workers shall leave the confined space. The measured levels of concentration must then be recorded on the entry permit. The Contractor shall then find the source of contamination, neutralize it, ventilate the confined space to eliminate contaminant residues and authorize access to the confined space only when concentrations of oxygen and gas have returned to normal.
12. Compressed gas cylinders or welding equipment shall not be brought into confined spaces: this equipment shall remain outside and shall not block entrances or exits; all cylinders shall be properly secured.
13. Tools and electrical devices used to work in the confined spaces shall be grounded and, when necessary, designed to be explosion-proof. All equipment must be connected to a ground fault interrupter outlet or to a step-down transformer. The Contractor shall, at his own cost, hire a qualified electrician to adjust power receptacles and/or circuit breakers that he intends to use which do not meet these criteria.
14. The Contractor shall obtain a Hot Work Permit and respect the requirements to that effect when the work to be carried out includes hot work.
15. The Contractor must assign a competent person to assume the duties of confined space safety watcher. The supervisor shall be exclusively dedicated to these duties and must constantly remain outside of the confined space as long as there is a worker in it. He must also:
  - a. ensure that the entry permit has been filled, signed and posted near the confined space;
  - b. be familiar with the work procedure specific to the confined space and ensure that it is respected;
  - c. ensure continuous communication with all the workers in the confined space and ensure that all the equipment required in case of emergency is present;
  - d. have a good knowledge of the backup ventilation systems and ensure their proper functioning for the duration of the work;
  - e. prevent access to unauthorized persons;
  - f. ensure that the conditions around the confined space zone is not a health or security risk for the workers inside the confined space;
  - g. initiate the emergency procedure if needed.
16. The same person may act as a confined space safety watcher and as the person in charge of the health and safety of the work in confined spaces, provided all requirements of both functions are met.

**1.34 EXCAVATION WORK**

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



# Excavation guidelines

N° \_\_\_\_\_ of \_\_\_\_\_

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

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

## Field survey

Chaining or axes : from \_\_\_\_\_ to \_\_\_\_\_ Attached plan  Plan no. : \_\_\_\_\_

## Working method to use

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

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

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


	Minimum	Maximum
H Depth		
Wb Width at bottom		
Width at top		

## Safety measures

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

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

Name	Occupation	
Signature	Date	Telephone no.
Directive submitted		
<input type="checkbox"/> to the responsible of the work on the site <input type="checkbox"/> to the operator of the earth-moving machine		

DIRECTIVES (0811-01)

**1.35 LIFTING LOADS WITH CRANE OR BOOM TRUCK**

1. Unless specified otherwise, the Contractor must prepare a hoisting plan and submit it to the Departmental Representative for all lifting operations done with a crane or a boom truck at least 5 days before these lifting operations begin. The hoisting plan must contain at a minimum the information listed at the end of this article.
2. The hoisting plan must be signed and sealed by an engineer for the following lifting operations:
  - a. lifting of concrete panels;
  - b. lifting mechanical/electrical equipment on a roof or on the floor of a building;
  - c. lifting of loads encroaching on the public road;
  - d. lifting large dimensions or very heavy loads;
  - e. all other lifting operation, in accordance with the requirements of the Departmental Representative.
3. In addition to the above requirements, the Contractor must plan the hoisting operations in a way as to avoid that the loads pass over the occupied zones on the site. When there is no alternative, the hoisting plan must absolutely be signed and sealed by an engineer and must guarantee the security of the occupants in that zone; the plan must also be approved by the Departmental Representative. The Departmental Representative can, if he deems necessary, require that the work be done at night or on weekends.
4. Upon the beginning of the work on the construction site, the Contractor must submit the list of the hoisting plans anticipated for the whole project to the Departmental Representative. That list shall be updated as needed if changes occur during the work.
5. In addition to the mechanical service inspection certificate, the annual inspection certificate and the crane logbook must be aboard all cranes and boom truck cabs.
6. The entire lifting area shall be marked off to prevent the entry of non-authorized persons.
7. The Contractor shall carefully inspect all of the slings and lifting accessories and make sure that those in poor condition are destroyed and scrapped.
8. Compressed-gas cylinders shall be lifted with a basket specially designed for this purpose.

**1.36 MINIMUM CONTENT OF HOISTING PLAN**

1. Sketch indicating at a minimum, the location of the crane, the surrounding facilities, the zone covered by the hoisting operations, the pedestrian's pathways and vehicular routes, the security perimeter, etc.
2. Weight of loads.
3. Dimensions of loads.
4. List of hoisting devices and weight of each.
5. Total weight lifted.
6. Maximum height of obstacles to clear.
7. Height of loads lifting relative to the surface of the roof (in the case of loads to be placed on roofs).
8. Use of guide cables.

9. Type of crane used.
10. Crane capacity.
11. Boom length.
12. Boom angle.
13. Crane's radius of action.
14. Deployment of stabilizers.
15. Percentage usage of the crane's capacity.
16. Verification confirmation of hoisting equipment.
17. Identification of the crane operator and the person responsible for the hoisting operations with date and signatures.

### **1.37 HOT WORK**

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

#### **Welding and cutting:**

1. In addition to the requirements prescribed in the preceding paragraphs, the Contractor must respect the following requirements:
  - .1 Welding and cutting work must be carried out in accordance with the requirements of the Code de Sécurité pour les travaux de construction, S-2.1, r.4 (Safety code for the construction industry) and CSA standard W117.2, Safety in Cutting, Welding and Allied Processes.
  - .2 Air extraction system with filters must be used for all welding and cutting work performed inside.
  - .3 Stop all activities producing flammable or combustible gas, vapours or dust in the vicinity of the welding or cutting work.
  - .4 Store all compressed gas cylinder on a fireproof fabric and make sure that the room is well ventilated.

- .5 Store all oxygen cylinders more than 6 metres from a flammable gas cylinder (ex: acetylene) or a combustible such as oil or grease, unless the oxygen cylinder is separated from it by a wall made of non-combustible material as mentioned in the article 3.13.4 of the Code de sécurité pour les travaux de construction, S-2, r. 6 (Safety code for the construction industry)
- .6 Store the cylinders far from all heat sources.
- .7 Not to store the cylinders close to the staircases, exits, corridors and elevators.
- .8 Do not put acetylene in contact with metals such as silver, mercury, copper and alloys of brass having more than 65% copper, to avoid the risk of an explosive reaction.
- .9 Check that welding equipment with electric arc has the necessary tension and are grounded.
- .10 Ensure that the conducting wires of the electric welding equipment are not damaged.
- .11 Place the welding equipment on a flat ground away from the bad weather.
- .12 Install fireproof canvas when the welding work is done in a superposition and where there is the risk of falling sparks.
- .13 Move away or protect the combustible materials which are closer than 15 metres from the welding work.
- .14 Prohibition to weld or cut any closed container.
- .15 Do not perform any cutting, welding or work with a naked flame on a container, a tank, a pipe or other container containing a flammable or explosive substance unless:
  - a. they have been cleaned and air samples indicating that work can be done without danger has been taken; and
  - b. provisions to ensure the safety of the workers have been made.

**1.38 ROOFING WORK****Protection against fall from heights:**

- .1 Installation of guardrails is mandatory at all times; however, the installation of a warning line is allowed to define the limits of the work zones provided that all the requirements of the articles 2.9.4.0 and 2.9.4.1 of the Code de sécurité pour les travaux de construction (Safety code for the Construction Industry) are respected.
- .2 The guardrails must remain in place until the end of the project. The Departmental Representative will authorize their dismantling when he can confirm that all the work, inspections and corrections have been made.
- .3 Workers installing guardrails must wear safety harnesses.
- .4 Workers installing and modifying guardrails or flashing shall wear safety harnesses in the event guardrails must be moved temporarily.
- .5 Workers shall wear safety harnesses when receiving material and giving directions to the crane operator next to a drop.
- .6 Safety harnesses shall be worn when carrying out work next to a drop where collective protection is not sufficiently safe.
- .7 The Contractor shall provide a fastening method and safety cable system compliant with section 2.10.12 of the Code de sécurité pour les travaux de construction (L.R.Q., S-2.1, r.4) (Safety code for the Construction Industry) for each construction site or location.

**Lifting of materials**

- .1 For all winch installations, the Contractor shall provide the Departmental Representative with the installation method recommended by the manufacturer. If unavailable, the Contractor shall then provide an installation procedure signed and sealed by an engineer. The installation procedure must take into account load-bearing capacity, the amount, weight and location of counterweight and any other detail that may affect the capacity and stability of the device.
- .2 The Contractor shall carefully inspect all of the slings and lifting accessories and make sure that those in poor condition are destroyed or scrapped.
- .3 Compressed-gas cylinders shall be lifted with a basket specially designed for this purpose.
- .4 In all cases where a crane or boom truck is used, the Contractor must respect the requirements of the paragraph Lifting Loads With Crane or Boom Truck, in this section.

**Protection against burns:**

- .1 Individuals assigned to the boilers shall wear long sleeves, safety glasses and a face shield when filling the boilers.
- .2 Individuals working with asphalt or other hot liquids shall wear gloves, long sleeves and safety glasses.

**Protection against fire:**

- .1 The storage and use of propane cylinders shall comply with the standard CAN/CSA-B149.2, *Propane Storage and Handling Code*. The cylinders shall be stored outdoors, in a safe place, away from any unauthorized handling, in a storage cabinet specially designed for this purpose. The cylinders shall be securely kept upright and locked at

all times in a place where no vehicles are allowed unless the cylinders are protected by barriers or similar protection.

2. The number of propane cylinders on the roof shall not exceed the number of cylinders necessary for a day's work, and cylinders shall at all times be secured upright or held in a cart designed for this purpose.
3. All hot work (burning, heating, riveting, welding, cutting, grinding, etc.) must be done in accordance with paragraph "Hot Work" in this section.

### **Material and waste management**

1. On the roof, light material and sheet material shall be kept in containers or be securely fastened. In the event this requirement is disregarded in the slightest way, the Departmental Representative may disallow the storage of materials on the roof.
2. Waste shall be discarded as produced using a waste chute or appropriate containers. The Contractor shall provide the means to prevent waste from being carried away by the wind.
3. All waste must be removed from the roof at the end of shifts.
4. Unless otherwise authorized by the Departmental Representative, all waste bins must be placed at least 3 m from any structure or building.

### **Protection of occupants and the public**

1. Contractor must install covered passageways, nets or other devices above the entrances and the exits of the building to protect the workers, the public and the occupants against falling object. The means of protection must be approved by the Departmental Representative.
2. A safety perimeter on the ground must be placed under the work zone in order to protect the workers, the public and the occupants.
3. The ground construction site, material handling area and boiler area shall be clearly sealed off to prevent occupants or the public from accessing the construction site and areas.
4. Before installing any device that may emit gas or fumes, the Contractor shall receive authorization from the person in charge of the construction site, who shall make sure that there is no risk of gas or fumes infiltrating the building's ventilation system.

### **1.39 STEEL STRUCTURE ERECTION OR DISMANTLING WORK**

- .1 In addition to respecting section 3.24 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry), the Contractor must also respect the requirements described in the following paragraphs.
- .2 Contractor must submit the following documents to the Departmental Representative before the beginning of steel structure erection work:
  - .1 erecting procedures in accordance with article 3.24.10 du *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry);

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

#### **1.40 WORK NEAR BODIES OF WATER**

- .1 Not applicable to the scope of work.

#### **1.41 INTERIOR USE OF INTERNAL COMBUSTION ENGINES**

- .1 In addition to respecting article 3.10.17 of the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry), the Contractor must also respect the requirements described in the following paragraphs.
- .2 The use of a gas-powered equipment inside a building is prohibited even if the building is provided with openings.
- .3 The use of other equipment powered by an internal combustion engine inside a building must be submitted to the approval of the Departmental Representative.
- .4 For the use of any piece of equipment powered by an internal combustion engine inside a building, even if the building is provided with openings, the Contractor must install a ventilation system able to maintain the concentrations of toxic gases below the regulatory values. The stale air shall be exhausted outside the building.
  - a. Before using equipment powered by an internal combustion engine, the Contractor must plan and write the following:
    - b. number of fans to install;
    - c. power of the fans;
    - d. location of the fans;
    - e. dimensions of the openings that will be open during the work.

- .5 During the operation of equipment with internal combustion engine, the Contractor must measure the concentrations of carbon monoxide and nitrogen oxides in the work area and at the breathing area of the workers; the concentration levels measured must be recorded in a register every 30 minutes that must be available for consultation.
- .6 If work is in an occupied building, the Contractor must also measure the concentrations of carbon monoxide and nitrogen oxides in the rooms next to the work area and the concentration levels measured must be recorded in a register every 30 minutes.
- .7 If the carbon monoxide or nitrogen oxides detector alarm goes off during the work, the Contractor must stop the work and take the corrective measures required before resuming the work.
- .8 A portable fire extinguisher must be available at all times in the work area during the use of equipment with internal combustion engines.
- .9 The equipment must be maintained at a safe distance from all combustible material.
- .10 The storage of fuel for any equipment with internal combustion engine is prohibited inside a building.

#### **1.42 TEMPORARY HEATING**

- .1 In addition to respecting section 3.11 of the *Code de sécurité pour les travaux de construction* (S-2.1, r.4) (Safety code for the Construction Industry), the Contractor must also respect the requirements described in the following paragraphs.
- .2 A portable fire extinguisher must be available at all times near the heating units, no matter what type of heating is used.
- .3 The heating units must always be used in accordance with the manufacturer's specifications.
- .4 If applicable, the canvas or tarpaulins used next to the heating units must be solidly fixed so as not to be projected on the heaters, on the pipes connected to the heaters or on any other heat source.
- .5 The gas cylinders must be installed in a way that they are protected from vehicle and other equipment traffic.
- .6 For the use of heating units other than electric, the Contractor must install a carbon monoxide detector in the work area, next to the heating units and/or the workers, throughout the course of the heating period. The Contractor must immediately apply the corrective measures required to the heating units if the detector's alarm goes off.
- .7 The Contractor must ensure a minimum surveillance of the heating units outside the hours of work (nights and weekends). He must submit a surveillance plan to the Departmental Representative before the use of the heating units.

#### **1.43 WORK NEAR OVERHEAD POWER LINES**

- .1 When there is an overhead power line in the work zone and that the Contractor chooses to apply paragraph b) of article 5.2.2 of the *Code de sécurité pour les travaux de construction* (2.1, r.4) (Safety code for the Construction Industry), a copy of the agreement with the electrical power company and a copy of the work process, required in the article 5.2.2 b), must be submitted to the Departmental Representative before the beginning of the work in relation to these documents.

**1.44 DIVING OPERATIONS**

- .1 Not applicable to the scope of work.

**1.45 HEALTH AND SAFETY SUBORDINATION AGREEMENT**

**Project:** \_\_\_\_\_ **Address:** \_\_\_\_\_

**EXTERNAL CONTRACTOR**

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

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

Name of representative: \_\_\_\_\_

Name of business: \_\_\_\_\_

Description of work to be done on the construction site: \_\_\_\_\_

Approximate dates of work (start-end): \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**PRINCIPAL CONTRACTOR**

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

Name of representative: \_\_\_\_\_

Name of the Principal Contractor’s business: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

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

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Division 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2                FIRE DEPARTMENT BRIEFING**

- .1            The Departmental Representative will co-ordinate arrangements for contractor for briefing on Fire Safety at pre-work conference by Fire Chief before work is commenced.

**1.3                REPORTING FIRES**

- .1            Know location of nearest fire alarm box and telephone, including emergency phone number.
- .2            Report immediately fire incidents to Fire Department as follows:
  - .1            By telephone.
  - .3            When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify location.

**1.4                INTERIOR AND EXTERIOR FIRE PROTECTION AND ALARM SYSTEMS**

- .1            Fire protection and alarm system will not be:
  - .1            Obstructed;
  - .2            Shut-off; and
  - .3            Left inactive at end of working day or shift without authorization from Fire Chief or his representative.
- .2            Fire hydrants, standpipes and hose systems will not be used for other than fire-fighting purposes unless authorized by Fire Chief.

**1.5                FIRE EXTINGUISHERS**

- .1            Supply fire extinguishers, as scaled by Fire Chief, necessary to protect work in progress and contractor's physical plant on site.

**1.6                BLOCKAGE OF ROADWAYS**

- .1            Advise Fire Chief of work that would impede fire apparatus response. This includes violation of minimum overhead clearance, as prescribed by Fire Chief, erecting of barricades and digging of trenches.

**1.7                SMOKING PRECAUTIONS**

- .1            Observe smoking regulations.

**1.8 RUBBISH AND WASTE MATERIALS**

- .1 Keep rubbish and waste materials at minimum quantities.
- .2 Burning of rubbish is prohibited.
- .3 Removal:
  - .1 Remove rubbish from work site at end of work day or shift or as directed.
- .4 Storage:
  - .1 Store oily waste in approved receptacles to ensure maximum cleanliness and safety.
  - .2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove specified.

**1.9 FLAMMABLE AND COMBUSTIBLE LIQUIDS**

- .1 Handling, storage and use of flammable and combustible liquids governed by current National Fire Code of Canada 2015 (NFC).
- .2 Keep flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires permission of Fire Chief.
- .3 Transfer of flammable and combustible liquids is prohibited within buildings or jetties.
- .4 Transfer of flammable and combustible liquids will not be carried out in vicinity of open flames or any type of heat-producing devices.
- .5 Do not use flammable liquids having flash point below 38 degrees C such as naphtha or gasoline as solvents or cleaning agents.
- .6 Store flammable and combustible waste liquids, for disposal, in approved containers located in safe ventilated area. Keep quantities minimum and Fire Department is to be notified when disposal is required.

**1.10 HAZARDOUS SUBSTANCES**

- .1 Work entailing use of toxic or hazardous materials, chemicals and/or explosives, or otherwise creating hazard to life, safety or health, in accordance with National Fire Code of Canada (NFC).
- .2 Obtain from Fire Chief a "Hot Work" permit for work involving welding, burning or use of blowtorches and salamanders or any other heat generating equipment, in buildings or facilities.
- .3 When Work is carried out in dangerous or hazardous areas involving use of heat, provide fire watchers equipped with sufficient fire extinguishers. Determination of dangerous or hazardous areas along with level of protection necessary for Fire Watch is at discretion of Fire Chief. Contractors are responsible for providing fire watch service for work on scale established and in conjunction with Fire Chief at pre-work conference.

- .4 Provide ventilation where flammable liquids, such as lacquers or urethanes are used, eliminate sources of ignition. Inform Fire Chief prior to and at cessation of such work.

**1.11 QUESTIONS AND/OR CLARIFICATION**

- .1 Direct questions or clarification on Fire Safety in addition to above requirements to Fire Chief.

**1.12 FIRE INSPECTION**

- .1 Co-ordinate site inspections by Fire Chief through the Departmental Representative.
- .2 Allow Fire Chief unrestricted access to work site.
- .3 Co-operate with Fire Chief during routine fire safety inspection of work site.
- .4 Immediately remedy unsafe fire situations observed by Fire Chief.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 SUMMARY**

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

**1.2 RELATED REQUIREMENTS**

- .1 Division 01, 06, 08, 23, 31 to 33, 40, A and D

**1.3 REFERENCES TO REGULATORY REQUIREMENTS**

- .1 Perform Work in accordance with National Building Code of Canada (NBC) 2015, including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Specific design and performance requirements listed in the specifications or indicated on the Drawings may exceed the minimum requirements established by the referenced Building Code; these requirements will govern over the minimum requirements listed in the Building Code.
- .3 The work must meet or exceed the requirements of documents mentioned below:
  - .1 Contractual documentation:
  - .2 Mechanical:
    - .1 Z1006-10 - Management of work in confined spaces.
    - .2 CGA-3.16-M88 (R2014) - LEVER OPERATED NON-LUBRICATED GAS SHUT-OFF VALVES.
    - .3 ANSI Z21.21-2012/CSA 6.5-2012 - AUTOMATIC VALVES FOR GAS APPLIANCES.
    - .4 BPVC 2013 BOILER AND PRESSURE VESSEL CODE - BOILER AND PRESSURE VESSEL CODE, 2013.
    - .5 CSA B51-14 - BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE.
    - .6 ANSI/CSA B149.1-15 - NATURAL GAS AND PROPANE INSTALLATION CODE.
    - .7 ANSI/CSA B149.6-15 – CODE FOR DIGESTER GAS, LANDFILL GAS, AND BIOGAS GENERATION AND UTILIZATION.
    - .8 ASME CSD-1-2012 - CONTROLS AND SAFETY DEVICES FOR AUTOMATICALLY FIRED BOILERS.
    - .9 ASME B16.5-2013 - PIPE FLANGES AND FLANGED FITTINGS: NPS 1/2 THROUGH NPS 24 — METRIC/INCH STANDARD.
    - .10 ASME B16.5 / ASME B16.47.
    - .11 ASME B16.9-2012 - FACTORY MADE WROUGHT STEEL BUTTWELDING FITTINGS.

- .12 ASME B18.2.1-2013 - SQUARE, HEX, HEAVY HEX, AND ASKEW HEAD BOLTS AND HEX, HEAVY HEX, HEX FLANGE, LOBED HEAD, AND LAG SCREWS (INCH SERIES).
- .13 ASME B16.11-2011 - FORGED FITTINGS, SOCKET-WELDING AND THREADED.
- .14 ASME B36.19M-2004 - STAINLESS STEEL PIPE ;
- .15 ASTM D2513-14 - STANDARD SPECIFICATION FOR POLYETHYLENE (PE) GAS PRESSURE PIPING, TUBING AND FITTINGS.
- .16 ASTM F714-13 - STANDARD SPECIFICATION FOR POLYETHYLENE (PE) PLASTIC PIPE (DR-PR) BASED ON OUTSIDE DIAMETER.
- .17 CAN/CGSB-24.3-92 - IDENTIFICATION OF PIPING SYSTEMS.
- .18 MISS SP-42-2013 - CORROSION RESISTANT GATE, GLOBE, ANGLE, AND CHECK VALVES WITH FLANGED AND BUTT WELD ENDS (CLASSES 150, 300 & 600).
- .3 Electrical:
  - .1 The most restrictive standards CSA C22.1-10 et CSA C22.1-18.
  - .2 CAN/CSA-C22.3 NO7-15.
  - .3 CAN/CSA B72-M87 (R2013).
  - .4 CSA C22.2 NO 152.
  - .5 NORMES HYDRO-QUÉBEC E.21-10 ET E.21-12.
- .4 Structure:
  - .1 CSA G30.18-D.E.
  - .2 CAN3-A.23.1-D.E.
  - .3 CAN3-G40.21-D.E.
  - .4 ASTM-A325M-D.E.
- .5 Environment:
  - .1 Regulatory framework for atmospheric emissions (Canada).
  - .2 Environmental Quality Act, Quebec.
- .6 Municipal:
  - .1 Any applicable by-law.

#### **1.4 BUILDING SMOKING ENVIRONMENT**

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

**1.5 QUALITY ASSURANCE**

- .1 Regulatory Requirements: Except as otherwise specified, Contractor shall apply for, obtain, and pay all fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**2.2 EASEMENTS AND NOTICES**

- .1 Owner will obtain permanent easements and rights of servitude that may be required for performance of Work.
- .2 Contractor shall give notices required by regulatory requirements.

**2.3 PERMITS**

- .1 Building Permit:
  - .1 Constructor shall apply to obtain and pay for building permit on behalf of the Owner, and other permits required for Work and its various parts.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Division 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2                INSPECTION**

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

**1.3                INDEPENDENT INSPECTION AGENCIES**

- .1            Independent Inspection Testing Agencies will be engaged by the Consultant for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Consultant.
- .2            Provide equipment required for executing inspection and testing by appointed agencies.
- .3            Employment of inspection/testing agencies does not relax responsibility of Contractor to perform Work in accordance with Contract Documents.
- .4            If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Contractor shall correct defect and irregularities as advised by the Departmental Representative at no cost to the Departmental Representative. Pay costs for retesting and reinspection.

**1.4                ACCESS TO WORK**

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

**1.5 PROCEDURES**

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

**1.6 REJECTED WORK**

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

**1.7 REPORTS**

- .1 Submit 2 copies of inspection and test reports to Consultant.
- .2 Provide copies to subcontractor of work being inspected or tested.

**1.8 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Consultant and may be authorized as recoverable.

**1.9 MILL TESTS**

- .1 Submit mill test certificates as required of specification Sections or requested.

**1.10 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment, balancing, pressure test or other compliance reports of tests done on site to Consultant.

**Part 2            Products**

**2.1                NOT USED**

.1                Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1                Not Used.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Divisions 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2 REFERENCE STANDARDS**

- .1 If there is question as to whether products or systems are in conformance with applicable standards, the Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .2 Cost for such testing will be born by the Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

**1.3 QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Products must use proven technologies and constructions in biogas sector. No equipment or experimental equipment being developed can be used.
- .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 the Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise specified in specifications, maintain uniformity by ensuring that materials or elements of the same type come from the same manufacturer.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

**1.4 AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify the Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify the Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

**1.5 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .5 Remove and replace damaged products at own expense and to satisfaction of the Departmental Representative.
- .6 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

**1.6 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by the Departmental Representative. Unload, handle and store such products.

**1.7 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

**1.8 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify the Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. The Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

**1.9 CO-ORDINATION**

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

**1.10 CONCEALMENT**

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform the Departmental Representative if there is interference. Install as directed by the Departmental Representative.

**1.11 REMEDIAL WORK**

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.
- .3 Inform Consultant and Departmental Representative of any corrective Work.

**1.12 LOCATION OF FIXTURES**

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

**1.13 FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

**1.14 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.

**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            Division 01, 06 to 08, 23 31 to 33, 40 A to D

**1.2                QUALIFICATIONS OF SURVEYOR**

- .1            Qualified registered land surveyor, licensed to practise in Place of Work, acceptable to the Departmental Representative.

**1.3                SURVEY REFERENCE POINTS**

- .1            Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .2            Make no changes or relocations without prior written notice to Departmental Representative.
- .3            Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .4            Require surveyor to replace control points in accordance with original survey control.

**1.4                SURVEY REQUIREMENTS**

- .1            Establish two (2) permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2            Establish lines and levels, locate and lay out, by instrumentation.
- .3            Stake for grading, fill and topsoil placement and landscaping features.
- .4            Stake slopes.
- .5            Set radial dimensions.
- .6            Stake batter boards for foundations.
- .7            Establish foundation column locations and floor elevations.

**1.5                EXISTING SERVICES**

- .1            Before commencing work, establish location and extent of service lines in area of Work and notify the Departmental Representative of findings.
- .2            Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by the Departmental Representative.

**1.6                LOCATION OF EQUIPMENT AND FIXTURES**

- .1            Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform the Departmental Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by the Departmental Representative.

**1.7 RECORDS**

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of all service lines, whether they have been moved or taken out of service, or remain intact.

**1.8 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit name and address of Surveyor to the Departmental Representative.
- .2 On request of the Departmental Representative, submit documents and samples to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying those elevations and locations of completed Work that conform with Contract Documents.

**1.9 SUBSURFACE CONDITIONS**

- .1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Division 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2 PROJECT CLEANLINESS**

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

**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 including other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by the Departmental Representative. Do not burn waste materials on site, unless approved by the Departmental Representative.
- .6 Decide 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 and floors.
- .9 Remove snow and ice from access to building.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 SUMMARY**

- .1 This Section includes requirements for management of construction waste and disposal, which forms the Contractor 's commitment to reduce and divert waste materials from landfill.

**1.2 RELATED REQUIREMENTS**

- .1 Division 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.3 DEFINITIONS**

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, operations, repair and demolition.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non-toxic: Not poisonous to humans either immediately or after a long period of exposure.
- .6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on the project site.
- .11 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

- .16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:
  - .1 Solvents in paints and other coatings;
  - .2 Wood preservatives; strippers and household cleaners;
  - .3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
  - .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

#### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project, and ensure that requirements of the Construction Waste Management Plan are followed.
- .2 Preconstruction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings before starting any Work of the Contract attended by the Owner, Contractor, affected Subcontractor's and Representative to discuss the Contractor's Construction Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

#### **1.5 DOCUMENTS/SAMPLES TO BE SUBMITTED**

- .1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

#### **1.6 PROJECT CLOSEOUT SUBMISSIONS**

- .1 Record Documentation: Submit as constructed information in accordance with Section 01 78 00 – Closeout Submittals as follows:
  - .1 Waste sorting Facility certificate certifying that the content has been sorted and includes a waste assessment report.

#### **1.7 QUALITY ASSURANCE**

- .1 Certifications: Provide proof of the following during the Work:
  - .1 Provide certificates from the waste sorting facility to the Departmental Representative for approval.

**1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:
  - .1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
  - .2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.
- .2 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 (CWM PLAN) IMPLEMENTATION**

- .1 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:
  - .1 Recycling and waste bin areas are to be kept neat and clean and clearly marked to avoid contamination of materials.
  - .2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.
- .2 Progressive Documentation: Submit a monthly summary of waste generated by the project to ensure that waste diversion goals are on track with project requirements.

**3.2 SUBCONTRACTOR'S RESPONSIBILITY**

- .1 Subcontractor's shall cooperate fully with the Contractor to implement the CWM Plan.
- .2 Failure to cooperate may result in the Owner not achieving their environmental goals, and may result in penalties being assessed by the Contractor to the responsible Subcontractor's.

**END OF SECTION**

**Part 1           General****1.1           RELATED REQUIREMENTS**

- .1       Division 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2           REFERENCE STANDARDS**

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

**1.3           ADMINISTRATIVE REQUIREMENTS**

- .1       Acceptance of Work Procedures:
  - .1       Contractor's Inspection: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents:
    - .1       Notify the Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2       Request the Departmental Representative and Consultant's inspection.
  - .2       Departmental Representative and Consultant's inspection:
    - .1       The Consultant or the Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
    - .2       Contractor to correct Work as directed.
  - .3       Completion Tasks: submit written certificates in French that tasks have been performed as follows:
    - .1       Work: completed and inspected for compliance with Contract Documents.
    - .2       Defects: corrected and deficiencies completed.
    - .3       Equipment and systems: tested, and fully operational.
    - .4       Certificates required by Boiler Inspection Branch, Utility companies submitted.
  - .4       Final Inspection:
    - .1       When completion tasks are done, request final inspection of Work by the Consultant, the Departmental Representative and Contractor.
    - .2       When Work incomplete according to Departmental Representative or Consultant, complete outstanding items and request re-inspection.
  - .5       Declaration of Substantial Performance: when the Consultant and the Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

**1.4 FINAL CLEANING**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1            General****1.1                RELATED REQUIREMENTS**

- .1            Divisions 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2                ADMINISTRATIVE REQUIREMENTS**

- .1            The elements mentioned in this section must be provided at completion that will arrive at the end of phase B. The services must be included in phase A contract, even if they are to be delivered at the end of phase B. Refer to the terms of the contract for approximate dates of the phases.
- .2            Pre-warranty Meeting:
  - .1            Convene meeting one week prior to contract completion with the Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:
  - .2            The Departmental Representative to establish communication procedures for:
    - .1            Notifying construction warranty defects.
    - .2            Determine priorities for type of defects.
    - .3            Determine reasonable response time.
  - .3            Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4            Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

**1.3                DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1            Provide documents and samples submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Three (3) weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four (4) final copies of operating and maintenance manuals in English and French.
- .3            Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4            Provide evidence, if requested, for type, source and quality of products supplied.

**1.4                FORMAT**

- .1            Organize data as instructional manual.
- .2            Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3            When multiple binders are used correlate data into related consistent groupings:
  - .1            Identify contents of each binder on spine.

- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab:
  - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on USB key.

## **1.5 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission.
  - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Data sheets: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Training: refer to Section 01 79 00 - Demonstration and Training.

## **1.6 AS -BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, at site for the Departmental Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, data sheets, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.

- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual:
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by the Departmental Representative.

## **1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .2 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .2 Measured depths of elements of foundation in relation to finish first floor datum.
  - .3 Field changes of dimension and detail.
  - .4 Changes made by change orders.
  - .5 Details not on original Contract Drawings.
  - .6 Referenced Standards to related shop drawings and modifications.
- .3 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .4 Other Documents: maintain manufacturer's certifications, required by individual specifications sections.
- .5 Provide digital photos, if requested, for site records.

## **1.8 EQUIPMENT AND SYSTEMS**

- .1 For each item of equipment and each system include description of unit or system, and component parts:
  - .1 Give function, normal operation characteristics and limiting conditions.
  - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.

- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences:
  - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
  - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .12 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage (> 200,000\$).
- .13 Additional requirements: as specified in individual specification sections.

## **1.9 MATERIALS AND FINISHES**

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations:
  - .1 Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

## **1.10 MAINTENANCE MATERIALS**

- .1 Spare Parts:
  - .1 Provide spare parts, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to site; place and store:
    - .1 Submit inventory listing to the Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.
  - .4 Obtain receipt for delivered products and submit prior to final payment.

- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to site; place and store.
  - .4 Receive and catalogue items:
    - .1 Submit inventory listing to the Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to [site] [location as directed]; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to the Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.

#### **1.11 DELIVERY, STORAGE AND HANDLING**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by the Departmental Representative.

#### **1.12 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Warranty management plan to include required actions and documents to assure that the Departmental Representative receives warranties to which it is entitled.
- .3 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .4 Submit, warranty information made available during construction phase, to the Departmental Representative for approval prior to each monthly pay estimate.
- .5 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (10) days after completion of applicable item of work.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.
- .6 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .7 Conduct a joint warranty inspection of major equipment pieces (> 200 000 \$) with the Departmental Representative after 9 months measured from time of acceptance, at the end of contract SR4B.
- .8 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
    - .11 Organization, names and phone numbers of persons to call for warranty service.
    - .12 Typical response time and repair time expected for various warranted equipment.
  - .3 Contractor's plans for attendance at 9 month post-construction warranty inspections.
  - .4 Procedure and status of tagging of equipment covered by extended warranties.
  - .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .9 Respond in timely manner to oral or written notification of required construction warranty repair work.

- .10 Written verification to follow oral instructions.
  - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 SEQUENCE OF CONTRACT**

- .1 The scope of work (phase "B") includes:
  - .1 Supply and delivery of all equipment mentioned in divisions 06 to 09, 23, 31 to 33, 40, A and D and submitted to the plans provided.
  - .2 The installation of equipment provided by the Departmental Representative.
  - .3 Connections to all services specified in specifications and drawings provided.
  - .4 Start-up, demonstration and specific training for each of the equipment provided under this contract or provided by the Departmental Representative under this contract.
- .2 Start-up, demonstration and training on equipment shall be provided at the time of completion and start-up of the project.

**1.2 RELATED REQUIREMENTS**

- .1 Division 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection.
- .2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
  - .1 Verify conditions for demonstration and instructions comply with requirements.
  - .2 Verify designated personnel are present.
  - .3 Ensure that materials, equipment and systems have been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and are fully operational.
  - .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
  - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, at the location designated.
  - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
  - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
  - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

- .5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system as follows:
  - .1 Hybrid boiler, minimum 6 hours.
  - .2 Bioreactor and Gas holder, minimum 2 days.
  - .3 Treatment of biogas (air injection, chlorine fittings injection, and drying), minimum 6 hours.
  - .4 Flare, minimum 1 day.
  - .5 Process Control, heating and ventilation system, minimum 2 days.
  - .6 Instrumentation, minimum 6 hours.
  - .7 Fire alarm and access control system, minimum 6 hours.
  - .8 Hydraulic door, minimum 6 hours.
  - .9 Macerator Pump, minimum 6 hours.
  - .10 Glycol piping and system, minimum 6 hours.
- .6 Original equipment manufacturers:
  - .1 The Contractor shall hire original equipment manufacturers to perform demonstrations and training required for equipment provided by the Departmental Representative (first 4 items listed in Previous point).
  - .2 The prices for these courses have already been submitted and must be included in the proposal for this contract. Refer to the slip provided with the administrative clauses.

#### **1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.
- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

#### **1.5 QUALITY ASSURANCE**

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

**Part 2            Products**

**2.1                NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Divisions 01, 06 to 08, 23, 31 to 33, 40, A and D

**1.2 SUMMARY**

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

**1.3 GENERAL**

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

- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.
- .4 AFD managed projects the term Departmental Representative in Cx specifications to be interpreted as AFD Service Provider.

#### **1.4 COMMISSIONING OVERVIEW**

- .1 Cx to be a line item of Contractor's cost breakdown.
- .2 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .3 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .4 The commissioning includes pre-operational verifications of all the equipment, but excludes the start-up of the process. If some equipment cannot be verified since they require, for example, biogas production, this equipment will be part of the elements to be completed following the provisional reception.
  - .1 The results of biogas production and quantity and quality of the digestate are excluded from the commissioning.
- .5 The introduction of firsts process inputs (excluding water) should be done under the supervision of the Departmental Representative who will provide the raw material.
- .6 The Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by the Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O&M training has been completed.

#### **1.5 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

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

**1.6 PRE-CX REVIEW**

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

**1.7 CONFLICTS**

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

**1.8 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit no later than 4 weeks after award of Contract:
    - .1 Name of Contractor's Cx agent.
    - .2 Draft Cx documentation.
    - .3 Preliminary Cx schedule.
  - .2 Request in writing to the Departmental Representative for changes to submittals and obtain written approval at least 4 weeks prior to start of Cx.

- .3 Submit proposed Cx procedures to the Departmental Representative where not specified and obtain written approval at least 4 weeks prior to start of Cx.
- .4 Provide additional documentation relating to Cx process required by the Departmental Representative.

## **1.9 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 The Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to the Departmental Representative.

## **1.10 COMMISSIONING SCHEDULE**

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

## **1.11 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 75% construction completion stage the Consultant to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
  - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
  - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by the Departmental Representative, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present upon the Departmental Representative request.

**1.12 STARTING AND TESTING**

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

**1.13 WITNESSING OF STARTING AND TESTING**

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

**1.14 MANUFACTURER'S INVOLVEMENT**

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

**1.15 PROCEDURES**

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

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

#### **1.16 START-UP DOCUMENTATION**

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

#### **1.17 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

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

**1.18 TEST RESULTS**

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

**1.19 START OF COMMISSIONING**

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

**1.20 INSTRUMENTS / EQUIPMENT**

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

**1.21 COMMISSIONING PERFORMANCE VERIFICATION**

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

**1.22 WITNESSING COMMISSIONING**

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

**1.23 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to the Departmental Representative within 5 days of test and with Cx report.

**1.24 COMMISSIONING CONSTRAINTS**

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

**1.25 EXTRAPOLATION OF RESULTS**

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by the Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formula.

**1.26 EXTENT OF VERIFICATION**

- .1 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .2 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .3 Perform additional commissioning until results are acceptable to the Departmental Representative.

**1.27 REPEAT VERIFICATIONS**

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

**1.28 SUNDRY CHECKS AND ADJUSTMENTS**

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

**1.29 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during start-up and Cx to satisfaction of the Departmental Representative.
- .2 Report problems, faults or defects affecting Cx to the Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from the Departmental Representative.

**1.30 COMPLETION OF COMMISSIONING**

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

**1.31 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

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

**1.32 TRAINING**

- .1 In accordance with Section 01 91 41 - Commissioning (Cx) - Training.

**1.33 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

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

**1.34 OCCUPANCY**

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

**1.35 INSTALLED INSTRUMENTATION**

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

**1.36 PERFORMANCE VERIFICATION TOLERANCES**

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10 % of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/- 2 % of recorded values.

**1.37 OWNER'S PERFORMANCE TESTING**

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

**Part 2 Products**

**2.1 NOT USED**

.1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

**Partie 1           General considerations****1.1               SECTION CONTENT**

- .1       All carpentry works to be integrated with the interior building elements.
- .2       All frames, blocking, blocking, furring, joists, anchors, screwing and nailing, shims, sub-frames, stringers, accessories (including those supplied and installed by others, where indicated, if applicable) and any other rough joinery required to complete the work.

**1.2               CONNECTED SECTIONS**

- .1       Section 07 10 00 - Air/Moisture Sealing
- .2       Section 07 92 00 - Joint Sealants
- .3       Section 08 11 00 - Metal Doors and Frames
- .4       Section 09 20 00 - Drywall Work
- .5       Section 09 91 00 - Painting
- .6       Divisions 22, 23 and 26 - Mechanical and electrical conduits

**1.3               REFERENCES (LAST PUBLICATIONS)**

- .1       American National Standards Institute/National Particleboard Association (ANSI/NPA)
  - .1       ANSI/NPA A208.1-2009 Particleboard.
- .2       ASTM International
  - .1       ASTM A 123/A 123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2       ASTM A153/A153M-09 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  - .3       ASTM A307-14 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength
  - .4       ASTM A 653/A 653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloyed-Coated (Galvannealed) by the Hot-Dip Process
  - .5       ASTM D 5055-13e1, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists
  - .6       ASTM D 5456-14b Standard Specification for Structural Composite Lumber Products
  - .7       ASTM F1667-13, Standard Specification for Driven Fasteners: Nails, Spikes and Staples
- .3       Canadian Wood Council
  - .1       Wood Design Manual 2010 (R2014) Edition
  - .2       Engineering Guide for Wood Frame Construction 2014
- .4       CSA International
  - .1       CAN/CSA-A123.2-03 (R2013) Roofing Felt Coated with Bitumen
  - .2       CSA B111, Wire Nails, Spikes and Staples (steel wire nails, plugs and jumpers).
  - .3       CSA O86-14, Design Rules for Wood Frames
  - .4       CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure)
  - .5       CSA O121-F08 (C2013), Douglas Fir Plywood.
  - .6       CSA O141-F05 (C2014), Softwood Lumber.

- .7 CSA O151-F09 (C2014), Canadian Softwood Plywood.
- .8 CSA O153-13, Poplar plywood.
- .9 CSA O325-FM07 (C2012), Intermediate Construction Coatings.
- .10 CAN/CSA-S406-92 (R2008), Construction of Preserved Wood Foundations. CAN/CSA-S406-92 (R2008), Construction of Preserved Wood Foundations
- .11 CAN/CSA-Z809-08, Sustainable Forest Management.
- .5 Forest Stewardship Council (FSC)
  - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .6 National Research Council Canada (NRC)
  - .1 National Building Code of Canada (NBCC)
- .7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI.
  - .1 SCAQ® Rule 1168- [A2005], Adhesives and Sealants Applications.
- .8 Sustainable Forestry Initiative
  - .1 SFI-2015-2019 standard.
- .9 Underwriter's Laboratories of Canada (ULC)
  - .1 CAN/ULC-S706-09, Building Fiberboard Insulation Board

#### **1.4 QUALITY ASSURANCE**

- .1 Marking plywood, particle board and OSB and composite wood-based panels to relevant CSA and ANSI standards.

#### **1.5 TRANSPORTATION, STORAGE AND HANDLING**

- .1 Delivery and Acceptance: Deliver materials and materials to the work site in their original packaging, which must be labeled with the name and address of the manufacturer.
- .2 Storage and Handling
  - .1 Store materials and materials so that they do not sit on the ground, indoors and dry, in a clean, dry, well-ventilated area as recommended by the manufacturer.
  - .2 Stack, lift, contraband, cut and score engineered wood products in strict accordance with manufacturer's instructions and recommendations.
  - .3 Replace damaged materials and equipment with new materials and equipment.
  - .4 Store reusable wood waste properly separated at the cutting station and the work area.

#### **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Do not burn rubbish on site.

### **Partie 2 Products**

#### **2.1 GENERAL CONSIDERATIONS**

- .1 Adhesives used in the manufacture of composite wood must not contain formaldehyde urea.

#### **2.2 BODY STRUCTURE**

- .1 Lumber: softwood with S4S finish (bleached on 4 sides) with a moisture content of no more than 19% (R-SEC).

- .1 Complies with CSA O141.
- .2 Meets NLGA's Canadian Lumber Grading Rules.
- .2 Finger-jointed and glued components approved under the SPS Special Products Standard (NLGA) are acceptable for studs.
- .3 Factory produced lumber:
  - .1 Exterior Phenolic Adhesive or Formol-Phenol Resorcinol Adhesive to CSA O112.9.
  - .2 Factory made subject to quality control according to ASTM D 5055.
- .4 Composite lumber must comply with ASTM D5456 for the following uses:
  - .1 Glulam lumber (LVL): beams, ridge and valley rafters and rim joists], as indicated.
  - .2 Oriented Slat Wood (OSL): Posts as indicated.

### 2.3 FURRING AND CALES

- .1 Furrings, wedges, nailing strips, nailing bases, subframes, cleats and battlements, members, nailing bases for fascia and joists.
  - .1 S2S finish elements are acceptable, except for carpentry elements.
  - .2 Boards: category (standard) or higher.
  - .3 Dimension lumber: classification (light (light) frame), category (standard) or higher.
  - .4 Poles and pieces of square wood: category (standard) or higher.

### 2.4 PANEL MATERIALS AND APPLICATION

- .1 Roof covering panels
  - .1 Douglas fir (Douglas fir) or Canadian softwood plywood, grade, or poplar plywood, squared edges, 16 mm thick.
- .2 Wall panels for exterior walls
  - .1 Douglas fir (Douglas fir) or Canadian softwood plywood, or squared plywood with squared edges, 13 mm thick.
- .3 Panels for mounting electrical equipment
  - .1 Douglas fir (Douglas fir) or Canadian softwood plywood, beautiful grade on one side or poplar plywood, beautiful class on one side, squared edges, 19 mm thick. The panel is flame retardant and meets the requirements of the regulators as to their characteristics.

### 2.5 ACCESSORIES

- .1 Sealants: See section 07 92 00 Joint Sealants
- .2 All purpose glue: complies with CSA O112.9.
- .3 Nails, plugs and jumpers: ASTM F1667 compliant.
- .4 Bolts: 12.5 mm in diameter, unless otherwise specified, with nuts and washers.
- .5 Patented fasteners: rocker bolts, expansion pads with lag screws, screws with lead or inorganic fiber bushings, explosive cartridge fasteners, recommended by the manufacturer.
- .6 Joist stirrups, connectors and fasteners: confined to shop drawings with steel sheet at least one (1) mm thick, and zinc-plated ZF001 designation.
- .7 Nailing discs: flat caps at least 25 mm in diameter and 0.4 mm thick, made of sheet metal, shaped to prevent bulging. Deformed discs (convex or concave) are not acceptable.
- .8 H-staples for roof coatings: panel thickness, extruded 6063-T6 aluminum alloy.

.9 , fixing devices

.1 Galvanized metal: according to ASTM A123/A123M, for external works.

.10 Sealing rail gasket: Closed-cell polyethylene foam gasket with a width corresponding to that of the seat rail and 6 mm thick.

## 2.6 SEALING MEMBRANES

.1 Section 07 10 00 - Air/Moisture Sealing

## 2.7 INSULATION

.1 Section 07 21 10 - Insulation

## 2.8 ADHESIVES

.1 General Purpose Adhesive for Construction: Complies with CSA O112.9 Series Standards.

.2 Contact adhesive: depending on the application.

## 2.9 FIXING DEVICES

.1 Galvanized metal: according to CAN/CSA G164-M, for interior works.

.2 Stainless steel: grade 302 or 304, for pressure-treated or flame-retarded woodwork, or outdoor structures, wet or exposed to water.

## 2.10 MANUFACTURE OF FINISHING CARPENTRY

### .1 CHARACTERISTICS RELATED TO SUSTAINABLE DEVELOPMENT

.1 Solid lumber and composite wood products: to CAN/CSA-Z809, FSC or SFI standards.

.2 Composite Wood Products: formaldehyde emissions within the following limits when tested according to ASTM E1333.

.1 Hardwood plywood with veneered core (HWPW-VC): 0.05 ppm

.2 Hardwood and composite core plywood (HWPW-CC): 0.05 ppm

.3 Particleboard (PB): 0.09 ppm

.4 Medium Density Fiberboard (MDF): 0.11 ppm

.5 Medium Density Fibreboard of Thickness (less than 8 mm) (tMDF): 0.13 ppm

.3 Coating:

.1 Clearcoat: VOC content up to 550 g/L, according to SCAQMD GS-11 regulation 1113.

.2 Paints: VOC content up to 100 g/L, according to GS-11 SCAQMD Rule 1113.

### .2 QUALITY

.1 Provide all materials and perform all work specified in this section according to the AWMAC Architectural Mill Standards.

.2 In the event of discrepancy between the contractual documents and the AWMAC Architectural Woodwork Standards, the Contract Documents take precedence.

### .3 MATERIALS/MATERIALS

.1 Softwoods and Hardwoods: Healthy wood meeting the requirements of the Architectural Woodworking Standards for grades, oven dried to lower the moisture content to the appropriate level at the work site .

.1 Wood with a strength rating is acceptable for all jobs.

.2 Douglas fir plywood (Douglas fir): complies with [CSA O121], classification (construction)," standard" category.

**Partie 3            Implementation****3.1                EXAMINATION/INSPECTION**

- .1            Verification of conditions: Before proceeding with the installation of joint sealants, ensure that the condition of surfaces/supports previously implemented under other sections or contracts is acceptable and allows the work to be carried out according to the written manufacturer's instructions.
  - .1            Make a visual inspection of the surfaces/supports.
  - .2            Immediately inform the Departmental Representative of any unacceptable conditions identified.
  - .3            Start installation work only after correcting unacceptable conditions.
- .2            Examine the works of other trades on which the work of this Section is based and report any defect that may affect their proper performance. Any work initiated will be considered an implicit acceptance of these works.

**3.2                CONSTRUCTION OF THE OSSATURE**

- .1            Install engineered wood framing and factory-made wood framing, including all brackets, connectors and fasteners, according to accepted shop drawings and manufacturer's instructions.
- .2            Install the elements square and plumb, according to the height dimensions, levels and alignments prescribed.
- .3            Install the seat rail gasket in continuous lengths between the concrete surfaces and the wood frame.
- .4            Realize the continuous elements from the longest possible pieces.
- .5            Install the bracing elements so that their arch is upwards.
- .6            Carefully choose the structural elements that will be left exposed. Install wood panels and components in a manner that conceals classification markings and signs of deterioration, or sanding these markings and traces from exposed surfaces.
- .7            Assemble, anchor, fix, fasten and counteract the elements to provide the necessary strength and rigidity.
- .8            If necessary, mill the holes so that the heads of the bolts do not protrude.
- .9            Set the type of panel specified for each application.
- .10          For soft cover materials, use nailing discs according to the material manufacturer's instructions.

**3.3                FURRING AND CALES**

- .1            Install furring and wedges necessary to spread the wall and support cabinets, wall and ceiling finishes, siding, curbs, soffits, siding, bathroom accessories, wall finishes, and ceilings, mounting panels for electrical equipment and other works as required.
- .2            Install furring to support vertical siding when the frame does not have shims and the liner can not be nailed directly to the framing.
  - .1            Install furring and wedges to ensure flatness and verticality of structures, the permissible deviation being 1: 600.
- .3            Install around bays false frames, nailing strips and trim to support frames and other structures.
- .4            Install the necessary furring and spacers where required, whether indicated on the drawings or not.

**3.4                CLEANING**

- .1            Leave the places clean at the end of each working day.
- .2            Remove surplus materials, excess materials, rubbish, tools and equipment.

**3.5 PROTECTION**

- .1 Protect installed equipment and components from damage during construction.
- .2 Repair damage to adjacent materials and equipment by glazing installation.

**3.6 INSTALLATION - GENERAL CONSIDERATIONS**

- .1 Comply with the requirements of the Specifications and according to the following requirements.
- .2 Carpentry work and finishing according to AWI/AWMAC/WI (Architectural Woodwork Standards) High Quality Recommendations.
- .3 Install the elements square and plumb, according to the height dimensions, levels and alignments prescribed.
- .4 Use only healthy materials, in the longest length to minimize joints. Use warp free materials that can not be corrected by anchoring or securing. To get rid of warped materials and other defects that would compromise the quality of the work.
- .5 Install the bracing elements so that their arch is upwards.
- .6 Carefully choose the structural elements that will be left exposed. Install wood panels and components in a manner that conceals classification markings and signs of deterioration, or sanding these markings and traces from exposed surfaces.
- .7 Install wall cladding panels and prefabricated items according to manufacturer's written instructions.
- .8 For materials not described in this specification, but indicated on cuts and plans, use those of the best quality.
- .9 Any piece of wood used outdoors, on the roof or fixed against concrete and masonry will be impregnated under pressure. Protect cut surfaces with compatible products.
- .10 Any damaged pieces of wood will be repaired or replaced if necessary.
- .11 Install around bays false frames, nailing strips and trim to support frames and other structures.
- .12 All structural work will be firmly anchored, carefully aligned and rigorously plumbed. Observe all indications of plans, such as furrings, suspended ceilings, blockages, anchors, rough penetrations, etc. Make any breakthroughs, rework, adjustments or other structural work and carpentry and any adjustments necessary or required for the proper performance of this contract.
- .13 Adjust the present works with those of other trades. Draw and fit for a precise fit. Match the location of furrings, nailing bottoms, wedges and similar supports with fasteners of other work. Check the dimensions indicated and record the dimensions before proceeding with the work.
- .14 Build and maintain in order throughout the construction, ladders, railings, ramps, walkways, bleachers and other equipment, which are necessary for the use of all trades and adequate protection of men. The necessary railings for openings in floors, roofs, etc., will be built with posts firmly reinforced and secured. They must have a minimum of 900mm (3'0" ) in height and must be installed as far as possible within 600mm (2'0") of the edges of the wells and openings.
- .15 No additional remuneration will be granted for any carpentry and hardware that are necessary for the proper performance of the work and which are not shown on the plans and/or specifications.
- .16 At the end of the work, complete inspection of the carpentry work and any necessary adjustments will be carried out without delay. Any damaged or soiled parts will be carefully repaired or replaced where necessary.

**3.7 FASTENING DEVICES**

- .1 Assemble, anchor, fix, fasten and counteract the elements to provide the necessary strength and rigidity.
- .2 If necessary, mill the holes so that the heads of the bolts do not protrude.

- .3 Use galvanized corrugated nails to secure the various treated wood elements.
- .4 For soft cover materials, use nailing discs according to the material manufacturer's instructions.
- .5 Provide all anchor bolts required to anchor and secure the woodwork to concrete or masonry. Collaborate with other trades and ensure that all bolts will be placed where required.

### **3.8 MOUNTING PANELS**

- .1 Provide and install the necessary panels for mounting electrical, mechanical and telephone equipment.
- .2 Unless otherwise specified, install the panels on a 19mm x 38mm ( $\frac{3}{4}$ " x 1  $\frac{1}{2}$ " ) frame, reinforced with the same size, installed at intervals of 300mm (12" ) or less.
- .3 Coordinate the installation of these panels so that they are painted before installation work on the equipment and the equipment.

### **3.9 OTHER WORKS INCLUDED AND RELATED TO COORDINATE**

- .1 Provide and install in plywood walls, wood blockings and windowheads or doors, as indicated on the plans, where necessary, at the other locations according to the details as well when not included in other sections of the specification.
- .2 Provide materials and perform all formwork, hangers, etc. required for pouring concrete.
- .3 Temporary Closures: Unless otherwise noted in the other sections, provide and install all temporary closures and exterior outlets mounted with proper hinges, handles and padlocks.
- .4 Additional Work: Provide and install all necessary wood pieces as requested in the mechanical and electrical plans as well as all plywood supports for electrical panels, etc.
- .5 All woodwork exposed to the weather or fixed against concrete or masonry must undergo pressure impregnated condom treatment.
- .6 Provide and install all other necessary items for woodwork and other related works.

### **3.10 CLEANING**

- .1 Leave the places clean at the end of each working day.

### **3.11 PROTECTION**

- .1 Protect installed equipment and components from damage during construction.
- .2 Repair damage to adjacent materials and equipment by glazing installation.

**END OF SECTION**

**Part 1            General****1.1                RELATED REQUIREMENTS**

- .1        Division 01 and A1030

**1.2                REFERENCE STANDARDS**

- .1        CSA International:
  - .1        CAN/CSA O80 Series-08, Wood Preservation.
  - .2        CSA O86 Consolidation-09, Engineering Design in Wood.
  - .3        CSA O141-F05 (R2014), Softwood Lumber.
  - .4        CSA S307-M1980 (R2006), Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.
  - .5        CSA S347-99 (R2014), Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
  - .6        CSA W47.1-F09, Certification of Companies for Fusion Welding of Steel.
  - .7        CAN/CSA-Z809-08, Sustainable Forest Management.
- .2        Forest Stewardship Council (FSC):
  - .1        FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .3        National Lumber Grades Authority (NLGA):
  - .1        Standard Grading Rules for Canadian Lumber 2017.
- .4        National Research Council Canada (NRC):
  - .1        National Building Code of Canada 2010 (NBC):
  - .2        Canadian Construction Materials Centre (CCMC)-on-line edition, Registry of Product Evaluations.
- .5        Truss Plate Institute of Canada (TPIC):
  - .1        TPIC - 2007, Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (Limit States Design).
- .6        Sustainable Forestry Initiative (SFI):
  - .1        SFI-2010-2014 Standard.

**1.3                DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

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

- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Quebec, Canada.
  - .2 Include on drawings:
    - .1 Each shop erection drawing submission.
    - .2 Indicate special structural application and specification as according to local authorities having jurisdiction.
    - .3 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates.
    - .4 Indicate species, sizes, and stress grades of lumber used as truss members. Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for members.
    - .5 Submit stress diagram or print-out of computer design indicating design load for truss members. Indicate allowable load and stress increase.
    - .6 Provide certification that trusses meet requirements of CSA S307 and CSA S347.
    - .7 Indicate arrangement of webs or other members to accommodate ducts and other specialties.
    - .8 Show location of lateral bracing for compression members.
    - .9 Test reports: submit certified test reports for prefabricated wood trusses from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
    - .10 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
    - .11 Instructions: submit manufacturer's installation instructions.

#### **1.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Fabricator for trusses to show evidence of quality control program such as provided by regional wood truss associations, or equivalent.
  - .2 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.

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

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

- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect wood trusses from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
  - .4 Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses.

## **Part 2 Products**

### **2.1 DESIGN REQUIREMENTS**

- .1 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for wood truss chords and webs in accordance with engineering properties in CSA O86.
- .2 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for truss joint designs to test engineering properties in accordance with CSA S347 and listed in CCMC Registry of Product Evaluations.
- .3 Design trusses, bracing, bridging in accordance with CSA O86.1 and minimum uniform and minimum concentrated loadings stipulated in NBC commentary for building locality as ascertained by National Building Code of Canada (NBC), Climatic Information for Building Design in Canada for loads indicated.
- .4 Limit live load deflection to 1/360th of span where ceilings are hung directly from trusses.
- .5 Limit live load deflections to 1/240<sup>th</sup> of span unless otherwise specified or indicated.
- .6 Provide camber for trusses as indicated.

### **2.2 MATERIALS/EQUIPMENT**

- .1 Materials and products in accordance with Section [01 47 15- Sustainable Requirements: Construction].
- .2 Lumber: Eastern spruce, 4-sided (S4S) No. 2, with maximum moisture content of 19 % at time of fabrication and to following standards; S4S:
  - .1 CSA O141.
  - .2 National Lumber Grading Association, Standard Grading Rules for Canadian Lumber (NLGA).
  - .3 CAN/CSA-Z809 or FSC or SFI certified.
- .3 Fastenings: to CSA O86.

**2.3 FABRICATION**

- .1 Fabricate wood trusses in accordance with approved shop drawings.
- .2 Provide for design camber and roof slopes when positioning truss members.
- .3 Connect members using metal connector plates.

**2.4 SOURCE QUALITY CONTROL**

- .1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

**Part 3 Execution****3.1 EXAMINATION**

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

**3.2 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.

**3.3 ERECTION**

- .1 Erect wood trusses in accordance with approved shop drawings.
- .2 Handling, installation, erection, bracing and lifting in accordance with manufacturers instructions.
- .3 Make adequate provisions for handling and erection stresses.
- .4 Exercise care to prevent out-of-plane bending of trusses.
- .5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.
- .6 Install permanent bracing in accordance with approved shop drawings, prior to application of loads to trusses.
- .7 Do not cut or remove any truss material without approval of the Departmental Representative.
- .8 Remove chemical and other surface deposits on treated wood, in preparation for applied finishes.

### **3.4 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its product(s), and submit written reports, in acceptable format, to verify compliance of work with Contract.
  - .2 Manufacturer's field services: provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
  - .3 Upon completion of work, after cleaning is carried out.
- .2 Obtain reports within three (3) days of review and submit immediately to the Departmental Representative.

### **3.5 CLEANING**

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

**END OF SECTION**

**Partie 1           General considerations****1.1               SECTION CONTENT**

- .1 Elements and assemblies designed to provide continuous sealing by means of membranes and attached accessories between shell elements and building openings and perforations including the following assemblies:
  - .1 Floor slabs
  - .2 Foundation walls, including soles
  - .3 Exterior Walls
  - .4 Roofing
  - .5 Other assemblies and junctions
- .2 Sealants and caulking applicable for this Section are described in Section 07 92 00 – Joint Sealants.
- .3 Unless otherwise specified, all trades must refer to this Section for protection against air, moisture and water.

**1.2               CONNECTED SECTIONS**

- .1 Section 06 10 00 – Articles of Wood
- .2 Section 07 21 10 - Insulation
- .3 Section 07 62 00 - Sheet Metal Flashings and Trim
- .4 Section 07 92 00 – Joint Sealants
- .5 Section 08 11 00 - Metal Doors and Frames
- .6 Section 08 50 00 - Windows
- .7 Section 09 20 00 - Drywall Work
- .8 Division 3 - Structure - Concrete Structures

**1.3               REFERENCES (LAST PUBLICATIONS)**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-19.13, One-component, Elastomeric, Chemical Curing Sealant.
  - .2 CAN/CGSB-19.18M, Silicone-Based, One-Component Sealing Compound, Solvent Evaporative Polymerization.
  - .3 CAN/CGSB-19.24, Multi-Component Sealant, Chemical Curing.
  - .4 CGSB19-GP-14M, One-component butyl-polyisobutylene-based sealant, solvent-evaporation polymerization.
  - .5 CAN/CGSB-51.33-M89, Sheet vapor barrier, except polyethylene, for buildings.
  - .6 CGSB 51.34, Polyethylene sheet vapor barrier for buildings.
- .2 Canadian Council of Standards (Standard Council of Canada)
  - .1 CAN/ULC-S741, Standard for air barrier materials - specification.
- .3 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
  - .2 ASTM E96/E96M Standard Test Methods for Water Vapor Transmission of Materials.
  - .3 ASTM E154/E154M, Standard Test Methods for Water Vapor Retarders Used in Contact with Underground Concrete Slabs, on Walls and Ground Cover.
  - .4 ASTM E283, Standard Test Method for Determining the Rate of Air Leakage Through Exterior

- Windows, Curtain Walls, and Doors Under the Differential Pressure Across Specimen.
- .5 ASTM E1186, Standard Practices for Air Leakage Site Detection in Building Envelope and Air Retarder Systems.
  - .6 ASTM E1643, Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth and Granular Fill Under Concrete Slabs.
  - .7 ASTM E1745, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
  - .8 ASTM E2178 Standard Test Method for Air Permeance of Building Materials.
- .4 Part 5 of the Quebec Building Code, Separation of Different Environments.
  - .5 Sealant and Waterproofers Institute - Sealant and Caulking Guide Specification.

#### 1.4 DOCUMENTS AND SAMPLES TO SUBMIT

- .1 Technical Data Sheets: Submit the required data sheets, as well as the manufacturer specifications and documentation for the products. The data sheets must indicate:
  - .1 Product characteristics
  - .2 Performance criteria;
  - .3 Constraints.
- .2 Quality Assurance
  - .1 Instructions: Submit the installation instructions provided by the manufacturer and comply with the manufacturer requirements, recommendations and written specifications, including any technical bulletin, handling, storage and installation instructions. to the indications of the data sheets.

#### 1.5 QUALITY ASSURANCE AND PERFORMANCE REQUIREMENTS

- .1 Perform complete and uninterrupted waterproofing to moisture, air and water vapor, ensuring continuity of protection from the foundation walls to the roof, covering all surfaces, also ensuring continuity with existing surfaces.
- .2 Install wall and roof elements and assemblies so that there is minimal air leakage due to static and dynamic air pressure, on the roof and exterior walls, including the wall - curtain and windows, glazings, doors, louvers and any other interruption of the airtightness of the walls. When subjected to a differential pressure of 75 Pa or for one hour at wind pressures likely to occur once every ten years, according to the NBC, the air barrier system of the walls and roof must not show air leakage with a flow rate greater than 0.15 L/s.m<sup>2</sup>, measured according to the requirements of ASTM E96.
- .3 The work must be performed according to the requirements of the Sealant and Caulking Guide Specification of the Sealant and Waterproofers Institute for materials and their application.
- .4 The work must be performed according to the requirements of the National Air Barrier Association Professional Contractor Quality Assurance Program and the materials and their implementation.
- .5 The work must be performed according to the requirements of the Canadian Urethane Foam Contractor's Association Professional Contractor Quality Assurance Program and the materials and their implementation.
- .6 Keep a copy of the documents on the site.

#### 1.6 TRANSPORTATION, STORAGE AND HANDLING

- .1 Materials and materials must be transported, stored and handled according to the manufacturer's written instructions, in their intact packaging, clearly indicating the name of the manufacturer and the product.
- .2 Avoid accidental spills. If necessary, notify the Departmental Representative and clean up.
- .3 in the event of accidental spills, clean soiled surfaces and return them to their original condition.

- .4 Store hot-applied rubber asphalt outdoors in closed containers. Do not overheat hot applied rubber bitumen.
- .5 Store primers at a temperature above 5 ° C to facilitate handling. Keep solvents away from open flame and sources of excessive heat.
- .6 Store the materials in upright rolls with the joints side up.
- .7 Do not use primers containing solvents near the open flame.

**1.7 IMPLEMENTATION CONDITIONS**

- .1 It is prohibited to use solvent evaporative polymerization sealants or vapor-releasing adhesive materials in enclosed areas without ventilation.
- .2 Confined spaces must be ventilated.
- .3 Maintain the temperature and humidity at the levels recommended by the materials manufacturers before, during and after their use.
- .4 Do not apply the waterproofing membrane in wet weather or on a gel-covered or wet surface. Wait at least fourteen (14) days for the concrete to dry before installing the membrane.
- .5 For an application during the cold period, store the materials at a warm temperature before use and according to the manufacturer recommendations. Apply at temperatures above 0 ° C, unless otherwise specified by the manufacturer.

**1.8 COORDINATION**

- .1 Coordinate work closely with continuous works to ensure perfect continuity of the envelope's vapor barrier and air barrier.
- .2 Ensure that all the work to be done before the membranes are put in place are completed.
- .3 Check the compatibility of the membranes with the materials they will be in contact with.

**1.9 EXTENDED WARRANTY**

- .1 For sealants and sheet seals, the warranty will be **five (5) years**. Submit the warranty according to the requirements of Section 01 33 00 - Submittal Procedures.
- .2 Provide a written and signed document stating that the sealing work is warranted against leakage by the manufacturer and the Contractor for a period of **ten (10) years** for the materials and **five (5) years** for the manpower, from the date of substantial completion of the work.
- .3 The warranty must cover the sealants and sheet seals used which do not provide the air and water tightness, loss of adhesion or cohesion, or do not take it.

**Partie 2 Products**

**2.1 GENERAL CONSIDERATIONS**

- .1 All adhesives and primers must be compatible with each other and with the membranes as recommended by the manufacturer.

**2.2 SEALING MEMBRANES**

TABLE OF SEALING MEMBRANES			
IDENTIFICATION (Types)	Applicable Standards/Characteristics	Acceptable products	Application location where indicated, including
Type MEMB.1	<ul style="list-style-type: none"> <li>▪ CAN/CGSB-51.34</li> <li>▪ ASTM E1745 Class A, B and</li> </ul>	<ul style="list-style-type: none"> <li>▪ Perminator from WR Meadows</li> </ul>	<ul style="list-style-type: none"> <li>▪ Under the concrete slab</li> </ul>

Vapor barrier membrane made of extra-strong polyethylene film	<ul style="list-style-type: none"> <li>▪ C</li> <li>▪ 254 micron film (10 mils)</li> <li>▪ Use with reinforcing tape of at least 100mm (4" ).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Duchesne's Ultra X Pro</li> </ul>	
Type <b>MEMB.2</b> Vapor barrier membrane made of extra-strong polyethylene film	<ul style="list-style-type: none"> <li>▪ CAN/CGSB-51.34</li> <li>▪ 0.15mm film (6 mils)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Duchesne Ultra +</li> </ul>	<ul style="list-style-type: none"> <li>▪ Exterior Walls</li> <li>▪ Where indicated in the drawings</li> </ul>
Type <b>MEMB.5</b> Self-adhering air/vapor barrier membrane	<ul style="list-style-type: none"> <li>▪ CAN/ULC S741 and CAN/ULC-S742</li> <li>▪ ASTM E2178 and E2357</li> <li>▪ Ribbon membrane 200mm wide min.</li> <li>▪ Self-adhesive.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Membrane 3015 from 3M</li> </ul>	<ul style="list-style-type: none"> <li>▪ Around openings</li> <li>▪ Junction of walls and foundations</li> <li>▪ Junction of flashings</li> <li>▪ Any change of direction of membrane</li> </ul>
Type <b>MEMB.7</b> Air barrier membrane made of high density polyethylene sheet	<ul style="list-style-type: none"> <li>▪ ASTM E1677 and E2178</li> <li>▪ Air permeance of 0.175 L/sec. m<sup>2</sup> minimum.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Tyvek from DuPont</li> </ul>	<ul style="list-style-type: none"> <li>▪ Exterior Walls</li> </ul>
Type <b>MEMB/C.16</b> WATERPROOFING MEMBRANE	<ul style="list-style-type: none"> <li>▪ Membrane composed of bitumen modified with SBS polymers and a nonwoven polyester reinforcement</li> <li>▪ Thickness 2.5mm</li> <li>▪ Mechanically fixed</li> </ul>	<ul style="list-style-type: none"> <li>▪ Soprafix Base 630 from Soprema</li> </ul>	<ul style="list-style-type: none"> <li>▪ Underlay of the current part of the roof</li> </ul>
Type <b>MEMB.18</b> WATERPROOFING MEMBRANE	<ul style="list-style-type: none"> <li>▪ polyester-reinforced membrane with granulated surface</li> <li>▪ Thickness</li> </ul>	<ul style="list-style-type: none"> <li>▪ Soprene Flam 250 GR from Soprema</li> </ul>	<ul style="list-style-type: none"> <li>▪ Finishing layer of the current part of the roof, readings and railings</li> </ul>
Type <b>MEMB.23</b> Foundation plaster	<ul style="list-style-type: none"> <li>▪ Coating composed of bitumen and fast evaporation solvent.</li> <li>▪ 0.5 to 0.7 l/m<sup>2</sup> (1.2 to 1.7 US gal/100 ft<sup>2</sup>)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Resisto Foundation Coating</li> </ul>	<ul style="list-style-type: none"> <li>▪ Foundation wall and soles</li> </ul>

### 2.3

#### PRIMERS AND ADHESIVES

- .1 **Type MEMB/AD.1** : Polyethylene film membrane adhesive: all-purpose adhesive based on an elastic black emulsion, high solids content.
  - .1 Acceptable Product: As manufactured by Soprema
- .2 High Power Adhesive 90, 94 from 3M or 30-NF Fastbond from 3M
- .3 Adhesives recommended by the manufacturer.
- .4 Provide the primer recommended by the manufacturer of the overlay materials to promote adhesion between the substrate and the overlay material.

**2.4 ACCESSORIES**

- .1 Sealants: compatible with the membrane used, and recommended by the manufacturer of the latter. Section 07 92 00 - Joint Sealants
- .2 **Type MEMB/RC.1** : Connection and intramural membranes: Membrane composed of SBS modified bitumen and a trilaminar polyethylene woven fabric on the upper surface, which can serve as membrane for walls, and/or intramural, and/or for openings. The adhesive underside is protected by a detachable silicone sheet. Available in summer grade, for applications at temperatures above 10 ° C and in winter grade for applications between 10 ° C and +10 ° C.
  - .1 Acceptable product: Sopraseal stick 1100T or Sopralene adhesive stick of Soprema
- .3 Sealant: SBS-modified bitumen putty, fiber, mineral and solvent.
  - .1 Acceptable product: Sopramastic from Soprema
- .4 Sealant based on synthetic rubber plasticized with bitumen.
  - .1 Acceptable product: Sopramastic 200 from Soprema Company
- .5 Joint tape for polyethylene film membrane: 100 mm (4" ) wide.
  - .1 Acceptable Product: WR Meadows Perminator Tape
- .6 Joint sealing tape: airtight, single-sided, duct-type adhesive tape of the type recommended by the vapor barrier manufacturer, 50 mm wide in the case of overlap and peripheral seals, and 25 mm in the case of other seals, or as written by the manufacturer.
- .7 Thinner and membrane cleaner: as recommended by the sheet seal manufacturer
- .8 Fasteners: bars and anchors in galvanized steel.
- .9 Mechanical fasteners: fasteners with protective disc and as recommended by the manufacturer.
- .10 Protective pipe sleeves: Make protective pipe sleeves with the vapor barrier material and pressure-sensitive tape according to the manufacturer's instructions.

**2.5 THERMAL RUPTURE**

- .1 Neoprene molding.
  - .1 Acceptable product: As manufactured by Cie Dupont.

**Partie 3 Implementation****3.1 GENERAL**

- .1 Comply with the requirements of the Quebec Building Code and the Regulation respecting energy conservation in new buildings in Québec or the more stringent requirements indicated.
- .2 Comply with the standards referenced and the manufacturer's instructions for the application of the different products.
- .3 Ensure the compatibility of all materials in contact, as well as the materials and substrates to which they are applied.
- .4 Ensure substrate, adhesive and primer are completely clean and dry, free of oil, grease, dirt, ice and scrap material, excess mortar or other contaminants before to lay the membranes. Fill the crumbled sections to obtain a smooth surface.
- .5 Ensure that the curing time of the concrete is adequate in relation to the type of membrane used. Unless otherwise specified, concrete surfaces must have been cured for at least fourteen (14) days, and must be dry before applying air barrier membranes.
- .6 Unless otherwise stated, do not cover or apply other materials to the membranes until they are completely ripe.

- .7 Do not install materials in rainy or snowy weather.
- .8 When curing agents are used, they must be based on clear resin and contain no oil, wax or pigments.
- .9 Any cracks over 12mm (1/2" ) must be filled.
- .10 Protect adjacent surfaces and materials from excessive spraying (spatter, dispersions, etc.) of primers, coatings, gelled membranes, etc.
- .11 Check and ensure the continuity of the air/vapor barrier and waterproofing systems; repair punctures and tears, seal around staples and other projections.
- .12 Repair existing damaged membranes during demolition work with identical or compatible materials.
- .13 Coordinate with Civil/Structure/Mechanical/Electrical divisions to avoid conflicts in excavation, backfilling, earthworks and installation of French drains or conduits.
- .14 Unless supplied and installed by others, provide galvanized metal flashings 0.61 mm (24 g) thick, where required, to ensure continuity of air/vapor barriers. Coordinate with other trades.

### **3.2 INSPECTION**

- .1 Ensure that the surfaces are ready to receive the work prescribed in this section, and that the conditions of implementation are adequate.
- .2 Ensure that all factors that may affect the workmanship, such as temperature and ventilation, are adequate for the job.
- .3 Notify the professionals in writing of any unsatisfactory condition or any defect that may affect the quality of the work before the work begins.
- .4 It is forbidden to start work before anomalies have been corrected. The fact that the Contractor begins the work means that the contractor accepts the condition of the work.

### **3.3 PRELIMINARY WORKS**

- .1 Remove loose or foreign materials that could compromise the adhesion of materials.
- .2 All surfaces must be smooth, sound, dry, clean, free from oil, grease, dust or frost, excess mortar and other contaminants, large depressions, loose materials or sharp edges.
- .3 Ensure that all substrates are free of oil and excessive accumulation of dust; open joints must be filled; there must be no large voids, sponged areas or sharp protuberances on the concrete surfaces. Repair cracks, holes and other surface defects.
- .4 Make sure there is no moisture on the surface of the substrates before applying the membrane.
- .5 Metal surfaces must be free of sharp edges and burrs.
- .6 According to the manufacturer's instructions, prime the surface of the substrates that are to receive adhesives and sealants.
- .7 Dynamic cracks or those more than 3mm wide will be reported to the Departmental Representative prior to membrane installation. As for non-dynamic cracks, up to 3mm wide, they must be treated with a 150mm wide strip of detail that will be centered on the crack. The installation of the band will be done before the installation of the membrane.
- .8 Apply primers according to manufacturers' recommendations.

### **3.4 IMPLEMENTATION - GENERAL**

- .1 Implement the materials according to manufacturers' instructions and architectural drawings.
- .2 Apply primer on overlapping parts to ensure complete adhesion.
- .3 Apply liquid waterproofing in areas with difficult access to the trowel. Caulk with a sealant to obtain a

perfectly waterproof structure.

- .4 Be sure to install the membranes the same day as the primer application, otherwise a new primer application may be required.
- .5 Sealing work must be done continuously as surfaces are ready and weather conditions permit.
- .6 Overlap the sealing sheet and seal with a tape joint. Make lap joints on a solid support.
- .7 In order to minimize the number of joints, use sheets with the largest possible dimensions.
- .8 Make sure the leaves form a continuous barrier. If necessary, repair perforations and tears with a sealing tape before concealing the work.
- .9 Install the roll seal between the door and window frame and adjacent wall sealing materials with an adhesive. Caulk to obtain a perfectly sealed structure. Make lap joints on a solid support.
- .10 Apply sealant when the temperature is within the recommended temperature range. Consult the manufacturer of the product when it is impossible to apply it under the prescribed conditions.

### **3.5 INSTALLATION OF VAPOR BARRIER MEMBRANE IN SHEETS UNDER SLAB**

- .1 The installation must be carried out according to the manufacturer's instructions and ASTM E 1643.
- .2 Unroll the vapor barrier by placing the largest side parallel to the pouring direction.
- .3 Overlap the vapor barrier on the soles and seal to the foundation walls.
- .4 Overlap the fittings on 150mm (6" ) and seal with the manufacturer recommended tape.
- .5 Seal all protruding objects (including hoses) with the manufacturer recommended protective hose sheath.
- .6 No protrusion of the vapor barrier is permitted except for reinforcing steel and permanent technical equipment.
- .7 Repair damaged areas by covering them with cut-off vapor barriers, making sure to overlap at least 150mm (6" ) and gluing all four sides with sealant and sealant tape.
- .8 Install the vapor barrier on a well compacted and leveled stone dust or sand substrate as shown in the drawings.
- .9 Extend the 100mm (4" ) membrane to columns and foundation walls.
- .10 Install a connection membrane at all service perforations and at the meeting of all foundation columns and walls.
- .11 After laying the reinforcement and before pouring concrete, check and repair any tears or holes with a piece of the membrane and seal all around.

### **3.6 INSTALLATION OF MEMBRANE TYPE MEMB.23**

- .1 The concrete surface must be sound and free from cracks or other irregularities. Avoid application on wet or frosty surfaces. Seal the formwork tie rods with a plastic cement before applying the foundation coating.
- .2 Make sure the coating is dry to the touch before allowing backfilling.

### **3.7 INSTALLATION OF THE POLYETHYLENE VAPOR BARRIER AND OTHER MEMBRANES IN SHEETS AND ROLLS**

- .1 The material is mainly used in buildings built above ground level and inside those built below ground level.
- .2 The material must have a uniform appearance and must be free of visible defects such as holes, tears, blisters and stings, according to good construction practice.
- .3 The material must not be sticky to the point of tearing or damage during unwinding.
- .4 Manufacturers' installation guides describe how their products must be joined to interior studs, interior

foundation, windows and doors as well as wall and ceiling perforations to ensure the continuity of the vapor barrier.

- .5 Cover rear of switches and outlets (exterior walls). Pass the poly behind the cabinet avoiding perforation/secure the cabinet to the amount/marry the pre-installed poly when installing the cabinet to that of the wall with tape.
- .6 Apply a bead of acoustical sealant (putty) all along the sand pit and the rail on which the vapor barrier will adhere.
- .7 Install the roller vertically, close to the wall, so that it can be easily unrolled along the wall. Unroll the vapor barrier, down it on the acoustical sealant cords and lay down the staples. Make sure that a horizontal fur comes to support the poly in the sealer along the smooth and sand pit.
- .8 Then press along the previously applied sealant to form a seal between the film and the frame.
- .9 Cover joints as needed. Have them overlap on 2 consecutive frame elements. First seal the amount to which the first membrane will adhere. Then apply a bead of sealant on the previous post covered with the vapor barrier, to which will adhere the second membrane forming the seal. Continue along the exterior wall until completely covered and sealed. The vapor barrier of the ceiling will fall back over that of the outer walls.
- .10 Pass the poly behind the cabinet avoiding perforation/secure the cabinet to the amount/marry the pre-installed poly when installing the cabinet to that of the wall with tape.
- .11 Seal the poly to the face of the window or door jamb (acoustical sealant). Seal the space between the window or door frame and the structure of the building with sprayed urethane, avoiding to let it overflow so as not to have to cut it off.

### **3.8 INSTALLATION OF AIR BARRIER SHEETS AND ROLLS OF WOVEN AND NONWOVEN THERMOPLASTIC FIBERS**

- .1 Install the air barrier before installing doors and windows.
- .2 Do not leave the air barrier exposed to ultraviolet light as recommended by the manufacturer of the air barrier.
- .3 Install sheet air barriers from the top of the foundation on surfaces such as: plywood, particle board and OSB.
- .4 Make sure the air barrier is airtight and free of tears and punctures. Seal all openings in the air barrier before installing the exterior finish.

### **3.9 PROTECTION OF THE WORK**

- .1 Take the necessary precautions to prevent contiguous works from damaging the work performed under this section.
- .2 Protect the finished work against the weather.

**END OF SECTION**

**Partie 1           General considerations****1.1               SECTION CONTENT**

- .1       Panel insulation, mat insulation, loose insulation and projected insulation.
- .2       Insulation of foundation walls.
- .3       Insulation of interior walls.
- .4       Insulation of the exterior walls.
- .5       Insulation for the roof.
- .6       Wherever required to complete the work and in the places indicated on the architectural drawings.

**1.2               CONNECTED SECTIONS**

- .1       Section 06 10 00 – Articles of Wood
- .2       Section 07 10 00 - Air/Moisture Sealing
- .3       Section 07 62 00 - Sheet Metal Flashings and trims
- .4       Section 07 92 00 – Joint Sealants
- .5       Section 08 11 00 - Metal Door and Frame
- .6       Section 08 50 00 - Windows
- .7       Section 09 20 00 - Drywall Work

**1.3               REFERENCES (LAST PUBLICATIONS)**

- .1       American Society for Testing and Materials International, (ASTM)
  - .1       ASTM C208 Specification for Cellulosic Fiber Insulating Board. (Pannels)
  - .2       ASTM C516 Standard Specification for Vermiculite Loose Fill Thermal Insulation. bulk
  - .3       ASTM C549, Standard Specification for Perlite Loose Fill Insulation. bulk
  - .4       ASTM C553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications. Mattress
  - .5       ASTM C591, Standard Specification for Unfilled Preformed Rigid Cellular Polyisocyanurate Thermal Insulation. (Pannels)
  - .6       ASTM C612, Standard Specification for Mineral Fiber Block and Thermal Insulation Board. (Pannels)
  - .7       ASTM C665, Specification for Mineral Fiber Blanket Thermal Insulation for Frame Construction and Manufactured Housing. Mattress
  - .8       ASTM C726 Standard Specification for Mineral Fiber Roof Insulation Board. (Pannels)
  - .9       ASTM C728, Standard Specification for Perlite Thermal Insulation Board. (Pannels)
  - .10      ASTM C739, Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation. bulk
  - .11      ASTM C1126, Standard Specification for Faced or Unfiled Rigid Cellular Phenolic Thermal Insulation. (Pannels)
  - .12      ASTM C1289, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board. (Pannels)
  - .13      ASTM C1320, Standard Practice for Installation of Mineral Fiber Batt and Thermal Insulation Blanket for Light Frame Construction. Mattress
  - .14      ASTM E96/E96M Standard Test Methods for Water Vapor Transmission of Materials. (Pannels)
- .2       Canadian General Standards Board (CGSB)

- .1 CGSB 71-GP-24M, Flexible Adhesive for Expanded Polystyrene Insulation. (Pannels)
- .2 CGSB 51.34, Polyethylene sheet vapor barrier for buildings. bulk
- .3 Canadian Standards Association (CSA)/CSA International.
  - .1 CSA B111, Wire Nails, Spikes and Staples (steel wire nails, plugs and jumpers).
- .4 Underwriter's Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701, Standard for Polystyrene Thermal Insulation, Panels and Pipe Coatings. (Pannels)
  - .2 CAN/ULC-S702, Standard for Mineral Fiber Thermal Insulation for Buildings. (Pannels/Mattress/Bulk)
  - .3 CAN/ULC-S703, Standard for Mineral Fiber Thermal Insulation for Buildings. bulk
  - .4 CAN/ULC-S704, Standard for Urethane and Isocyanurate Thermal Insulation: Coated Panels. (Pannels)

**1.4 QUALITY ASSURANCE**

- .1 One (1) week before the beginning of the work covered by this section and the installation work, hold a meeting at which:
  - .1 The requirements of the works;
  - .2 The state of the support and the conditions of installation;
  - .3 Coordination of work with those performed by other trades;
  - .4 The manufacturer's instructions regarding the installation and the terms of the warranty offered by the manufacturer.
- .2 Health and safety: take the necessary measures regarding health and safety in construction.
- .3 The use of phenolic insulation is to be avoided.

**1.5 DOCUMENTS AND SAMPLES TO SUBMIT**

- .1 Manufacturer's Instructions: Submit installation instructions provided by the manufacturer.

**1.6 CONDITIONS FOR IMPLEMENTATION**

- .1 Proceed with the installation of the insulation only when the ambient temperature and the temperature of the surfaces to be insulated are within the limits prescribed by the manufacturer.
- .2 Protection
  - .1 Provide temporary enclosures to prevent the generated dust from contaminating the air outside the area of application.
  - .2 Protect surrounding surfaces and equipment from damage that may be caused by fallout and generated dust.

**Partie 2 Products**

**2.1 INSULATION**

INSULATION TABLE			
IDENTIFICATION (Types)	Applicable Standards/Characteristics	Acceptable products	Application location where indicated, including
ISOL.M1 type Thermal insulation made of mineral fiber (rock fiber)	<ul style="list-style-type: none"> <li>▪ CAN/ULC S702, S-102 and CAN4-S114</li> <li>▪ Insulating value according</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rockwool Comfortbatt from Rockwool</li> </ul>	<ul style="list-style-type: none"> <li>▪ Wood frame exterior walls</li> <li>▪ Inner drywall</li> </ul>

	<ul style="list-style-type: none"> <li>to indications</li> <li>▪ Semi-rigid</li> </ul>		
<p>Type <b>ISOL.P1</b> Extruded polystyrene panel insulation</p>	<ul style="list-style-type: none"> <li>▪ CAN/ULC S701</li> <li>▪ RSI: 0.88/25mm (R: 5/in)</li> <li>▪ Compressive Strength: 210 Kpa (30 psi)</li> <li>▪ Dimensions: 610 mm x 2438 mm (24" x 96")</li> <li>▪ Thickness:</li> <li>▪ Ship-lapped edges</li> </ul>	<ul style="list-style-type: none"> <li>▪ Foamular C-300 from Owens Corning</li> </ul>	<ul style="list-style-type: none"> <li>▪ Below ground level on the face of the foundation walls</li> </ul>
<p>Type: <b>ISOL.P2</b> High density extruded polystyrene panel insulation</p>	<ul style="list-style-type: none"> <li>▪ CAN/ULC S701</li> <li>▪ RSI: 0.88/25mm (R: 5/in)</li> <li>▪ Compressive strength: 275 Kpa (40 psi)</li> <li>▪ Dimensions: 610 mm x 2438 mm (24" x 96")</li> <li>▪ Thickness: 25 mm, 38 mm, 51 mm, 76 mm and 102 mm (1", 1.5", 2", 3" and 4")</li> <li>▪ Ship-lapped edges</li> </ul>	<ul style="list-style-type: none"> <li>▪ Foamular 400 from Owens Corning</li> <li>▪ Styrofoam HI 40 from Dow</li> </ul>	<ul style="list-style-type: none"> <li>▪ Under the concrete slab</li> </ul>
<p>Type: <b>ISOL.G1</b> Single-component polyurethane foam insulation</p>	<ul style="list-style-type: none"> <li>▪ Low expansion</li> </ul>	<ul style="list-style-type: none"> <li>▪ Dufast Foam from Adfast Corp.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Window frames</li> <li>▪ Outdoor door frames</li> </ul>
<p>Type: <b>ISOL.V2</b> Rock fiber insulation in bulk</p>	<ul style="list-style-type: none"> <li>▪ CAN/ULC-SS702-09</li> <li>▪ Mineral fiber in granular form</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rockwool Premium Plus</li> </ul>	<ul style="list-style-type: none"> <li>▪ Attic</li> </ul>

**2.2 ADHESIVES FOR INSULATION**

- .1 Compliant with CGSB 71 GP 24 standard:
- .2 Type: according to manufacturer recommendations.
- .3 VOC emission rate: 0.

**2.3 PRIMER**

- .1 As recommended by the manufacturers, depending on the surface conditions.

**2.4 ACCESSORIES**

- .1 Fasteners: Cross-type, 50 mm side, 0.8 mm thick cold rolled and perforated carbon steel, with adhesive coated underside; annealed steel rod 2.5 mm in diameter, of appropriate length to the thickness of the insulation; self-locking washers 25 mm in diameter.
- .2 Nails: Galvanized steel, 25 mm thicker than insulation thickness, to CSA B111.
- .3 Staples: legs at least 12 mm long.
- .4 Ribbon: type recommended by the manufacturer.

**Partie 3 Implementation****3.1 GENERAL**

- .1 Compliance: Comply with the manufacturer's written requirements, recommendations and specifications, including the technical bulletins and installation instructions specified in the product catalogs and packaging cartons, and the specifications in the data sheets.
- .2 Verification of conditions:
  - .1 Before proceeding with the application of insulators, ensure that the condition of the surfaces/supports previously implemented under other sections or contracts is acceptable and allows the work to be carried out according to the written manufacturer's instructions.
  - .2 Before starting work, make sure the support is solid, straight, smooth and dry, and free of snow, ice, frost, dust and debris.
  - .3 Check the substrate on which the insulation will be installed and immediately inform the Departmental Representative in writing of any defect found.

**3.2 QUALITY OF WORK EXECUTION (ALL INSULATORS)**

- .1 Install the insulation on a dry substrate only.
- .2 Install insulation to provide continuous thermal protection to building elements and voids.
- .3 Carefully adjust the insulation around electrical boxes, accessories, ducts, air ducts, and other protruding characteristics.
- .4 Leave a clearance of at least 75 mm between the insulation and any element that emits heat.
- .5 If multiple thicknesses of insulation are required, offset vertical joints and horizontal joints.
- .6 Do not cover the insulation until the installation work has been inspected and checked by the Departmental Representative.
- .7 Apply adhesive, primer and insulation to clean, sound, dry surfaces, free of oil, grease, dust, frost, laitance, other contaminants or adhesion-resistant materials.

**3.3 INSTALLATION OF PANEL INSULATION**

- .1 Apply a layer of adhesive to the substrate using the type recommended by the manufacturer, at the rate of 0.75 L/m<sup>2</sup>, with a bristled trowel, according to the manufacturer recommendations.
- .2 Cut and carefully cut the insulation so that it fully occupies the open spaces. Execute tight joints and offset vertical joints. Use only insulation boards whose edges are not chipped or broken. Use panels of the greatest possible size to minimize the number of joints.
- .3 Do not glue insulating board joints that coincide with expansion or rupture joints. Before installing the insulation, close these joints using a continuous membrane of modified bitumen 150 mm wide and 0.15 mm thick, bonded with an adhesive and covered with a compatible primer.

**3.4 INSULATION OF FOUNDATION WALLS.**

- .1 Interior installation: lay the panels vertically against the inner face of the peripheral foundation walls, up to 1200mm below the slab or up to the indicated level if different.
- .2 Laying under slab: lay the insulation continuously under the slab. The panels must be placed on a level embankment and well compacted.
- .3 Install insulation to provide continuous thermal protection to building elements and voids and according to ASTM C1320.

**3.5 INSTALLATION OF INSULATION MAT**

- .1 Install insulation to provide continuous thermal protection to building elements and voids.
- .2 Do not compress the insulation to fit the spaces to be insulated.

**3.6 IMPLEMENTATION OF FIBER INSULATION**

- .1 Blow the insulation between the roof trusses so as to obtain a thermal resistance factor RSI of at least as indicated.
- .2 Ensure that all ceiling and roof surfaces, exposed to outside air, are insulated.
- .3 Make sure that no obstacle hinders the free flow of air to the eaves.
- .4 Install baffles as indicated, to prevent the insulation from overflowing over the outside walls and blocking soffit vents, or being displaced by the wind entering the vents.
- .5 Maintain insulation at least 75 mm from any heat emitting element, such as recessed lighting fixtures.

**3.7 CLEANING**

- .1 Once the installation work is complete, remove surplus materials and materials, waste materials, tools and safety barriers from the work site.
- .2 Remove insulating materials that have overflowed or fallen to the ground during the installation of bulk insulation.

**END OF SECTION**

**Partie 1            General considerations****1.1                SECTION CONTENT**

- .1            Steel cladding

**1.2                CONNECTED SECTIONS**

- .1            Section 06 10 00 – Articles of Wood
- .2            Section 07 10 00 - Air/Moisture Sealing
- .3            Section 07 62 00 - Sheet Metal Flashings and Trim
- .4            Section 07 92 00 – Joint Sealants

**1.3                REFERENCES (LAST PUBLICATIONS)**

- .1            American Society of Mechanical Engineers (ASME)
  - .1            ASME B18.6.3-2013, Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series).
- .2            ASTM International
  - .1            ASTM A 653/A 653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloyed-Coated (Galvannealed) by the Hot-Dip Process
  - .2            ASTM D2369-10-2015e1, Test Method for Volatile Content of Coatings.
  - .3            ASTM D2832-92 (2016), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
  - .4            • ASTM D5116-10, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products [www.astm.org](http://www.astm.org)
- .3            CSA Group
  - .1            CSA B111, Wire Nails, Spikes and Staples (steel wire nails, plugs and jumpers).
- .4            South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1            SCAQMD Rule 1168- [A2005], Adhesives and Sealants Applications.
- .5            Underwriters Laboratories (UL)
  - .1            UL 2761, Sealants and Caulking Compounds
- .6            ULC Standards
  - .1            CAN/ULC-S706-09, Standard for Wood Fiber Insulation Boards for Buildings.
  - .2            CAN/ULC-S741-08, Airtight Materials - Specification

**1.4                DOCUMENTS AND SAMPLES TO SUBMIT**

- .1            Technical Data Sheets: Submit the required data sheets as well as the manufacturer's instructions and documentation for the metal coating. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finish.

**1.5                QUALITY ASSURANCE**

- .1            Installer skills: minimum three years experience with specified products, references to support.
- .2            Examine the substrates, work area and conditions under which the tiles will be installed so that everything meets the requirements of the specified tolerances and any other conditions affecting tile performance once installed. When starting the work, the installer recognizes the existing conditions as acceptable for

installation.

## 1.6 DESIGN REQUIREMENT

- .1 The wall system must be designed to support the expected positive or negative wind loads in the project's geographic area (CNBC weather data, 50-year probabilities).
- .2 The deflection of the wall system must not exceed 1/180 of the range for wind loads based on the functional limit states.
- .3 Thermal Movement: Thermal movement due to ambient and surface temperature variations must be allowed to prevent curl, overload of components, failure of connections, and other adverse effects. Calculations must be based on the surface temperature of the materials due to solar radiation and night heat loss.
- .4 Design expansion joints to adapt to movement in the siding and between the siding and the structure to avoid permanent distortion or siding damage.
- .5 Design the wall system to maintain the following mounting tolerances:
  - .1 Maximum deviation from plan or location shown on shop drawings: 20 mm/10 m
  - .2 Maximum offset from the actual alignment between two adjacent end-to-end and in-line elements: 1 mm

## 1.7 TRANSPORTATION, STORAGE AND HANDLING

- .1 Store materials according to manufacturer recommendations.
- .2 Store the metal coating to protect it from marks, scratches and scratches.
- .3 Replace damaged materials and equipment with new materials and equipment.
- .4 Delivery and Acceptance: Deliver materials and materials to the work site in their original packaging, which must be labeled with the name and address of the manufacturer.

## Partie 2 Products

### 2.1 STEEL COATING ELEMENTS

- .1 Type **REV/AC.7**: Profiled coating such as:
  - .1 Vicwest CL 622R, 0.61mm, QC16069 white color vertical pose.
  - .2 Commercial Profile Ideal Covering 0.66mm, vertical pose color white bone ID 8273.

### 2.2 ACCESSORIES

- .1 Exposed trim: recessed corner and protruding corner pieces, wall moldings, counter flashings, trim strips, bibs, starter strips, sill and sill trim, and gaskets Door and window frames must be of the same material, color and gloss as the cladding, and be pre-drilled to receive the fastenings.
  - .1 Color: arranged on the facing
  - .2 Finish: unique
  - .3 Thickness of bare metal: 0.76 mm

### 2.3 FASTENERS

- .1 Nails and screws must comply with CSA B111 and ANSI B18.6.4 respectively. Of special manufacture, these fixings must be in stainless steel.

**Partie 3            Implementation**

**3.1                MANUFACTURER'S INSTRUCTIONS**

- .1        Compliance: Comply with manufacturer's written requirements, recommendations, and specifications, including any available technical bulletins, product catalog instructions, product packaging instructions, and data sheet instructions.

**3.2                LAYING**

- .1        Install exterior finish as per CGSB 93.5 and manufacturer's written instructions.
- .2        Continuously install starting strips, recessed corner pieces, curbs, soffits, bibs, sill and sill flashings and trim, and window and door bay flashings and trim indications.
- .3        Carefully lay the projecting corner pieces, the filler pieces and the closure pieces so as to obtain a well shaped and profiled structure.
- .4        Install soffits and fascia as indicated.
- .5        Make sure the joints of the exterior cladding are perfectly aligned and butted.
- .6        Fix the elements so that they do not interfere with thermal contraction and expansion movements.
- .7        Caulk joints between adjacent parts and structures with sealant according to Section 07 92 00 - Sealants.

**3.3                CLEANING**

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

**3.4                PROTECTION**

- .1        Protect installed equipment and components from damage during construction.
- .2        Repair damage to adjacent materials and equipment by installing exterior metal wall coverings.

**END OF SECTION**

**Partie 1            General considerations****1.1                SECTION CONTENT**

- .1        Materials and equipment with modified bitumen and their implementation to complete an unprotected membrane cover.
- .2        Snow stop
- .3        Sealing of all exits to the roof, illustrated or not in plan.

**1.2                RELATED SECTIONS**

- .1        Section 06 10 00 – articles of Wood
- .2        Section 07 10 00 - Air/Moisture Sealing
- .3        Section 07 62 00 - Sheet Metal Flashings and Trim
- .4        Section 07 92 00 - Joint Sealants

**1.3                REFERENCES (LAST EDITIONS)**

- .1        ASTM International Inc.
  - .1        ASTM C726 Standard Specification for Mineral Fiber Roof Insulation Board.
  - .2        ASTM C728, Standard Specification for Perlite Thermal Insulation Board.
  - .3        ASTM C1177/C1177M-06, Standard Specification for Glass Matte Gypsum Substrate for Use as Sheathing.
  - .4        ASTM C1396/C1396M-06a, Standard Specification for Gypsum Board.
  - .5        ASTM D41-05, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
  - .6        ASTM D312-00 (2006), Standard Specification for Asphalt Used in Roofing.
  - .7        ASTM D448-03a, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
  - .8        ASTM D2178-04, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
  - .9        ASTM D6162-00a, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials.
  - .10      ASTM D6163-00e1 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
  - .11      ASTM D6164-05, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
  - .12      ASTM D6222-02e1, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcement.
  - .13      ASTM D6223-02e1, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcement.
  - .14      ASTM D6509-00, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcement.
- .2        Canadian General Standards Board (CGSB)
  - .1        CGSB 37-GP-9Ma-83, Unsprayed bitumen for basecoats of roof coatings and for waterproofing to moisture and water.
  - .2        CGSB 37-GP-56M-80b (A1985), Modified, prefabricated and reinforced bituminous membrane for roofing.

- .3 CAN/CGSB-51.33-M89, Sheet vapor barrier, except polyethylene, for buildings.
- .3 Canadian Roofing Contractors Association (CCAA)
  - .1 Quote, Covers, 1997, CRCA.
- .4 Canadian Standards Association (CSA)/CSA International.
  - .1 CSA A123.21-F04, Standard Test Method for Wind-Resistant Dynamic Wind Resistance of Mechanically Attached Membrane Roofing Systems.
  - .2 CSA A123.3-F05 (2015), Organic roofing felt impregnated with bitumen core.
  - .3 CSA-A123.4-F04, Bitumen used for the waterproofing and the realization of multilayer coatings for roofs.
  - .4 CSA A231.1-06, Precast Concrete Paving Slabs.
  - .5 CSA O121-F08, Douglas Fir plywood.
  - .6 CSA O151-F04, Canadian Softwood Plywood.
- .5 Factory Mutual (FM Global)
  - .1 FM Approvals - Roofing Products.
- .6 Health Canada - Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS)
- .7 Underwriter's Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701, Standard for Polystyrene Thermal Insulation, Panels and Pipe Coatings.
  - .2 CAN/ULC-S702.2-03, Standard for Mineral Fiber Thermal Insulation for Buildings.
  - .3 CAN/ULC-S704-03, Standard for Polyurethane and Polyisocyanate Thermal Insulation: Coated Panels.
  - .4 CAN/ULC-S706-02, Standard for Wood Fiber Thermal Insulation for Buildings.

#### 1.4 DOCUMENTS AND SAMPLES TO SUBMIT

- .1 Datasheets
  - .1 Submit the most recent data sheets of the roofing components, describing the physical properties of the materials and materials, the performance criteria and the constraints.
  - .2 Submit Material Safety Data Sheets required under the Workplace Hazardous Materials Information System (WHMIS), which must comply with this system.
  - .3 Material Safety Data Sheets must indicate the VOC content of the following products:
    - .1 Primers
    - .2 Bitumen.
    - .3 Sealants
    - .4 FILTER CLOTH

#### 1.5 QUALITY ASSURANCE

- .1 Qualification of the installer: a firm or person specializing in the production of modified bitumen membrane roofing approved by the manufacturer.
- .2 The presence of the Architect or the Departmental Representative during an inspection will not relieve the General Contractor of his responsibility to properly perform the insulation, roofing and sheet metal work.

#### 1.6 FIRE DETECTION

- .1 Portable fire extinguishers,
  - .1 Portable fire extinguishers with auxiliary pressure or permanent pressure, rechargeable, equipped

with a flexible hose and a nozzle with shut-off valve.

- .2 ULC approved fire extinguishers for Class A, B and C fire.
  - .3 One (1) fire extinguisher per torch user, on the roof, located within 6 m of the roof.
- .2 Ensure the presence of a fire safety officer for a period of one (1) hour after the end of the work day.

## 1.7 TRANSPORTATION, STORAGE AND HANDLING

- .1 Storage and Handling
- .1 Safety: Comply with the safety requirements of the Workplace Hazardous Materials Information System (WHMIS) with respect to the use, handling, storage and disposal of bitumen as well as primers and sealants and caulking.
  - .2 Store materials in a dry, weather-proof area so that they are not in contact with the ground.
  - .3 Felt and membrane rolls must be stored upright; in the case of membranes, the overlapping edge must be at the top.
  - .4 Only remove from the room or storage area the quantity of materials that will be implemented the same day.
  - .5 Make plywood roads over the completed structure to allow for the passage of people and materials.
  - .6 Keep sealants at or above 5 degrees Celsius.
  - .7 Protect insulating materials against daylight, inclement weather and any harmful substances.

## 1.8 IMPLEMENTATION CONDITIONS

- .1 Environmental requirements
- .1 Do not proceed with the application of roofing materials when the temperature is below -18 degrees Celsius in the case of a membrane glued by torch welding, or when the temperature is below that recommended by the manufacturer. case of a membrane adhered to the bitumen applied with a mop.
  - .2 The solvent-based adhesive must be applied at a temperature equal to or greater than -5 degrees Celsius.
- .2 The application bases will be prepared according to the manufacturers instructions; plain, clean, structurally sound, perfectly dry, free of large slits, prominent traces, holes; well swept to remove any dust, etc.
- .3 The roof rack must be dry, free of snow and ice. Use only dry materials, and apply them only when weather conditions will not promote moisture penetration into the roofing system.

## 1.9 EXTENDED WARRANTY

- .1 The Contractor hereby certifies that the cover and membrane flashings will remain in place and remain watertight for the **ten (10) year** warranty period (manufacturer warranty).

## Partie 2 Products

### 2.1 PERFORMANCE CRITERIA

- .1 It is essential that the different materials forming part of the roofing system are compatible with each other. Provide the Departmental Representative with a written statement certifying that the materials and components of the roofing system are compatible.
- .2 Cover System: Complies with CSA A123.21 for dynamic resistance to pulling under wind.

### 2.2 PRIMER

- .1 Primer (basecoat bitumen): according to CGSB 37-GP-9Ma.

**2.3 UNDERLAYMENT OF THE TWO-LAYER ELASTOMERIC ROOF MEMBRANE SYSTEM**

- .1 **Type MEMB/C.16** (See Section 07 10 00 - Air/moisture/water tightness)

**2.4 TOPCOAT OF THE TWO-LAYER ELASTOMERIC ROOF MEMBRANE SYSTEM**

- .1 **Type MEMB.18** (See Section 07 10 00 - Air/Moisture Sealing. For finishing layer of the current part, surveys and railings.

**2.5 ADHESIVES**

- .1 Adhesive for bonding the lining panels according to the manufacturer recommendations.

**2.6 BITUMEN.**

- .1 Asphalt: according to CAN/CSA A123.4, type recommended by the manufacturer.

**2.7 CARPENTRY**

- .1 Refer to Section 06 10 00 - Wood Work.

**2.8 FASTENINGS**

- .1 Attaching the cover to a steel support: Tapping screw sets with flat head, cadmium plated, number 10, type A or AB, and plates, approved by the FM.
- .2 Fastening insulation to support: galvanized, coated fasteners and galvanized plates for corrosion resistance and wind uplift, as recommended by the insulation manufacturer.

**2.9 SNOW STOP**

- .1 Snow stop" PP115-2 pipe" of" Alpine Snowguards". See plan position

**Partie 3 Implementation****3.1 WORK PERFORMANCE QUALITY**

- .1 Examine the condition of the support, carry out the preparatory work and lay the cover according to the specifications of the cover manufacturer.
- .2 Apply the primer according to the manufacturer's written recommendations.
- .3 Between the walls and the roof, interpose an interface made of durable rigid material, i.e., sheet steel and plywood, intended to ensure the continuity of the airtightness system.
- .4 Make the connection of the assembly, components and materials taking into account the design loads of the considered elements.
- .5 Coordinate the installation of snow stops to ensure watertightness.

**3.2 COVER SUPPORT INSPECTION**

- .1 Check the condition of the support, railings, burst joints, roof gutters, plumbing vents and vent outlets to determine if work can begin.
- .2 Before starting work, make sure:
  - .1 That the roof support is solid, level, smooth, dry and free of snow, ice and frost, and that it has been cleaned of dust and debris with a broom; it is forbidden to use calcium or de-icing salt to remove ice and snow;
  - .2 That the walls and mounting frames of the devices are in place;
  - .3 That the roof drains were installed at the appropriate level in relation to that of the finished surface

of the roof;

.4 That plywood or timber nailing plates have been installed on walls and railings as indicated.

.3 Do not install roofing materials when it is raining or snowing.

### 3.3 ON-SITE WORK PROTECTION

.1 Protect walls, traffic lanes and nearby structures from areas where materials or equipment must be hoisted or used.

.2 Provide and set up signs and safety barriers, and keep them in good condition until the end of the work.

.3 Remove promptly drops and dirt from bitumen.

.4 Ensure that rainwater is removed toward the edge of the roof, as far as possible from the facade of the building, until the drains or funnels have been installed and connected.

.5 Protect the cover against damage that could be caused by traffic, among other things. Take the precautions deemed necessary by the Departmental Representative.

.6 At the end of each work day or when work is interrupted due to inclement weather, protect finished surfaces as well as materials that have been removed from the room or storage area.

.7 When metal connectors are used, these and the metallic elements of the support must be galvanized or treated against rust.

### 3.4 PRIMER APPLICATION

.1 Apply a primer to the substrate, respecting the dosage recommended by the manufacturer.

### 3.5 MAKING AN APPARENT ORDINARY MEMBRANE COVER (UNPROTECTED)

.1 Laying the underlay

.1 Fasten mechanically, as required by the manufacturer.

.2 Laying the finishing layer

.1 Start at the low point, moving perpendicular to the axis of the slope; Unroll the topcoat membrane, align it, and wrap it from both ends.

.2 Unroll the topcoat membrane and torch it onto the base coat; avoid burning the membrane or its armature.

.3 Overlap the membrane sheets at least 75 mm and 150 mm, on the sides and ends respectively. The joints in the topcoat must be at least 300 mm away from those in the base coat.

.4 The finishing coat must not show any swelling, creasing or yawning.

.5 Make the membrane according to the manufacturer recommendations.

.3 Flashings

.1 Complete the installation of basecoat membrane flashing strips prior to applying the top coat.

.2 Mop glue on the substrate with membrane strips for basecoat and 1 m wide topcoat.

.3 Overlap the base layer membrane flashing over the base course to a width of at least 150 mm, then torch it or glue it with mop applied bitumen.

.4 Overlap the top coat membrane flashing over the finishing layer to a width of at least 250 mm, then torch it.

.5 Allow an overlap of at least 75 mm on the sides and seal.

.6 Fix correctly to their support the flashings thus made; the work must not show any sagging, swelling, yawning or wrinkling.

.7 Install flashing as recommended by the manufacturer.

.4 Roof crossings (illustrated or not in plan)

- .1 Install flashings around drains, vents, and other roof perforations and seal them to the membrane according to manufacturer details and recommendations.

**3.6 CLEANING**

- .1 Remove bitumen marks from finished surfaces.
- .2 When finished surfaces are soiled as a result of the work in this section, contact the manufacturer of the affected area for cleaning advice and instructions.
- .3 Repair or replace finished surfaces that have been altered or otherwise damaged as a result of the work described in this section.

**END OF SECTION**

**Partie 1            General considerations****1.1                SECTION CONTENT**

- .1        Flashing, control joints, cap flashings, and other pre-painted steel elements, without apparent fasteners.
- .2        Soffits of aluminum.
- .3        Fascias and steel sheet, without apparent attachments.
- .4        Gutters and downspout.

**1.2                CONNECTED SECTIONS**

- .1        Section 06 10 00 – articles of Wood
- .2        Section 07 10 00 - Air/Moisture Sealing
- .3        Section 07 21 10 - Insulation
- .4        Section 07 52 00 - Modified Bituminous Membrane Roofing
- .5        Section 07 92 00 – Joint Sealants

**1.3                REFERENCES (LAST PUBLICATIONS)**

- .1        American Architectural Manufacturers Association (AAMA):
  - .1        AAMA 611-14, Voluntary Specifications for Anodized Architectural Aluminum
  - .2        AAMA 621-02, Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Substrates
  - .3        AAMA 2603-15, Voluntary Specification, Performance Requirements and Test Procedures for Organic Pigmented Coatings on Aluminum Extrusions and Panels
  - .4        AAMA 2604-13, Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
  - .5        AAMA 2605-13, Voluntary Specification, Performance Requirements, and Test Procedures for Superior Aluminum Coatings
- .2        American National Standards Institute (ANSI)
  - .1        ANSI/SPRI/FM 4435/ES-1, Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems 2011
- .3        ASTM International Inc.
  - .1        ASTM A240/A240M-16, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
  - .2        ASTM A606/A606M-15, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
  - .3        ASTM A 653/A 653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloyed-Coated (Galvannealed) by the Hot-Dip Process
  - .4        ASTM A755/A755M-16e1 Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
  - .5        ASTM A 792/A 792M-10 (2015), Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
  - .6        ASTM B32-08 (2014), Standard Specification for Solder Metal
  - .7        ASTM B209-14, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate
  - .8        ASTM B 370-12, Standard Specification for Copper Sheet and Strip for Building Construction
  - .9        ASTM D 523-14 Standard Test Method for Specular Gloss

- .10 ASTM D1970/D1970M-15a, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials
- .11 ASTM D4587-11, Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings
- .12 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes and Staples
- .4 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-51.32-M77, Coating Membrane, Permeable to Water Vapor.
- .5 Canadian Roofing Contractors Association (CCAA)
  - .1 Quote, covers 2012.
- .6 Canadian Institute of Sheet Steel for Building (CSSBI)
  - .1 CSSBI S8-2008: Quality and Performance Specification for Steel Prefinished Sheet Used for Building Products
  - .2 CSSBI B17-2002: Barrier Series Prefinished Steel Sheet: Product Performance & Applications
  - .3 CSSBI Sheet Steel Facts 12 2003 Fastener Guide for Sheet Steel Building Products
- .7 CSA Group
  - .1 CSA A123.3-F05 (2015), Organic roofing felt impregnated with bitumen core.
  - .2 CSA A123.22 [08 (R2013), Self-Adhering Polymer Modified Bituminous Sheet Materials Used as a Protective Underlayment for Ice Dam Protection
- .8 FM Global
  - .1 Property Loss Prevention Data Sheets 1-49 Perimeter Flashing
- .9 Green Seal Environmental Standards
  - .1 Standard GS-11-2015, Paints, Coatings, Stains, and Sealers.
  - .2 Standard GS-36-2013, Adhesives for Commercial Use.
- .10 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS)
- .11 Sheet Metal and Air Conditioning Contractors Association of North America (SMACNA)
  - .1 Architectural Sheet Metal Manual (2012)
  - .2 Residential Sheet Metal Guidelines (2001)

#### 1.4 DOCUMENTS AND SAMPLES TO SUBMIT

- .1 Submit required specification sheets for flashing materials, manufacturer specifications and documentation. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finish.

## Partie 2 Products

### 2.1 SHEET METAL

- .1 Aluminum or pre-painted steel sheet: commercial grade, registered trade name, plain finish, at least 0.66 mm thick (24 gauge).

### 2.2 PREFINISHED STEEL SHEETS

- .1 Pre-finished steel sheets, factory coated with a polyester topcoat meeting the requirements of CSSBI S8
  - .1 Category: F1S.

- 2 Colors:
  - .1 Vicwest Forest Green, Qc 16078 for all eaves roofing.
  - .2 "Bone White, Qc 16069" from Vicwest, elsewhere.
- .3 Gloss specular: 30 units, with a maximum permissible deviation of 5 units plus or minus, according to ASTM D523.
- .4 Coating thickness: at least 25 micrometers.
- .5 Accelerated weathering resistance to weathering with a degree of chalking 8, discoloration of up to 5 units and erosion of less than 20%: according to ASTM D822, under the test conditions below.
- .6 Duration of exposure to the weather: 1000 hours.
- .7 Duration of exposure to moisture: 1000 hours

### 2.3 SOFFITES

- .1 Perforated aluminum soffit with three (3) panels, thick gauge, 6.73 sq. Ft. Per linear foot.
  - .1 Acceptable product: Gentek Co.
  - .2 Colors: white

### 2.4 ACCESSORIES

- .1 Protective coating: bituminous antibase paint
- .2 Plastic sealant: according to CAN/CGSB 37.5
- .3 Underlay for Metal Flashing: # 15 Perforated Asphalt Felt, to CSA A123.3
- .4 Metal armor. When the vertical portion of the drip edge exceeds 76.2 mm (3"), the transverse joints of the drip edge must be nested using an "S" joint
- .5 Sealants: See section 07 92 00 Joint Sealants
- .6 Fastening tabs: same material and same tempering as the sheet used, at least 50 mm wide and the same thickness as the sheet to be fixed.
- .7 Fastening devices: made of the same material as the sheet metal used, according to CSA B111, flat head and corrugated shank nails, length and thickness appropriate to metal flashings. No fasteners must be visible.
- .8 Washers: same material as the sheet used, 1 mm thick, with rubber gaskets.
- .9 Soft solder: according to ASTM B32.
- .10 Pickling flux: rosin, dilute hydrochloric acid or other commercial preparation compatible with the materials to be welded.
- .11 Touch-up paint: according to the recommendations of the manufacturer of the pre-finished sheet metal.

### 2.5 CUTTING

- .1 Metal flashings and other sheet metal members must be shaped according to the details of the FL series of the Canadian Roofing Contractors Association (CRCA) drawings in the instructions.
- .2 Parts must be formed into lengths of no more than 2400 mm. At the joints, it is important to plan the clearance necessary for the element expansion.
- .3 Exposed edges must be folded 12 mm on their underside. Angles must be mitered and sealed with sealant.
- .4 Elements must be square, level and precisely shaped to the required dimensions so that they are free from deformation or other defects that may affect their appearance or effectiveness.
- .5 Metal surfaces to be embedded in concrete or mortar must be coated with a protective coating.

### 2.6 METAL FLASHINGS

- .1 Flashings, capstones and fascia must be shaped to the required profiles with pre-finished galvanized sheet steel.

## 2.7 ENGRAVING AND COUNTER-FLASHING STRIPS

- .1 Countercuts and flush-mounted bands to receive flashing.

## 2.8 GUTTERS AND DOWNHOLE PIPES

- .1 Gutters and downspouts must be shaped with pre-finished aluminum sheet.
- .2 See placement in plan

## Partie 3 Implementation

### 3.1 MANUFACTURER'S INSTRUCTIONS

- .1 .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and

### 3.2 INSTALLATION

- .1 Set up sheet metal works according to the details or drawings of the CRCA's FL series and the instructions published in the Aluminum Sheet Metal Work in Building Construction document.
- .2 **Conceal fastenings**, except where the Departmental Representative has agreed to be left visible. No fasteners must be installed on top of railings or any horizontal surface.
- .3 Lay an underlayment before installing the sheet metal elements. Secure it and perform 100 mm lap joints. Provide a self-adhesive membrane suitable for adjacent elements.
- .4 Counter-flashing of asphalt flashings made at the meeting points of the roof and walls, mounting frames or other vertical surfaces. Make joints with single standing staples and secure them to the fastening strips as indicated.
- .5 Close the end seals and seal them with a sealant.
- .6 Install plumbers and leveling strips flush with level. Caulk the top of the belts with a sealant.
- .7 Insert the metal flashings into the splice strips under the counterflashes to form a watertight seal.
- .8 Fold the top end of the flashings at least 25mm into the recessed belts or mortar joints. Secure flashings in joints with lead. The counter flashing must be provided with a return water stop and must be of sufficient length to extend at least 152.4 mm (6" ) along the masonry and cover the lower flashing on 101.6 mm (4" ) at least.
- .9 With a sealant, caulk flashings in the grease strips and/or counter flashings.
- .10 Lay shaped sleeves in the prescribed locations around the ducts passing through the roofs.
- .11 Close the end seals and seal them with a sealant.
- .12 Flashings must be installed to extend at least 204mm (8" ) to the top of the wall, behind the wall siding and the underlying wall paper.

### 3.3 FLASHINGS SLOPE

- .1 Exterior Walls: Ensure that all flashings have a sufficiently steep slope (min 6 mm) to allow the water to flow outward. Flashings must never be sloping and maintain water at the base of the walls.

### 3.4 GUTTERS AND DOWNHOLE PIPES

- .1 Put the gutters in place and secure them to the building with nails placed at 610 mm centers and passing in spacers.

- .1 Tilt the gutters to the downspouts as indicated.
- .2 Seal the joints to make them watertight.
- .2 Install the downspouts by leaning the gooseneck against the wall.
  - .1 Fasten the pipes to the walls using clamps placed at 1500 mm oc; put at least two collars per pipe.

**END OF SECTION**

**Partie 1      General considerations****1.1            SECTION CONTENT**

- .1      Materials, preparatory work and implementation methods related to sealing and caulking products.
- .2      Unless otherwise indicated, any other Sections related to supplying and installing sealants must refer to the instructions in this Section including those regarding Mechanical and Electrical work in concealed spaces (between ceilings, etc.).

**1.2            CONNECTED SECTIONS**

- .1      Section 06 10 00 - Working on Wood
- .2      Section 07 10 00 - Air/Moisture Sealing
- .3      Section 07 21 10 - Insulators
- .4      Section 07 62 00 - Sheet Metal Flashings and Trim
- .5      Section 08 11 00 - Metal Doors and Frames
- .6      Section 08 80 50 - Glazing
- .7      Section 09 20 00 - Drywall Work

**1.3            REFERENCES (LAST PUBLICATIONS)**

- .1      American Society for Testing and Materials International, (ASTM)
  - .1      ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.
  - .2      ASTM C920, Standard Specification for Elastomeric Joint Sealants.
- .2      Canadian General Standards Board (CGSB)
  - .1      CGSB19-GP-5M, One-component, acrylic-based, solvent-evaporation cure sealant.
  - .2      CAN/CGSB-19.13, One-component, Elastomeric, Chemical Curing Sealant.
  - .3      CGSB19-GP-14M, One-component butyl-polyisobutylene-based sealant, solvent-evaporation polymerization.
  - .4      CAN/CGSB-19.17, One-component sealant based on an acrylic resin emulsion.
  - .5      CAN/CGSB-19.24, Multi-Component Sealant, Chemical Curing.
- .3      Department of Justice Canada (Jus).
  - .1      Canadian Environmental Protection Act (CEPA)
- .4      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1      Material Safety Data Sheets (MSDS)
- .5      Transport Canada (CT)
  - .1      REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

**1.4            DOCUMENTS AND SAMPLES TO SUBMIT**

- .1      The manufacturer data sheets must include the following:
  - .1      Caulking products;
  - .2      Primers;
  - .3      Sealants (all types), including their compatibility with each other;
  - .4      Manufacturer's instructions

**1.5            QUALITY ASSURANCE**

- .1 Sealant inter-compatibility:
  - .1 Use prescribed sealants from a single manufacturer to ensure inter-product compatibility;
  - .2 The manufacturer must notify the applicator about procedures to be followed in the event of intersection of different products.

## 1.6 TRANSPORT, HANDLING AND STORAGE

- .1 Transport and store materials in original containers and packaging with the recipient and manufacturer label intact. Protect materials against water, moisture and frost; do not place them directly on the ground or on a floor.

## 1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Place substances meeting the definition of toxic or hazardous waste in designated containers.
- .2 Handle and dispose of hazardous materials according to the Canadian Environmental Protection Act, the Transportation of Dangerous Goods Act, and regional and municipal regulations.
- .3 Disposal of unused sealants in sewers, waterways, lakes, on the ground, or in any other place where it may be hazardous to health or the environment is prohibited.
- .4 Route unused sealants to an approved hazardous materials collection site approved by the Quebec Ministry of the Environment.
- .5 Empty plastic containers of sealants are not recyclable. Do not mix with plastic items for recycling.

## 1.8 IMPLEMENTATION CONDITIONS

- .1 Ambient conditions: Proceed with sealant installation only under the following conditions.
  - .1 Ambient and substrate temperatures are within the limits established by the product manufacturer or greater than 4.4 degrees Celsius.
  - .2 Substrate is dry.
  - .3 Manufacturer recommendations for temperatures, relative humidity and moisture content of the substrate specific to sealant application and drying as well as special instructions for their use, are respected.
- .2 Joint Width: Apply sealants only when the joint width is greater than that established by the product manufacturer for the specified applications.
- .3 Subject: Proceed with sealing products only after the substrate has been cleared of all contaminants that may prevent product adhesion.
- .4 Ensure that the product supplied is used within the prescribed period following the manufacture date.

## 1.9 EXTENDED WARRANTY

- .1 According to Section 01 33 00 - Documents and Samples to Submit, in addition to the manufacturer standard warranty, submit a **three (3)-year** written warranty against defects in workmanship and materials, guaranteeing that sealants will not leak, crack, crush, melt, shrink, loosen or stain adjacent surfaces from the date of substantial completion of the work.

## Partie 2 Products

### 2.1 SEALANT CHARACTERISTICS

- .1 Sealing and caulking products used must meet the following requirements:
  - .1 They must meet or exceed the relevant safety and performance industry and government standards.
  - .2 They must be manufactured and transported in such a way that all process stages, including

disposal of generated waste comply with applicable laws, orders and governmental regulations including those located in Canada, the Fisheries Act and the Canadian Environmental Protection Act.

- 2 Sealing and caulking products must not contain or be made from the following components: aromatic solvents, talc or asbestos fibers, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium, barium and derivatives, with the exception of barium sulfate.
- 3 Sealing and caulking products must not contain more than 5% by weight (in total) of volatile organic compounds (VOCs), calculated on the basis of the recorded quantities of components used in the preparation of the product.
- 4 In order to minimize health risks and maximize product performance, it is important that these be accompanied by detailed instructions regarding the method of application and necessary information regarding disposal methods.
- 5 Caulking products that emit strong odors, contain toxic chemicals or are not certified to be of a mold-resistant type must not be used in air handling units.
- 6 If you must use toxic products, restrict their use to areas where fumes can be vented to the outdoors or where they will be confined behind an air-proofing system or apply them several months before the place is occupied so as to allow evacuation of the fumes over the longest possible period
- 7 Products selected for the purpose of carrying out the work under this section must have the following characteristics: manufactured without any compound that may promote ozone layer depletion in the upper atmosphere.
- 8 The selected sealants must be on the list of approved products published by the Sealant Product Certification Board of the CGSB. For sealants approved with a primer, only the primer in question must be used with the sealant.

## 2.2

### SEALANTS

SEALANT TABLE				
IDENTIFICATION (Types)	Applicable Standards/Characteristics	Color	Acceptable products	Application location where indicated, including
<b>PE type.1</b> Three-component sealant based on high performance polyurethane	<ul style="list-style-type: none"> <li>▪ CAN/CGSB-19.24, Type 2 Class B.</li> </ul>	To be selected	<ul style="list-style-type: none"> <li>▪ Sonolastic NP2 SL2 from Sonneborne</li> </ul>	<ul style="list-style-type: none"> <li>▪ Expansion joints</li> <li>▪ Break joints</li> </ul>
<b>PE type.2</b> Polyurethane adhesive sealant	<ul style="list-style-type: none"> <li>▪ Single component</li> <li>▪ Cure with moisture</li> </ul>	grey	<ul style="list-style-type: none"> <li>▪ Sikabond construction adhesive from Sika</li> </ul>	<ul style="list-style-type: none"> <li>▪ As an adhesive between dissimilar expansion coefficient materials</li> <li>▪ Under the aluminum thresholds</li> </ul>
<b>PE type.3</b> Elastomeric sealant, polyurethane-based, non-sag, high-performance	<ul style="list-style-type: none"> <li>▪ CAN/CGSB-19.13</li> <li>▪ ASTM C920</li> <li>▪ Single component</li> </ul>	To be selected	<ul style="list-style-type: none"> <li>▪ Sikaflex 15 LM from Sika</li> <li>▪ CWS from Dow Sil</li> </ul>	<ul style="list-style-type: none"> <li>▪ Exposed joints</li> <li>▪ Apparent rupture joints</li> <li>▪ Seals around windows and door frames</li> <li>▪ Flashing joints</li> </ul>

<b>PE type.4</b> 100% silicone low and medium modulus sealant	<ul style="list-style-type: none"> <li>▪ ASTM C920, Type S, Nuance NS, Class 50.</li> </ul>	To be selected	<ul style="list-style-type: none"> <li>▪ SCCS (Contractors Concrete Sealant) or CWS from Dow Sil</li> </ul>	<ul style="list-style-type: none"> <li>▪ Joints apparent at the concrete junction.</li> <li>▪ Construction Joints</li> </ul>
<b>PE type.5</b> Silicone sealant	<ul style="list-style-type: none"> <li>▪ CAN/CGSB-19.13</li> <li>▪ ASTM C920</li> <li>▪ Single component</li> <li>▪ Unpainted</li> </ul>	To be selected	<ul style="list-style-type: none"> <li>▪ Contractors SCS1000 from GE Silicones</li> </ul>	<ul style="list-style-type: none"> <li>▪ Interior exposed joints</li> <li>▪ Between frames of windows, doors and vision panels and adjacent interior surfaces.</li> <li>▪ Around built-in furnishings</li> <li>▪ For exposed joints partitions or glass panels, etc.</li> </ul>
<b>PE type.6</b> Silicone sealant	<ul style="list-style-type: none"> <li>▪ ASTM C920</li> <li>▪ Single component</li> <li>▪ Unpainted</li> </ul>	To be selected	<ul style="list-style-type: none"> <li>▪ Construction SCS1200 from GE Silicones</li> </ul>	<ul style="list-style-type: none"> <li>▪ Around every element of mechanics, electricity and electronic controls on walls and ceilings</li> <li>▪ For the installation of the interior glazing</li> </ul>
<b>PE type.7</b> Silicone sealant	<ul style="list-style-type: none"> <li>▪ CAN/CGSB 19.22</li> <li>▪ Mildew resistant</li> <li>▪ Single component</li> <li>▪ Unpainted</li> </ul>	To be selected	<ul style="list-style-type: none"> <li>▪ Sanitary 1700 from GE Silicones</li> <li>▪ Dow sil 786</li> </ul>	<ul style="list-style-type: none"> <li>▪ Around sanitary appliances (sinks, urinals, seats, toilets, sinks, etc.)</li> </ul>
<b>PE type.9</b> Filling of epoxy-urethane or polyurea gasket	<ul style="list-style-type: none"> <li>▪ Two (2) components</li> </ul>	grey	<ul style="list-style-type: none"> <li>▪ Loadflex by Sika</li> </ul>	<ul style="list-style-type: none"> <li>▪ For removal joints (saw cuts) and concrete slab control joints</li> </ul>
<b>PE type.10</b> Acrylic-based sealant	<ul style="list-style-type: none"> <li>▪ CAN/CGSB-19.21</li> <li>▪ To be painted</li> </ul>	-	<ul style="list-style-type: none"> <li>▪ Sonolac from Sonneborne</li> </ul>	<ul style="list-style-type: none"> <li>▪ Non-dynamic interior joints that do not require fire resistance, such as the perimeter of interior frames</li> </ul>
<b>PE type.11</b> Hybrid sealant with low modulus polyurethane	<ul style="list-style-type: none"> <li>▪ ASTM C920, Type S, Nuance NS, Class 35.</li> <li>▪ Quick drying</li> <li>▪ Movement capability:</li> </ul>	To be selected	<ul style="list-style-type: none"> <li>▪ Dymonic FC from Tremco</li> </ul>	<ul style="list-style-type: none"> <li>▪ Seals expansion and removal</li> <li>▪ Perimeter caulking</li> </ul>
<b>PE type.12</b> Polyurethane multi-component sealant	<ul style="list-style-type: none"> <li>▪ ASTM C920, Type S, Nuance NS, Class 50.</li> <li>▪ Movement capability:</li> </ul>	To be selected	<ul style="list-style-type: none"> <li>▪ Dymetric 240/240 FC from Tremco</li> </ul>	<ul style="list-style-type: none"> <li>▪ Dynamic movement joints.</li> </ul>
<b>PE type.15</b> Sealing stopper	<ul style="list-style-type: none"> <li>▪ Sealant based on synthetic rubber plasticized with bitumen.</li> </ul>	-	<ul style="list-style-type: none"> <li>▪ Sopramastic 200 from Soprema.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Modified bitumen membrane roof</li> </ul>
<b>PE type.30</b>	<ul style="list-style-type: none"> <li>▪ Single component</li> </ul>	-	<ul style="list-style-type: none"> <li>▪ Insta-Seal from</li> </ul>	<ul style="list-style-type: none"> <li>▪ To fill the space deep</li> </ul>

Polyurethane foam insulation sealant	<ul style="list-style-type: none"> <li>▪ CFC free</li> </ul>		Foam Products <ul style="list-style-type: none"> <li>▪ CF 812 Insulating foam from Hilti</li> <li>▪ Sika Boom AS-PRO from Sika</li> </ul>	between window frames and aluminum or steel doors, and adjacent surfaces.
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**2.3 BACKING JOINT FOAM**

- .1 The choice of backing foam must be suitable for the selected sealant and must be of the type recommended by the manufacturer.
  - .1 Preformed, compressible and non-compressible backing joint foam
  - .2 Elements made of polyethylene foam, urethane, neoprene or vinyl.
  - .3 Cellular or extruded cellular foam filling rods.
  - .4 Oversized elements from 30 to 50%.
  - .5 Neoprene or rubber-butyl elements.
  - .6 Round and full rods with a Shore A hardness of 70.
  - .7 High density foam elements.
  - .8 Extruded cellular PVC foam elements, extruded cellular polyethylene foam, having a Shore A hardness of 20 and having a tensile strength of 140 to 200 kPa, extruded polyolefin foam, having a density of 32 kg/m<sup>3</sup>, or in neoprene, with dimensions recommended by the manufacturer.
- .2 Vertical joints and horizontal joints not exposed to traffic:
  - .1 Closed-cell closed-cell polyethylene foam rod, compressible, with non-stick coating on the outside, available in several widths between 3/8" and 4". The stems will have 25% more than the openings to be filled
- .3 Horizontal joints exposed to pedestrian traffic:
  - .1 High density closed cell polyethylene foam coated with a non-stick film.
  - .2 Prescribed Product: Sonolastic Expansion Joint Sonneborne Filler.

**2.4 NON-STICK TAPE**

- .1 Polyethylene tape that does not adhere to the sealant, available in the widths required in the drawings.

**2.5 PRIMER**

- .1 Characteristics:
  - .1 As specified by the manufacturer .
  - .2 Sealants and their respective primers must be supplied by the same manufacturer.

**2.6 SEAL CLEANING PRODUCTS**

- .1 Non-corrosive and non-messy cleaning products that are compatible with joint component materials and sealants and are recommended by their manufacturer.

**Partie 3 Implementation**

**3.1 WORK SITE STRUCTURE PROTECTION**

- .1 Protect structures installed by third parties against dirt or any other form of contamination.

**3.2 TEST**

- .1 Checking conditions: Before proceeding with the installation of joint sealants, ensure that the condition of surfaces/supports previously implemented under other sections or contracts is acceptable and allows the

work to be carried out according to the written manufacturer's instructions.

### **3.3 SURFACE PREPARATION**

- .1 Check the dimensions of the joints to be made and the condition of the surfaces in order to obtain a suitable width/depth ratio for the implementation of the joint bottoms and sealants.
- .2 Rinse any undesirable material off seal surfaces including dust, rust, oil, grease and other foreign matter that may affect work quality.
- .3 Do not apply sealants to joint surfaces that have been treated with a pore filler, hardener, water repellent or other type of coating unless prior testing has confirmed the compatibility of the sealant. these materials. Remove coatings already covering surfaces as needed.
- .4 Make sure the joint surfaces are dry and not frozen.
- .5 Prepare surfaces according to the manufacturer's instructions.

### **3.4 PRIMER APPLICATION**

- .1 Before applying primer and caulking, conceal adjacent surfaces as needed to prevent soiling.
- .2 Apply the primer to the side surfaces of the joints immediately before applying the sealant according to the manufacturer's instructions.

### **3.5 FOAM BACKING INSTALLATION**

- .1 Apply non-stick tape (anti-adhesion) where required, according to manufacturer's instructions.
- .2 By compressing it by approximately 30%, install the backing foam according to the desired depth and joint profile.

### **3.6 DOSAGE**

- .1 Dose the components strictly following the sealant manufacturer's instructions.

### **3.7 IMPLEMENTATION**

- .1 Sealant Application
  - .1 Apply the sealant according to the manufacturer's written instructions.
  - .2 In order to make clean joints, lay masking tape on the edge of the surfaces to be grouted.
  - .3 Apply the sealant forming a continuous bead.
  - .4 Apply sealant using a spray gun with a properly sized nozzle.
  - .5 The supply pressure must be strong enough to fill the voids and seal perfectly.
  - .6 Make joints to form a continuous sealing bead free of ridges, creases, sag, air pockets and embedded dirt.
  - .7 Before a layer forms on the joints, shape the apparent surfaces to give them a slightly concave profile.
  - .8 Remove excess sealant as work progresses and at the end.
- .2 Drying
  - .1 Dry and harden sealants according to the manufacturer directions for these products.
  - .2 Do not cover joints made with sealants before they are dry.

### **3.8 CLEANING**

- .1 Immediately clean adjacent surfaces and leave the works clean and in perfect condition.
- .2 As work progresses, remove excess and burrs with sealant using recommended cleaners.

- .3 Remove the masking tape at the end of the initial sealant setting period.

**3.9 PROTECTION**

- .1 Protect installed equipment and components from damage during construction.
- .2 Repair damage to adjacent materials and equipment by installing joint sealants.

**END OF SECTION**

**Partie 1            General considerations****1.1                SECTION CONTENT**

- .1        Steel doors and frames.
- .2        Insulated steel doors and frames.

**1.2                RELATED REQUIREMENTS**

- .1        Section 06 10 00 – Articles of Wood
- .2        Section 07 10 00 - Air/Moisture Sealing
- .3        Section 07 92 00 - Joint Sealants
- .4        Section 08 71 00 - Door Hardware
- .5        Section 09 20 00 - Drywall Work
- .6        Section 09 91 00 - Painting

**1.3                REFERENCES (LAST PUBLICATIONS)**

- .1        American Society for Testing and Materials International, (ASTM)
  - .1        ASTM A 653/A 653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloyed-Coated (Galvannealed) by the Hot-Dip Process
  - .2        ASTM B29, Standard Specification for Refined Lead.
  - .3        ASTM B749, Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .2        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-1.181, Zinc Rich Coating, Organic Prepared.
  - .2        CAN/CGSB 41-GP-19Ma, Rigid vinyl profiles for windows and doors.
- .3        Canadian Standards Association        (CSA)/CSA International.
  - .1        CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Steel.
  - .2        CSA W59, Welded Steel Construction (Arc Welding).
- .4        Canadian Steel Door Manufacturers Association (CSDMA)
  - .1        CSDMA, Recommended Specifications for Commercial Steel Doors and Frames.
  - .2        CSDMA, Selection and Usage Guide for Commercial Steel Doors.
- .5        National Fire Protection Association
  - .1        NFPA 80, Standard for Windows Fire and Fire.
  - .2        NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- .6        South Coast Air Quality Management District (SCAQMD), California State, Regulation XI.
  - .1        SCAQ® Rule 1113, Architectural Coatings.
  - .2        SCAQ® Rule 1168- [A2005], Adhesives and Sealants Applications.

**1.4                DESCRIPTION OF WORKS**

- .1        Design requirements
  - .1        Frames installed in exterior walls must be designed so that the elements (doors and frames) can expand and contract freely when their surface is subjected to temperatures ranging from -35 degrees Celsius to 35 degrees Celsius.

- .2 The maximum deflection of steel baffles under 1.2 kPa wind overload must not exceed 1/175 of the span.

**1.5 DOCUMENTS AND SAMPLES TO SUBMIT**

- .1 Submit the required documents, samples, data sheets and shop drawings according to Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings
  - .1 The shop drawings must indicate each type of door proposed, the nature of the materials used, the thickness of the bare metal, the mortise joints, the reinforcing pieces, the location of the anchors and apparent fixings, the arrangement of the articles hardware, as well as finishing coatings.
  - .2 The shop drawings must indicate each type of frame proposed, the nature of the materials used, the thickness of the bare metal, the reinforcing pieces, the glazing beads, the location of the anchors and apparent fixings and the types of finishes and flame retardant reinforcement.
  - .3 The shop drawings must include a nomenclature of doors with markings and numbers corresponding to those used in the drawings and the table of doors, frames and hardware.
  - .4 Indicate height variations for floor/ceiling frames, due to floor level variations, if applicable.
  - .5 Submit test results, technical data and installation instructions.

**1.6 TRANSPORTATION, STORAGE AND HANDLING**

- .1 Transport, store and handle materials and equipment according to Section 01 61 00 - General Product Requirements.

**1.7 EXTENDED WARRANTY**

- .1 according to the requirements of Section 01 30 00, provide a written and signed document stating that the products supplied and installed are warranted against defects in workmanship and installation for a period of **three (3) years** from the date of Completion. substantial amount of work.

**Partie 2 Products**

**2.1 MATERIALS AND EQUIPMENT**

- .1 Hot Dipped Galvanized Steel Sheet: to ASTM A653/A653M, with commercial grade zinc plating; minimum thickness of bare metal conforming to the relevant CSDMA standard, Table 1 - Thickness for Component Parts.
- .2 Wall anchors: 1.6mm steel for masonry walls and 1.2mm for drywall.
- .3 Reinforcement box for lock and hinge: 1.6mm thick steel.
- .4 Reinforcing parts and profiles: steel to CSA-G40.20/G40.21, 44W grade, ZF75 galvanized to ASTM A653M, galvanized finish similar to the frame, minimum thickness according to the following table :

Reinforcement for	Minimum Thickness
Hinge	3.4mm (cal.10)
Lock and strike	1.9mm (cal.14)
Low and high doors	1.9mm (cal.14)
Door closer	1.9mm (cal.14)
Vertical sides of the doors	1.2mm (cal.18)

- .5 Adhesives
  - .1 Cellular cores and steel elements: thermoresistant, vaporizable contact adhesive based on neoprene rubber (polychloroprene) with incorporated resin filler, low viscosity.
  - .2 Polystyrene and polyurethane cores: heat-resistant contact adhesive based on epoxy resins, low

viscosity.

- .3 Staple gaskets: Fire-resistant adhesive/sealant based on polychloroprene with incorporated resin filler, high viscosity.
- .6 All other elements of doors and frames must comply with the requirements of the CSDMA and the recommendations of the manufacturers.

## 2.2 FINISHED

- .1 Primer: zinc chromate, CGSB standard 1-GP-132M and CAN/CGSB-1.181.
- .2 Painting: Steel doors and frames must be painted on site according to Section 09 91 00 - Painting. The weatherstripping must not be painted. ULC certification labels must not be painted. Finished surfaces must be free from scratches or other imperfections.

## 2.3 STAFF

- .1 Stamped steel frames for interior doors and glazed panels:
  - .1 Unless otherwise specified, the minimum basic thickness of the steel sheet must be as indicated below, for door openings with doors: (16 gauge)
- .2 Steel frames for exterior doors: 1.6 mm (0.060" / cal.12) thick, welded and thermal break, made of rigid polyvinyl chloride (PVC) extrusion according to CGSB-41-GP-19Ma.

## 2.4 DOORS

- .1 **PR/AC type.1:** Inner doors of hollow metal (P-102 and P-103):
  - .1 Overall thickness: 45 mm (1 ¾")
  - .2 Minimum thickness: 1.2mm (0.048" / cal.18) thick in general, 1.6mm (0.060" / cal.16) for doors greater than 2,440mm (8'-0" ) in height, or as indicated.
  - .3 Door core: Honeycomb type core, not larger than 24.5mm, made of Kraft paper having a mass of not less than 36.3 kg per ream and a density of not less than 16.5 kg/m Sanded to the required thickness, hot rolled in a hydraulic press using waterproof epoxy adhesive.
  - .4 Rives: Vertical edges with stapled and glued walls, with standard U-profiles on the upper and lower edges (see Door construction below).
- .2 **PR/AC type.2:** Insulated metal exterior doors (P-101 and P-104):
  - .1 Overall thickness: 45 mm (1 ¾")
  - .2 Minimum thickness: 1.6mm (0.060" / cal.16) or as indicated.
  - .3 Polyurethane core: Rigid polyurethane core, compliant with CAN/ULC S705.1-98 with an RSI factor of 1.22 per 25mm thick density of 32 kg/m.
  - .4 The doors must be provided with vertical reinforcements securely welded to each facing sheet, not more than 150 mm oc. The voids between the reinforcements of the external doors must be filled with a honeycombed polyurethane material.
  - .5 The exterior elements must be separated from the interior elements by a mechanically stapled continuous breaking device.
  - .6 The thermal break must be made by extruded rigid PVC elements according to CGSB 41-GP-19Ma.
- .3 Thermal insulation must meet the following requirements:
  - .1 The insulation materials used must not be included in a class of products known to be toxic, corrosive, flammable or explosive and labeled as such under the Consumer Chemicals and Containers Regulations, made under the Food and Drugs Act. dangerous products.
  - .2 Chemicals used in the manufacture of insulation must have the lowest possible ozone depletion potential (ODP).

**2.5 ACCESSORIES**

- .1 Shock absorbers for doors: single stud, neoprene rubber.
- .2 Inner horizontal closure profiles: rigid PVC extruded profiles according to CGSB 41-GP-19Ma.
- .3 Door Bottom Weatherstripping: Refer to Section 08 71 00 - Door Hardware.
- .4 Metal filler: according to the manufacturer specifications.
- .5 Fire certification labels: fastened with metal rivets.
- .6 Sealants: See section 07 92 00 Sealants VOC content of not more than 250 g/L.
- .7 Insulation for filling the cavities of external door frames: **Type ISOL.G.1**

**2.6 MANUFACTURE - GENERAL**

- .1 Fabricate galvanized steel doors and frames as detailed, according to CSDMS recommendations, unless otherwise specified.
- .2 Check the dimensions of all openings on the premises and ensure that the floor is level below the doors before starting production.
- .3 Coordinate work with finishing hardware suppliers (Section 08 71 00) to obtain templates and information needed to reinforce and drill doors and frames to receive hardware.
- .4 Prime the structural steel and reinforcements in the workshop.
- .5 Apply a touch-up primer in the shop, where the zinc coating has been damaged.
- .6 All screw heads must be concealed with putty, ground and smoothed by sanding.
- .7 Install glazing beads as indicated, with joints filled with putty and ground, preferably at the factory.
- .8 Fabricate fire resistant doors and frames to CAN4-S104 and CAN4-S105 standards. Certified doors and frames must have the certification label of an organization accredited by the Standards Council of Canada; for doors and frames of non-standard dimensions.

**2.7 MANUFACTURING OF MANAGERS - GENERAL**

- .1 Frames must be manufactured according to CSDMA standards.
- .2 Fabricate the frames with ASTM A924M-94 tension-leveled steel having a zinc/iron alloy hot-dip alloy layer of 75 g/m<sup>2</sup> Z75 (A25) grade commercial grade (CQ) according to ASTM A653-M-94. Recognized commercially as "Galvanealed".
- .3 All exposed welds must be continuous along the length of each joint.
- .4 Grind welded seams and corners and all exposed joints by grinding, filling with metal-filled filling paste and sanding to a smooth, even and flush finish.
- .5 For exterior doors and in very wet locations, fabricate the frames with ASTM A924M-94 tension-leveled steel, with a hot-dip zinc layer of 275 g/m<sup>2</sup> depending on the designation. Z275 (G90) Commercial Grade (QC) according to ASTM A653M-94. Recognized commercially as "Galvanized".
- .6 Thermal break frames must have a mechanically stapled continuous breaking device to isolate the outer elements of the interior elements.
- .7 The frames must be manufactured to the maximum profiles and frontal dimensions indicated.
- .8 Frames must be cut, reinforced, drilled and tapped as required to receive hardware and mortar hardware and, where required, the necessary electronic equipment, using templates provided by the supplier of hardware parts. finish. Frames must be reinforced as needed to accommodate projecting hardware.
- .9 Mortises must be protected with steel mortice covers for bulkheads other than drywall.

- .10 Single-leaf door frames must be fitted with three dampers and two-leaf door frames with two dampers installed on the top rail.
- .11 Reinforce the heads of the frames by more than 1220 mm (4'-0" ).
- .12 Arc weld all housings on frames and reinforcing plates for hardware.
- .13 Unless otherwise specified, fasteners must be concealed.
- .14 Frames must be retouched with primer paint where the zinc coating has been damaged during fabrication.
- .15 All frames must have a dust box at the bolt location.
- .16 Some frames will be type to receive pivot hinges, to maximize clearance once the door is open.
- .17 Install steel stiffeners to transport frames to the site.

## **2.8 ANCHORING THE FRAMES**

- .1 Appropriate devices for attaching frames to walls and floors must be provided and installed.
- .2 Wall anchors must be placed immediately above or below each hinge brace on the hinge side jamb, and directly opposite to the flush jamb.
- .3 Uprights with a rebate height equal to or less than 1520 mm must be provided with 2 anchors; additional anchorage must be provided for each additional segment or segment portion of 760 mm.
- .4 Anchors that will be embedded in frames of bays made before the installation of the door frames must be positioned not more than 150 mm from the top and bottom of each upright, and not more than 660 mm on the center line.

## **2.9 WELDED FRAMES (EVERYWHERE UNLESS OTHERWISE NOTED)**

- .1 Welds must be made according to CSA W59.
- .2 The elements of the frames must be assembled accurately, mechanically or mitered, then be securely welded to each other, the weld being deposited on the inner wall of the profiles.
- .3 The butt joints between the mullion elements, transoms, crossbeams and sills and supports must be accurately counter-profiled.
- .4 Seams and welded corners must be ground to a flat surface, filled with metal filler, and sanded to a smooth, even finish.
- .5 Floor anchors must be securely fastened inside each of the studs.
- .6 Two temporary braces must be welded to each frame to keep them upright during transport.
- .7 The lead shield must be securely fastened to the inside of the frame, from the ledge to the board (inclusive), only on the door side.

## **2.10 MANUFACTURING OF DOORS - GENERAL**

- .1 The doors must be flat, swinging and must have an opening allowing the installation of louvres (shutters), according to the indications in mechanics.
- .2 The longitudinal edges of the doors must be welded. The longitudinal joint must be ground to a flat surface, filled with metal filler, and sanded to a smooth, even finish.
- .3 Doors must be of special construction, tested and/or designed to form part of a fully functional assembly including a door, frame, gaskets and hardware, according to the requirements of ASTM E330.
- .4 Doors must be cut, reinforced and tapped as required to accommodate hardware and mortar hardware and electronic equipment required.
- .5 The doors will be reinforced to allow them to receive hardware mounted on the surface.

- .6 Openings with a diameter of 12.7 mm or greater must be drilled at the factory, except for those intended to receive mounting bolts and through bolts, which must be drilled on site at the time of installation of the hardware. .
- .7 Doors must be reinforced where hardware is to be mounted. Exterior doors must have a flush PVC profile at the top. Inner doors must be provided at the top and at the bottom with a recessed, spot welded profile.
- .8 Frames must be retouched with primer paint where the zinc coating has been damaged during fabrication.
- .9 Install the manufacturer identification plate on the doors, hinge side, so that they are hidden from view.
- .10 The transoms, if applicable, must be of identical manufacture to that of the doors.

### **2.11 THERMALLY BRIDGE DOORS AND FRAMES**

- .1 Doors with thermal break must have an insulated core, and the outer members must be separated from the interior elements by a mechanically stapled continuous breaker.
- .2 The thermal break must be made by extruded rigid PVC elements according to CGSB 41-GP-19Ma.
- .3 Thermal break frames must have a mechanically stapled continuous breaking device to isolate the outer elements of the interior elements.
- .4 Frames and doors must have insulation.

### **2.12 CLEANING AND FINISHING AT THE WORKSHOP**

- .1 Clean surfaces as required by SSPC-SP2, or higher quality as needed.
- .2 Make sure galvanized surfaces are free of manufacturing oil.
- .3 Apply a coat of primer paint in the shop, in addition to the galvanization compatible with the paint or special coating to be applied on site.
- .4 Apply the primer paint as prepared by the manufacturer, without any modifications. Apply to dry surfaces without rust, grease or scales. Do not apply primer at temperatures below 7 ° C.

## **Partie 3 Implementation**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and

### **3.2 INSTALLATION - GENERAL CONSIDERATIONS**

- .1 Install doors and frames according to the CSDMA installation guide.
- .2 Coordinate closely with Sections of related work.
- .3 Install the accessories as indicated.

### **3.3 INSTALLATION OF FRAMES**

- .1 Install the elements plumb, square, level and at the appropriate height.
- .2 Fasten the anchors to adjacent building elements.
- .3 Hold the frames firmly in position using braces until they are installed. Lay wooden temporary spacers horizontally to the thirds of the opening to keep the width of the frames constant. Install a vertical prop under the top rail in the center of the bay when the width of the bay is greater than 1200mm. Remove the wooden spacers once the frames are in place.
- .4 Leave the games necessary for bending to prevent the loads exerted by the frame being transmitted to the

frames.

- .5 Caulk surrounds between frames and adjacent elements with mattress insulation and sealant at the bottom of the joint.
- .6 Ensure the continuity of the airtightness system and the vapor barrier.

### 3.4 DOOR INSTALLATION

- .1 Install doors and hardware using the templates provided according to the manufacturer's instructions and the requirements of Section 08 71 00 - Door Hardware.
- .2 Provide a uniform gap between the doors and jambs of the frame and between the doors and the finished floor (and threshold), as follows:
  - .1 Hinges side: 1,0mm;
  - .2 Side latch and top rail: 1.5mm;
  - .3 Finished floor: 13mm.
- .3 Adjust the moving parts so that the doors operate smoothly.
- .4 Install the louvres (shutters).

### 3.5 EXECUTION OF TOUCH UP

- .1 Touch up surfaces that have been damaged during installation with a primer. Replace grooved and/or embossed parts.
- .2 Cover the exposed surface of the frame anchors and surfaces showing imperfections of metal filler, then sand down to a smooth, even finish.

### 3.6 DOOR FRAME INSULATION

- .1 Install ISOL.G.1 **Insulation inside** all exterior door frames, and where indicated for interior doors.
- .2 Make sure all voids are filled with insulation before starting work.

### 3.7 SETTING

- .1 Readjust the doors and hardware just prior to the completion of the work and after balancing the building ventilation system for smooth and easy operation.

**END OF SECTION**

**Partie 1            General considerations****1.1                SECTION CONTENT**

- .1 Exterior steel windows.

**1.2                CONNECTED SECTIONS**

- .1 Section 07 10 00 - Air/Moisture Sealing
- .2 Section 07 21 10 - Insulation
- .3 Section 07 62 00 - Sheet Metal Flashings and Trim
- .4 Section 07 92 00 – Joint Sealants
- .5 Section 08 80 50 - Glazing

**1.3                REFERENCES (LATEST EDITIONS)**

- .1 ASTM International (ASTM)
  - .1 ASTM A 123/A 123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 ASTM E 1748-95 (2009), Standard Test Method for Evaluating the Engagement Between Windows and Insect Screens as an Integral System.
- .2 CSA Group
  - .1 AAMA/WDMA/CSA 101/IS2/A440-11 (C2016), North American Window Standard (NAFS)/Specification for Windows, Doors and Skylights.
  - .2 CSA A440S1-09, Canadian Addendum to AAMA/WDMA/CSA 101/IS2/A440 - North American Window Standard (NAFS)/Specification for Windows, Doors and Skylights.
  - .3 CAN/CSA-A440.2-F14 /A440.3-14, Energy Efficiency of Fenestration Systems/CSA Guide A440.2-14, Energy Efficiency of Windowing Systems
  - .4 CAN/CSA-A440.4-F07 (C2016), Installation of Windows, Doors and Skylights.
  - .5 CAN/CSA-Z91-02 (R2013), Health and Safety Rules for Work on Suspended Equipment.
- .3 Green Seal (GS)
  - .1 GS-11-11, Paints and Coatings.
- .4 The Master Painters Institute (MPI).
  - .1 Architectural Painting Specification Manual - current edition.
    - .1 MPI # 79, Primer, Alkyd, Anti-Corrosive for Metal.
- .5 South Coast Air Quality Management District (SCAQMD):
  - .1 SCAQ® Rule 1113, Architectural Coatings.
  - .2 SCAQ® Rule 1168- A2005, Adhesives and Sealants Applications.
- .6 Sustainable Forestry Initiative
  - .1 SFI-2010-2014 standard.
- .7 Screen Manufacturers Association (SMA)
  - .1 SMA 1201R-2012 Specification for Insect Screens for Windows. Sliding Doors and Swinging Doors.

**1.4                DOCUMENTS AND SAMPLES TO SUBMIT**

- .1 Technical Data Sheets: Submit the required data sheets as well as the manufacturer's instructions and documentation for gypsum board and plaster. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finish.
- .2 Shop Drawings: Shop drawings must clearly indicate the nature of the materials, include full details of the top rail, jambs and window sill, as well as profiles of the building components, show interior trim and exterior, the junctions between the combined windows, indicate the dimensions of the structure and the details of the anchorages, show the place of application of the protective coating, and include a description of the related elements, of the caulking product as well as apparent finishes and fasteners. Shop drawings must also indicate the location of the manufacturer nameplate.

## 1.5 DOCUMENTS/COMPLEMENTS TO COMPLETE THE WORK

- .1 Operations and Maintenance Sheets: Provide instructions for operation and maintenance of windows.

## 1.6 QUALITY ASSURANCE

- .1 Certificates: submit the documents signed by the manufacturer, certifying that the products, materials and equipment comply with the requirements regarding physical characteristics and performance criteria.

## 1.7 TRANSPORTATION, STORAGE AND HANDLING

- .1 Transport, store and handle materials and equipment according to Section 01 61 00 - General Product Requirements.
- .2 Delivery and Acceptance: Deliver materials and materials to the work site in their original packaging, which must be labeled with the name and address of the manufacturer.
- .3 Storage and Handling
  - .1 Store materials and materials so that they do not sit on the ground, indoors and dry, in a clean, dry, well-ventilated area as recommended by the manufacturer.
  - .2 Store windows and frames to protect them from marks, scratches and scratches.
  - .3 Replace defective or damaged materials and equipment with new materials and equipment.

## 1.8 EXTENDED WARRANTY

- .1 according to the requirements of Section 01 33 00 - Submittal Procedures, in addition to the manufacturer standard warranty, submit a **five (5) year** written warranty against defects in materials and workmanship. the date of substantial completion of the work.

## Partie 2 Products

### 2.1 MATERIALS/EQUIPMENT

- .1 Materials: complies with AAMA/WDMA/CSA 101/IS2/A440 and the following requirements.
  - Chassis: steel with thermal break.
  - .3 Triple cutter cold with continuous primary seal welded to the four corners.
  - .4 Glass: Type **VTH.1**, according to Section 08 80 50- Glazing.
  - .5 Sealants
    - .1 VOC content up to 250 g/L, according to SCAQMD regulation 1168.
    - .2 Section 07 92 00 – Joint Sealants
  - .6 Provide an outside extension of appropriate length.

### 2.2 TYPES OF WINDOW

- .1 Types: fixed.
- .2 **Type FEN/AC-1:**
  - .1 Fixed frame window according to AAMA/WDMA/CSA 101/IS2/A440
  - .2 See architectural drawings for configuration and dimensions.

### 2.3 PRODUCTION

- .1 Windows must be manufactured according to the requirements of AAMA/WDMA/CSA 101/IS2/A440 and the following requirements.
- .2 Windows must be precision made and square, with a maximum tolerance of 1.5 mm plus or minus for windows measuring 1800mm or less diagonally, and 3 mm more or less for windows measuring more than 1800mm .
- .3 The detailed frontal dimensions are the maximum permitted magnitudes.
- .4 Racks must be braced during transportation and installation to maintain rigidity and maintain right angles.
- .5 Staples and steel reinforcements must be coated with a factory-applied primer coat according to CAN/CGSB-1.40 with a coating of 380 g/m<sup>2</sup> to ASTM A123/A123M.

### 2.4 PROTECTIVE COATING

- .1 According to the manufacturer recommendations depending on the condition of the surfaces.

### 2.5 AIR SEALING MEMBRANE AND VAPOR BARRIER

- .1 Window frames must be provided with a factory installed air barrier membrane and vapor retarder to seal the air and vapor barrier system. of the building as follows.
  - .1 Material: Identical or compatible with the air barrier membrane and vapor barrier of the building, and designed to provide the building envelope with the required characteristics of watertightness, air and the migration of water vapor.
  - .2 Material width: sufficient to provide the airtight and vapor barrier membrane of the building with the required airtightness and water vapor migration characteristics , from inside the building to the outside.

## Partie 3 Implementation

### 3.1 TEST

- .1 Verification of conditions: Before proceeding with the installation of joint sealants, ensure that the condition of surfaces/supports previously implemented under other sections or contracts is acceptable and allows the work to be carried out according to the written manufacturer's instructions.
  - .1 Make a visual inspection of the surfaces/supports.
  - .2 Immediately inform the Departmental Representative of any unacceptable conditions identified.
  - .3 Start installation work only after correcting unacceptable conditions.

### 3.2 INSTALLATION

- .1 Follow the manufacturer recommendations.
- .2 Window Installation
  - .1 Install windows according to AAMA/WDMA/CSA 101/IS2/A440.
- .3 Laying the supports
  - .1 Lay the metal supports so as to give them a uniform slope towards the outside; place them in alignment and level in the length direction, keeping the vertical parts level.

- .2 Cut the supports to the length of the window bay.
  - .3 Fasten the supports using anchoring devices placed at the ends of the one-piece supports and at 600 mm centers.
  - .4 Fasten expansion joint covers and rebates with stainless steel self-tapping screws.
  - .5 Leave a gap of 6 to 9 mm between the end ends of the continuous supports. For supports measuring more than 1200 mm in length, leave a space of 3 to 6 mm at each end.
- .4 Insulation: Insulate the perimeter of the window with low expansion splash insulation.
- .5 Caulking
- .1 Caulk joints between windows and supports with sealant. Install the splices and joint plates for the expansion joints of the caulking bath supports. Caulk the joint between the rising part of the support and the frame of the window. Caulk abutting joints of continuous supports.
  - .2 Apply sealant according to Section 07 92 00 - Sealants. Conceal the sealant inside the window.

**3.3 CLEANING**

- .1 Leave the places clean at the end of each working day.

**3.4 PROTECTION**

- .1 Protect installed equipment and components from damage during construction.

**END OF SECTION**

**Partie 1           General considerations****1.1               SECTION CONTENT**

- .1           Not necessarily limited to, this section includes the hardware items described herein and according to the Hardware Chart. It includes all hardware required for the installation of steel doors.

**1.2               CONNECTED SECTIONS**

- .1           Section 08 11 00 - Metal Doors and Frames (Hardware Installation)
- .2           Division 26 - Electrical Specifications for Electrical Wiring for Magnetic Locks, for Automatic Door Opener and for Release Devices and Electric Locks

**1.3               REFERENCES (LAST PUBLICATIONS)**

- .1           American National Standards Institute (ANSI)/Building Hardware Manufacturers Association
  - .1           ANSI/BHMA A156.1 American National Standard for Butts and Hinges.
  - .2           ANSI/BHMA A156.2, Bored and Preassembled Locks and Latches.
  - .3           ANSI/BHMA A156.3, Exit Devices.
  - .4           ANSI/BHMA A156.4, Door Controls - Closers.
  - .5           ANSI/BHMA A156.5, Auxiliary Locks and Associated Products.
  - .6           ANSI/BHMA A156.6, Architectural Door Trim.
  - .7           ANSI/BHMA A156.8, Door Controls - Overhead Stops and Holders.
  - .8           ANSI/BHMA A156.10, Power Operated Pedestrian Doors.
  - .9           ANSI/BHMA A156.12, Interconnected Locks and Latches.
  - .10          ANSI/BHMA A156.13, Mortise Locks and Latches Series 1000.
  - .11          ANSI/BHMA A156.14, Sliding and Folding Door Hardware.
  - .12          ANSI/BHMA A156.15, Release Devices - Closer Holder, Electromagnetic and Electromechanical.
  - .13          ANSI/BHMA A156.16, Auxiliary Hardware.
  - .14          ANSI/BHMA A156.17, Self-closing Hinges and Pivots.
  - .15          ANSI/BHMA A156.18, Materials and Finishes. XXXXX 12/14
  - .16          ANSI/BHMA A156.19, Power Assist and Low Power Energy - Operated Doors.
  - .17          ANSI/BHMA A156.20, Strap and Tee Hinges and Hasps.
- .2           Canadian Steel Door and Frame Manufacturers Association (CSDMA)/Canadian Steel Door Manufacturers Association (CWPA)
  - .1           CSDMA/ACFPA, Recommended Dimensional Standards for Commercial Steel Doors and Frames.

**1.4               REQUIREMENTS OF REGULATORY BODIES**

- .1           The standard position of hardware must meet the requirements of the Canadian Metric Guide for Steel Doors and Frames - Modular Construction Section, prepared by the Canadian Steel Door and Frame Manufacturers Association. However, the position of door hardware accessible to persons with limited mobility must meet the standards in force.
- .2           The hardware must comply with ANSI/BHMA standards.
- .3           Use qualified, ULC-labeled hardware for fire and emergency exit doors.

**1.5               DOCUMENTS AND SAMPLES TO SUBMIT**

- .1           Shop Drawings/Hardware Parts List

- .1 Submit the complete list of hardware parts provided by the hardware supplier, indicating all types that are identified in the hardware chart.
  - .2 Accompany each piece of hardware with a perfectly legible illustration and identify the hardware parts being examined, including make, model, material, function, finish, installation height and position, spinning diagrams (if required) as well as any other relevant information.
  - .3 The list will include the information gathered on the drawings and on the board of doors and frames; these are among others:
    - .1 All the doors of the door and frames board with the corresponding number.
    - .2 The hardware group assigned to each door and listed at the end of this section.
    - .3 The location, the appropriate degree of opening of each door, the action, size, material and type of each door and frame.
  - .4 The list will be submitted to the Departmental Representative before signing the purchase order. A copy will be returned to the Contractor, who will be required to provide a copy reviewed by the Departmental Representative to the supplier along with its purchase order.
- .2 Operation and maintenance sheets
    - .1 Provide the service sheet, parts list, and manufacturer's instructions for each type of door closers, locks, door stops, and accessories, and attach them to the service manual.
    - .2 Arrange for a training session to demonstrate to the Departmental Representative's maintenance staff the procedures for the use, cleaning of hardware and how to perform preventative maintenance.
  - .3 Manufacturer's Instructions: Submit installation instructions provided by the manufacturer.

## **1.6 SUBSTITUTE MATERIALS**

- .1 Provide two (2) sets of special tools required for specified hardware items, if applicable.

## **1.7 QUALITY ASSURANCE**

- .1 Locks, door closers, panic locks, stop arms, power boxes, power transfers, switches, keypads and electric strikes must be from one and the same manufacturer.
- .2 The project supplier's representative must have a minimum of five (5) years experience in the sale and distribution of finishing hardware for projects of the same type.
- .3 In the event that a piece of hardware is not compatible with the other specified elements, it will be necessary to provide, without supplement, a compatible part.
- .4 Finishing hardware will be suitable for the specified purpose and will be suitable for the designated location.
- .5 If certain items needed to complete the work were not specifically prescribed, obtain information and clarification as to the quality, quantity and type required to provide these items at no additional cost to the department.
- .6 The hardware list is provided as a guide to establishing the type, function, quality and minimum weight of the required items, but must not be construed as a list of quantities. Provide any additional hardware items that are not specified but required to complete the work according to the intent of the documents.
- .7 Any omissions or errors that make the operation or application specific to one or more openings that do not comply with the codes having jurisdiction, must be corrected sufficiently in advance to avoid any delay in the manufacture and delivery of the hardware.
- .8 During construction, he will make the necessary checks to ensure that the finishing hardware he supplies is properly laid and will inform the contractor.

## **1.8 INSTALLATION**

- .1 The hardware store will be installed and adjusted by personnel who have already installed this type of

hardware and have expertise in this type of work required by the Commission de Construction du Québec (Specifications).

- .2 All the work will be executed carefully and meticulously according to the rules of the art. Fasteners supplied by the supplier (s) for their respective hardware will be the only ones accepted.

## **1.9 WARRANTY**

- .1 Provide a joint document, supplier/manufacturer, written, signed and issued on behalf of the departmental representative stating that the materials are warranted against malfunction or finish, under normal use conditions.
- .2 The twelve (12) month warranty period specified in the Terms and Conditions will be extended to:
  - .1 Ten (10) years for door closers
  - .2 Five (5) years for locks
  - .3 Three (3) years for anti-panic locks
  - .4 Two (2) years for other hardware items.

## **Partie 2 Products**

### **2.1 GENERAL**

- .1 All items of the same type must come from the same manufacturer.
- .2 Provide hardware according to the relevant CGSB standard.
- .3 In the absence of an ANSI standard, the hardware must be able to perform its function and be of recognized use.

### **2.2 MATERIALS**

- .1 The hardware must be supplied with the screws, nuts and other devices so that it is fixed according to the recommendations of the manufacturers.
- .2 Double door locks with an overlapping astragal will have a strike whose lip will be flush with the front of the door.
- .3 Check floor conditions before ordering bumpers and thresholds, and provide different ones if conditions dictate. When no door closer is provided, provide and install doorstops attached to the floor.
- .4 The skid plates will be 25mm shorter than the width of each of the double doors on the PUSH side and 12mm shorter on the PULL side. For single doors 12mm less on the TIRER side and 40mm less on the PUSH side. Allow 5mm extra spacing between plates and astragals, weather stripping and sound suppression.
- .5 All hardware must be new and institutional and robust.

### **2.3 ATTACHMENTS**

- .1 Provide, through the various hardware manufacturers, the screws, bolts, expansible pads and other fasteners required to ensure the proper fastening and operation of these parts, as directed by the manufacturers.
- .2 Exposed fasteners must have the same finish as the installed hardware item.
- .3 The fasteners of the stainless steel elements must be made of stainless steel.
- .4 Where a pull handle is required on one side, and a push plate on the other side of the door, provide the necessary fasteners and install them so that the handle is secured from one side to the other. the door. Install the push plate so that the fasteners are hidden.

- .5 Use fasteners made of a material compatible with the one they pass through.
- .6 Use only the fasteners supplied by the manufacturer. Failure to comply with this requirement may compromise the warranties and invalidate the certification labels, if applicable.
- .7 Unless otherwise specified, countersunk countersunk head screws are used to secure push and kick plates, etc.

## 2.4 KEY SYSTEM

- .1 All locks must be secured to the master key system of the building (MEDECO).
- .2 Provide in triplicate the keys of each of the locks forming part of this contract, unless otherwise indicated.

## 2.5 LIST OF HARDWARE ITEMS

- .1 at the end of this section

## Partie 3 Implementation

### 3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with the manufacturer's written requirements, recommendations and specifications, including the technical bulletins and installation instructions specified in the product catalogs and packaging cartons, and the specifications in the data sheets.
- .2 Install standard hardware items according to the requirements of the Canadian Metric Guide for Steel Doors and Frames (Modular Construction), developed by ACFPA.
- .3 Provide manufacturers of doors and metal frames with installation templates and complete instructions to prepare their products to receive the hardware items specified in this section.
- .4 Provide, with each hardware item, the installation instructions developed by the manufacturer.

### 3.2 INSPECTION OF THE PREMISES

- .1 Ensure that frames and doors are level and properly prepared for hardware. Start the installation only if everything is in order.
- .2 At the beginning of the installation work, the supplier will make the necessary verifications to ensure that the finishing hardware supplied is properly installed and will inform the contractor.

### 3.3 POSE-GENERAL INSTRUCTIONS

- .1 Installation height:
  - .1 Verify with the Departmental Representative and the Contractor the appropriate installation height and any other special conditions, including those regarding the design of " barrier-free floor areas".
  - .2 Installation height of the following hardware parts:
    - .1 Panic Locks/Locks: 1024mm from the center of the strike to the finished floor.
    - .2 Roller latches on single door: according to the standards in force.
    - .3 Deadbolt locks: according to the standards in force.
    - .4 Output device: according to the manufacturer's instructions.
    - .5 Push plates: 1 145mm from the center of the finished floor plate.
    - .6 Pull Handles: 1,067mm from the center of the finished floor handle.
- .3 GROUND PROTECTION PLATES

- .1 Install the protection plates 5mm from the bottom of the door, except for doors with automatic door sills or those whose threshold has a stop; in this case, lay the plate 5mm above the threshold stop.
- .2 Center the plate over the width of the single doors.
- .3 On the pairs of doors, place the plate 5mm from the edge, lock side or striker of each door and, hinge side, at a sufficient distance so that it does not strike the frame stop, the weatherstrip, or the his appetite.
- .4 Threshold: Cover with the threshold the surface between the two jambs; trim and adjust to the frame. Be sure to seal the sill using a sealant prescribed by the manufacturer. Add the parts free of charge to extend the threshold if site conditions require it.
- .5 Bumpers: Install a bumper that must touch the tie rod so that it hits the bottom of the tie rod; provide mounting brackets for the wall stops.
- .6 All other hardware items not listed above must be installed according to the manufacturer installation instructions.
- .2 Drills, mortises, door adjustments: proceed with the preparation of the doors before they are painted; install all hardware, including dampers, weather stripping and soundproofing except for hinges and pivots, after the final coat of paint has been thoroughly dried.
- .3 Anti-dust locks: install the locks after cleaning the site and before adjusting the hardware.
- .4 Door Closers: Adjust the door closers during installation and then readjust just prior to the inspection request of the installed hardware. The strength of the door closers must be appropriate to the size and weight of the doors to meet the standards and requirements of the manufacturer.
- .5 Place the hardware level with the bolts and bolts provided by the manufacturer and as directed. Recessed parts will be flush with doors.
- .6 Install all fasteners perpendicular to the face of the workpiece. The screws will be strictly those supplied by the manufacturer and they must be installed according to the best practices of the trade. Screws with burrs that are not straight or are damaged in any way will need to be replaced.
- .7 Hardware that will not be installed due to architectural changes or other changes must be returned to the Departmental Representative in its original packaging.

### 3.4 **ADJUSTING AND CLEANING**

- .1 Ensure that the installed hardware is properly adjusted to the project requirements and according to the manufacturer recommendations.
- .2 Adjust hardware, operating and control devices and door closers to ensure smooth operation, safety, and tight sealing.
- .3 Adjust and verify the operation of the various hardware components at the time of installation and prior to the inspection request of the installed hardware.
- .4 Lubricate hardware, operating and control devices and all moving parts.
- .5 Adjust door hardware to ensure perfect contact between doors and their frames.
- .6 Adjust all door closers once all hardware is installed.
- .7 When the project is completely finished, all hardware items must be clean and intact. The General Contractor must repair or replace any defective hardware. He must also provide the Departmental Representative with a copy of each installation instruction for the installed items.

### 3.5 **PROOF**

- .1 Information given to maintenance staff
  - .1 Give maintenance staff the necessary information on the following.

- .1 Proper methods of cleaning and maintenance of hardware items.
  - .2 Characteristics, function, handling and storage of keys.
  - .3 Function, handling and storage of keys used to adjust hardware for exit doors, locks and door closers.
- .2 Demonstrate the operation of the elements, as well as adjustment and lubrication characteristics.

**3.6 PROTECTION OF WORK**

- .1 Protect hardware for the duration of the work against any damage that may be caused to them and that could affect their intended operation or prevent them during the work and once completed. End protective measures once work is complete
- .2 Any damaged hardware will need to be replaced.

**3.7 LIST OF HARDWARE ITEMS**

**Notes & Abbreviations:**

- Lr: Required length (to be coordinated with the openings in question).
- Hr: Height required (to be coordinated with the openings in question).
- Ep: Door thickness (to be coordinated with the openings in question).
- LC: Less Cylinder.
- CR: Regular key or key of exchange (regular keying). Provide 3 copies of keys for each cylinder/key ring.

**IMPORTANT:**

- The screws on the foot plates must be stainless steel and have a conical head. All other types of screws will be automatically rejected.
- The final choice of thresholds is to be coordinated with site conditions, in collaboration with the Departmental Representative. Those specified in groups are for informational purposes only. By cons, the manufacturer chooses must be respected.
- The choice of active and semi-active doors is to be coordinated with the departmental representative during the project (to be confirmed in shop drawings).
- The final coordination of the automatic fall-in thresholds is the responsibility of the general contractor and his hardware subcontractor.

**HARDWARE GROUPS**

**- Group 01/Exterior single doors**

Qty	DESCRIPTION	FINISH	Manufacturer
3	Robust ball bearing hinges and non-removable plugs T4A3386 4.5 " x 4 " FNA	630	McKinney
1	Power transfer EPT-10	630	Von Duprin
1	Electric strike Medeco HD 8000	630	Medeco
1	Mortise-type panic lock with exterior trim function deposit 9875NL x 36 " + 990NL-M x LC x door 1 ¾ "	626	Von Duprin
1	Key cylinder mortise type for exterior trim Medeco <sup>3</sup>	626	Medeco

1	SFIC Interchangeable Core Cylinder provided by the Departmental Representative but installed by the General Contractor	626	
1	protected LG10	630	
1	Parallel door closers with built-in bumper 4040XP-S-Cush	689	LCN
1	Plate with feet 8 " x 34.5 " (with stainless steel screws)	630	Miscellaneous
1	Flat aluminum threshold without thermal break AC6 x 36 "	627	Unique
1	Head seal kit for the head 17V x 36 "	627	Unique
2	Surface seal kit for jambs 1650 x 84 "	628	Unique
1	Door sill in brush type surface W-24S x 36 "	628	KN Crowder
1	Recessed Alarm Contact Model 1076W-M		
1	Outdoor Access Reader Model FP603		
1	Exit Request Detector Model T-REX-XL		
1	Piezo local alarm model PZ1		
1	Siemens CA-100 Model Access Controller c/a 2 modules of 16 points of supervision		
2	overvoltage modules model DTK-2LVLP-D		

- The quantities specified are the unit quantities required for each of the doors mentioned in reference.
- EMT ducts with pull cables, electrical and junction boxes, and 120V power connection: Provided, installed, and connected by the Electrical Division.
- Electrical equipment in this group: Provided, installed, connected, and turned on by this section (including low voltage wiring required to power the door lock).
- The access system and its components: Provided, installed, connected and commissioned by the Electrical Division, including all low voltage wiring (including those for magnetic contacts).
- The various stakeholders will have to coordinate their work together, and this in pre-project.

- **OPERATION:**

- The door is barred from the outside. To enter, present his magnetic card to the external reader. At this time, the electric strike will be energized and released momentarily. Pull the outside handle to manually open the door.
- Free exit by pushing panic. This authorized output is signaled to the controller by the output request detector.
- Add a new access controller for the main entrance door which will also serve as a supervision panel and transmit the various 20 monitoring points to the SPHINX management system of building # 1.
- The Sphinx Access Control System at Building # 1 will receive the new monitoring points for the new building.

- Provide an individual transmission from each of the 20 points of the new building to the SECURITY alarm center.

**Group 02/Double exterior doors**

Qty	DESCRIPTION	FINISH	Manufacturer
8	Robust ball bearing hinges and non-removable plugs T4A3386 4.5 " x 4 " FNA	630	McKinney
1	Set of manual down & up locks on semi-active door MGR 550 + 550 (with extension for the upper lock)	626	Rockwood
1	SFIC Interchangeable Core Kernel provided by the Departmental Representative but installed by the General Contractor	626	General contractor
1	MDR active door deposit lock AU5305LN x 497	626	Yale
1	Robust adjustable recessed stop arm on semi-active MGR door 1ADJ-536 x stop option only	630	Rixson
1	Door Closer Rail Closure Pull Side with Integrated MDR Door Stopper 4040XPTB (3038B)	689	LCN
1	Flat aluminum threshold without thermal break AC6 + AA1 x 96 "	627	Unique
1	Head seal kit for the head 17V x 96 "	627	Unique
2	Surface seal kit for jambs 1650 x 120 "	628	Unique
2	Door sill in brush type surface W-24S x 48 "	628	KNC
1	Z-shaped steel astragal welded on semi-active door MGR (Provide a full length Pemko S773D Self-Adhesive Sealant if needed)		Door manufacturer
2	Recessed Alarm Contact Model 1076W-M		

- The quantities specified are the unit quantities required for each of the doors mentioned in reference.
- Magnetic contacts for the supervision of this opening: Provided by this section, but installed, connected and commissioned by the Electrical Division (including low voltage wiring).
- The various stakeholders will have to coordinate their work together, and this in pre-project.
- **OPERATION:**
- State of the position of the doors monitored by the access control system

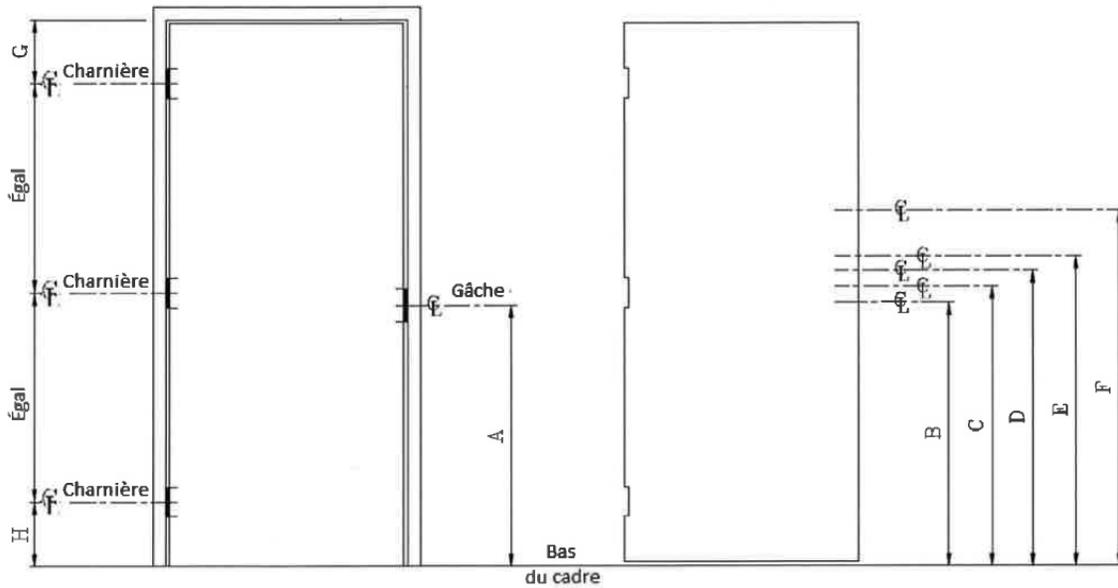
**- Group 03/Interior doors**

Qty	DESCRIPTION	FINISH	Manufacturer
3	Robust ball bearing hinges and non-removable plugs T4A3786 4.5 " x 4 " FNA	652	McKinney

1	Lever lock deposit function AU5405LN x 497	626	Yale
1	Key cylinder mortise type for exterior trim Medeco <sup>3</sup>	626	Medeco
1	SFIC Interchangeable Core Cylinder provided by the Departmental Representative but installed by the General Contractor	626	General contractor
1	Parallel door closers with built-in bumper 4040XP	689	LCN
1	Plate with feet 8 " x 34.5 " (with stainless steel screws)	630	Miscellaneous

- The quantities specified are the unit quantities required for each of the doors mentioned in reference.

## 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 3/4"	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.*

**ANSI/BHMA Materials and Finishes Chart**

<b>Cheat Description:</b>	<b>Basic equipment:</b>	<b>Canadian Equivalent</b>
<b>626</b> Satin chrome	Brass, bronze	C26D
<b>628</b> Anodized aluminum and clear satin	Aluminium free	C28
<b>630</b> Satin stainless steel	Stainless Steel Series 300	C32D
<b>652</b> Satin chrome plated	Steel	C26D
<b>689</b> Aluminum painted	Any	C28
<b>627</b> Natural aluminum without lacquer	Aluminium free	C27
<b>313</b> Dark Bronze anodized	Aluminium free	C10B
<b>613</b> Dark Bronze, Satin, Oxidized and Oiled	Brass, bronze	C10B
<b>690</b> Painted dark bronze	Any	C20
<b>315</b> Dark Anodized Black ( <b>109</b> for Alumico)	Aluminium free	C19
<b>622</b> Dark black matt plated	Brass, bronze	C19

**END OF SECTION**

**Partie 1            General considerations****1.1                SECTION CONTENT**

- .1            Glazing for exterior window.

**1.2                CONNECTED SECTIONS**

- .1            Section 06 10 00 – Articles of Wood
- .2            Section 07 10 00 - Air/Moisture Sealing
- .3            Section 07 62 00 - Sheet Metal Flashings and Trim
- .4            Section 07 92 00 – Joint Sealants
- .5            Section 08 50 00 - Windows

**1.3                REFERENCES (LAST PUBLICATIONS)**

- .1            American Society for Testing and Materials International, (ASTM)
  - .1            ASTM C542, Specification for Lock-Strip Gaskets.
  - .2            ASTM C1503, Standard Specification for Silvered Flat Glass Mirror.
  - .3            ASTM D790, Standard Test Methods for Flexible Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
  - .4            ASTM D1003, Test Method for Haze and Luminous Transmittance of Plastics.
  - .5            ASTM D1929, Test Method for Determination Ignition Temperature of Plastics.
  - .6            ASTM D2240, Standard Test Method for Rubber Property-Durometer Hardness.
  - .7            ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
  - .8            ASTM E330, Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
  - .9            ASTM F1233, Test Method for Security Glazing Materials and Systems.
- .2            Canadian General Standards Board (CGSB)
  - .1            CAN/CGSB-12.1, Tempered or laminated safety glass.
  - .2            CAN/CGSB-12.2, Flat and Clear Glass.
  - .3            CAN/CGSB-12.3, Float glass, flat and clear.
  - .4            CAN/CGSB-12.4, Athermane *glass (opaque infrared glass)*.
  - .5            CAN/CGSB-12.6, Transparent Mirrors (in one direction) (*observation room*).
  - .6            CAN/CGSB-12.8, Insulating glazing.
  - .7            CAN/CGSB-12.9, Tympanic Glass.
  - .8            CAN/CGSB-12.10, Reflective glass.
  - .9            CAN/CGSB-12.11 Armored Security Glass.
  - .10          CAN/CGSB-12.12, Plastic Safety Glazing Panels.
  - .11          CAN/CGSB-12.13, Patterned glass.
  - .12          CAN/CGSB-12.20, Design rules for window glass for buildings.
- .3            Canadian Standards Association            (CSA)/CSA International.
  - .1            CSA A440.2, Energy Performance Evaluation of Windows and Sliding Glass Doors.
  - .2            CSA, Window and Door Certification Program.
- .4            Environmental Choice Program (ECP).

- .1 DCC-045, Sealants and Caulking.
- .5 Glass Association of North American (GANA)
  - .1 GANA Glazing Manual.
  - .2 GANA Laminated Glazing Reference Manual.
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQ® Rule 1168- A2005, Adhesives and Sealants Applications.

#### **1.4 PERFORMANCE CRITERIA**

- .1 Comply with the following requirements for glazing and glass materials to ensure the continuity of the air and water vapor barrier system of the building envelope. The inner pane of multiple sealed glazings must ensure the continuity of the air and water vapor barrier system.
- .2 The dimensions of glazing must be such that they withstand permanent loads, wind loads and pressure and suction forces acting perpendicular to the glazing plane, calculated according to ASTM E330.
- .3 The maximum bending of the glazing must not exceed 1/200 of the ultimate bending strength of the glass, and this deformation must in no way alter the physical properties of the glass materials.

#### **1.5 DOCUMENTS AND SAMPLES TO SUBMIT**

- .1 Technical Data Sheets: Submit the required data sheets as well as the manufacturer's instructions and documentation for glazing, sealants and glazing accessories. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finish.
- .2 Shop drawings
  - .1 The drawings must indicate construction details, dimensions and thicknesses for each type of glazing and each type of joint.
  - .2 Shop drawings must indicate or show materials, finishes, assemblies, joints, details and accessories where applicable.

#### **1.6 TRANSPORTATION, STORAGE AND HANDLING**

- .1 Delivery and Acceptance: Deliver materials and materials to the work site in their original packaging, which must be labeled with the name and address of the manufacturer.
- .2 Storage and Handling
  - .1 Store materials and materials so that they do not sit on the ground, indoors and dry, in a clean, dry, well-ventilated area as recommended by the manufacturer.
  - .2 Store windows and frames to protect them from marks, scratches and scratches.
  - .3 Replace defective or damaged materials and equipment with new materials and equipment.

#### **1.7 IMPLEMENTATION CONDITIONS**

- .1 Glazing sealants must be operated at an ambient temperature of at least 50°F. Additionally, the area where the work is carried out must be ventilated for 24 hours after the installation of these sealants.
- .2 Ensure that the prescribed minimum temperature is obtained before starting the work and then maintain it during the installation of the glazing sealants and for the next 24 hours.

### **Partie 2 Products**

#### **2.1 GENERAL CONSIDERATIONS**

- .1 The thickness of the glass must never be less than the thickness specified in the specifications or drawings

and must comply with the requirements of the regulatory bodies (standards and building codes) according to their location and their area; the most severe of the requirements will have to be applied. Points 1.3 and 1.4

**2.2 DESIGN STANDARD**

- .1 Comply with the following requirements for glazing and glass materials to ensure the continuity of the air and water vapor barrier system of the building envelope.
  - .1 The inner pane of multiple sealed glazings must ensure the continuity of the air and water vapor barrier system.
- .2 The dimensions of glazing must be such that they withstand permanent loads, wind loads and pressure and suction forces acting perpendicular to the glazing plane, calculated according to ASTM E330. The thickness must therefore be increased in relation to the specification if it is deemed necessary by the manufacturer.
- .3 The maximum bending of the glazing must not exceed 1/200 of the ultimate bending strength of the glass, and this deformation must in no way alter the physical properties of the glass materials.

**2.3 GLAZING**

<b>TABLE OF TYPES OF GLASS</b>		
<b>IDENTIFICATION (Types)</b>	<b>Applicable Standards/Characteristics * Or greater if required by an applicable standard)</b>	<b>Application location where indicated, including</b>
Type VTH.1 Insulated glass, clear double sealed (thermos)	<ul style="list-style-type: none"> <li>▪ CAN/CGSB-12.2, 12.8 and 12.9</li> <li>▪ Minimum Thickness *: Two (2) clear 6mm (1/4" ) * thick glasses</li> <li>▪ Neat coating or equivalent in front # 1</li> <li>▪ Low-e coating 366, side 2.</li> <li>▪ 12.7mm (1/2" ) thick air gap with Black argon gas and R-Max spacer.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Outside windows</li> </ul>

**2.4 ACCESSORIES**

- .1 Spacer and seat blocks: Silicone, Shore A hardness 80 to 90 durometer measured according to ASTM D2240; total length of at least 100 mm x width of the rabbet of the panel of which one subtracted 1.5 mm, x the height.
- .2 Peripheral shims: in silicone, hardness A Shore 50 to 60 measured durometer according to the standard ASTM D2240, self-adhesive on one side, 75 mm length on half the height of the glazing beads on the thickness appropriate to the glazing set up.
- .3 Self-adhesive tape for glazing:
  - .1 Premixed butyl compound with integral, resilient and tubular shaped spacer, Shore A hardness 10 to 15 durometer measured according to ASTM D2240, coiled on non-stick coated paper or
  - .2 Closed-cell polyvinyl chloride foam, of suitable thickness, wound on non-stick paper, covered with adhesive on the sides, with a maximum water absorption capacity of 2%, capable of compressing 25%, sealing to air and steam.
- .4 Glazing beads: Resilient, silicone, extruded shape adapting to the rabbet, of the selected color.
- .5 Glazier's pliers: of the standard type, recommended by the manufacturer.
- .6 Sealants: See section 07 92 00 Sealants

**Partie 3 Implementation****3.1 REQUIREMENTS - INSPECTION**

- .1 Before manufacturing, take all dimensions on site or obtain them from the manufacturers of the parts in which the glazing is to be installed. Cut and prepare the glazing units at the factory to the required dimensions, grind and polish the sides where required and label each pane to indicate the quality and direction of the draft lines.
- .2 Verification of conditions: Before proceeding with the installation of joint sealants, ensure that the condition of surfaces/supports previously implemented under other sections or contracts is acceptable and allows the work to be carried out according to the written manufacturer's instructions.
  - .1 Make sure that openings for glazing are well dimensioned and that they comply with tolerances.
  - .2 Make sure that the surfaces of the rabbets and other recesses are clean and free of obstruction, and that they are ready to receive glazing.
- .3 Any defective installation will be replaced at the expense of the Contractor. No imperfections will be tolerated.
- .4 Any imperfections, dust or debris on exposed glazed surfaces after installation may cause rejection of the work.
- .5 Ensure that all steel ready to receive glazing is either galvanized, zinc-coated or rust-resistant and that the entire weight in direct contact with the sealant has been primed with paint.
- .6 Ensure that the applied film adheres to the entire surface and that no air bubbles remain between the glass and the film.

**3.2 PRELIMINARY WORKS**

- .1 Clean the contact surfaces with a solvent and dry with a cloth.
- .2 Seal recessed surfaces and porous glazing profiles with a primer paint or sealant that is compatible with the substrate.
- .3 Apply a primer paint to the surfaces to be covered with a sealant.

**3.3 EXTERIOR GLAZING - MIXED MOUNTING (ADHESIVE BANDS/SEALING MASTIC)**

- .1 Perform work according to the specifications contained in the GANA Glazing Manual and the specifications contained in the GANA Laminated Glazing Reference Manual for glazing assembly methods.
- .2 Cut the adhesive strips to the appropriate length and place them against the permanent beads, 6mm below the line of vision. Seal the corners by splicing the strips and covering them with sealant.
- .3 Shape a bead of sealant at the base of the glazing, at the meeting point of the permanent glazing beads and the frame, so as to seal the air and water vapor between the frame and the glass on all around the glazing.
- .4 Place the shims at intervals corresponding to a quarter of the width of the glazing, so that the end shims are at most 150mm from the corners of the latter.
- .5 Place the glazing on the seat blocks and press against the adhesive strips and the sealant bead formed at the base of the glazing, exerting sufficient pressure to obtain perfect contact with the surfaces around the glazing.
- .6 Arrange the removable glazing beads, with peripheral wedges between them and the glazing, at 6mm below the line of vision. Lay the tape on the glazing so that it is flush with the line of sight.
- .7 Fill the gap between the glazing and the glazing beads with sealant to a depth equal to the rebate, but not more than 9mm below the line of sight.
- .8 Form a bead of uniform sealant at the top of the glazing, along the gap between the glazing and the glazing beads, and flush with the line of sight. Smooth the surface of the sealing bead with a cloth or a suitable tool.

**3.4 CLEANING**

- .1 Clear finished surfaces of any putty or compound used for glazing.
- .2 Remove all tags once work is complete.
- .1 Clean the glazing with a non-abrasive product, according to the manufacturer's instructions, and leave it free from dirt and dust indoors and outdoors.

**3.5 PROTECTION**

- .1 Protect installed equipment and components from damage during construction.
- .2 Replace any broken or cracked glass that forms part of the structure until final acceptance of the work.
- .3 Once the installation is complete, mark each glazing with an X using a paste or a removable plastic tape. Do not mark reflective glass panels or athermane glass.
- .4 Repair damage to adjacent materials and equipment by glazing installation.

**END OF SECTION**

**Partie 1            General considerations****1.1                SECTION CONTENT**

- .1        Internal partitions.
- .2        Outer wall
- .3        Ceilings

**1.2                ALL SEALANT AND SURFACE TREATMENT PRODUCTS RELATED MATERIALS**

- .1        Section 06 10 00 – Articles of Wood
- .2        Section 07 10 00 - Air/Moisture Sealing
- .3        Section 07 21 00 - Insulation
- .4        Section 07 46 10 - Metal Wall Claddings
- .5        Section 07 92 00 - Joint Sealants
- .6        Section 08 11 00 – Metal Doors and Frames
- .7        Section 08 50 00 - Window
- .8        Section 09 72 50 - Non-slip flooring
- .9        Section 09 91 00 - Painting
- .10      See Section 09 91 00-T - Paint Systems Table.

**1.3                REFERENCES (LAST PUBLICATIONS)**

- .1        American Society for Testing Materials (ASTM)
  - .1        ASTM A 653/A 653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloyed-Coated (Galvannealed) by the Hot-Dip Process
  - .2        ASTM C28/C28M Standard Specifications for Gypsum Plasters.
    - .1        ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
    - .2        ASTM C475, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
    - .3        ASTM C557, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
    - .4        ASTM C587, Standard Specification for Gypsum Veneer Plaster.
    - .5        ASTM C631, Standard Specification for Bonding Compounds for Interior Gypsum Plastering.
    - .6        ASTM C645 Standard Specification for Non-structural Steel Framing Members
    - .7        ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
    - .8        ASTM C840, Standard Specification for Application and Finishing of Gypsum Board.
    - .9        ASTM C841, Standard Specification for Interior Installation Lathing and Furring.
    - .10      ASTM C842, Standard Specification for Application of Interior Gypsum Plaster.
    - .11      ASTM C843, Standard Specification for Application of Gypsum Veneer Plaster.
    - .12      ASTM C844, Standard Specification for Application of Gypsum Base to Receive Gypsum Veneer Plaster.
    - .13      ASTM C847, Standard Specification for Metal Lath.
    - .14      ASTM A879/A879M Standard Specification for Steel Sheet, Zinc-Coated Electrolytic, for Light

- Weight Coating [Mass] Applications.
- .15 ASTM C954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (084mm) to 0.112 in. (2.84mm) in Thickness.
  - .16 ASTM C1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  - .17 ASTM C1047, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
  - .18 ASTM C1177/C1177M, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
  - .19 ASTM C1178/C1178M, Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
  - .20 ASTM C1278/C1278M, Standard Specification for Fiber-Reinforced Gypsum Panel.
  - .21 ASTM C1280 Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
  - .22 ASTM C1396/C1396M-06a, Standard Specification for Gypsum Board.
  - .23 ASTM C1629/C1629M, Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
  - .24 ASTM C1658/C1658M Standard Specification for Glass Mat Gypsum Panels.
  - .25 ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
  - .26 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
  - .27 ASTM E413 Classification for Rating Sound Insulation.
  - .28 ASTM E488 Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
  - .29 ASTM E1190 Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.
- .2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.40, Alkyd Resin Coating for Construction Steel.
  - .2 CAN/CGSB-7.1- Light Steel Wall Frames.
  - .3 CAN/CGSB-19.21-M87 Sealing and Bedding Compound Acoustical Sep 99
  - .4 CGSB 51.34, Polyethylene sheet vapor barrier for buildings.
  - .5 CAN/CGSB-71.25-M, Adhesive for Bonding Prefabricated Panels to Wood Framing and Metal Studs
- .3 Canadian Standards Association (CSA)/CSA International.
- .1 CAN/CSA S136 - North American Specification for the Calculation of Cold-formed Steel Structural Members.
- .4 Association of the Wall and Ceiling Industries International (AWCI).
- .5 Underwriter's Laboratories of Canada (ULC)
- .1 CAN/ULC-S101, Standard Fire Resistance Test Methods for Buildings and Building Materials.
  - .2 CAN/ULC-S102, Standard Test Method - Superficial Burning Characteristics of Construction Materials and Assemblies.
  - .3 CAN/ULC-S114, Standard Test Method for the Determination of the Incombustibility of Building Materials.
  - .4 CAN/ULC-S702, Standard for Mineral Fiber Thermal Insulation for Buildings.
- .6 Installation references

- .1 Unless otherwise specified and more restrictive to the documents, perform the work according to the recommendations contained in the "Gypsum CGC Construction Manual" and according to the recommendations of the CGC SA923 Manual.
- .2 CSSBI - Steel Sheet Steel Building Institute
  - .1 LSF Technical Bulletin Volume 7, Number 1 Maximum Height Tables for Interior Non-Load bearing Partitions.

#### **1.4 DOCUMENTS AND SAMPLES TO SUBMIT**

- .1 Technical Data Sheets: Submit the required data sheets as well as the manufacturer's instructions and documentation for gypsum board and plaster. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finish.

#### **1.5 QUALITY ASSURANCES**

- .1 Maximum deflection to prevent cracking of panels, joints and applied finishes: arrow of 1/360 (ceilings) and 1/240 (walls) of the span; walls with special coatings (epoxy, other).
- .2 Fire Resistant Assembly: Provide materials and equipment identical to those tested to ASTM E90 and rated to ASTM E413.
- .3 Earthquake resistance: according to the requirements of the Quebec Construction Code, ch.1, building, and any other applicable code.
- .4 All members of exterior walls will have to withstand wind loads.
- .5 Where indicated, obtain full continuous seal against moisture, air, steam and smoke, ensuring continuity of protection with membranes, sealants and other materials, according to the details, to prevent transfer of pollutants from one space to another once the pressurization of the building has been completed.

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

- .1 Deliver the materials in the original intact containers or packaging and bearing the name of the manufacturer and the brand of the product.
- .2 Store materials in a location protected from damage, moisture and weather, protected from sunlight, contamination of surfaces caused by corrosion or other damage that may occur as a result of site operations. Store materials flat and without overhang on wood rails so as not to cause deflections.
- .3 Handle panels to avoid rippling edges, edges or surface.
- .4 Replace defective or damaged materials and equipment with new materials and equipment.

#### **1.7 IMPLEMENTATION CONDITIONS**

- .1 Maintain room temperature at least 13° C and not more than 21° C for 48 hours before and during panel installation and grouting, and for at least 48 hours after completion of seals.
- .2 Install plasterboard and grout on dry, non-frosted surfaces.
- .3 Provide sufficient ventilation to remove excess moisture that may prevent drying of the grout immediately after application.
- .4 Where necessary, erect waterproof screens to prevent the spread of dust in the work area. Seal grilles, diffusers and other openings.

### **Partie 2 Products**

#### **2.1 BILLBOARDS**

- .1 **Type GYP.1 & GYP.1/RF**-Gypsum board, regular and fire resistant: according to ASTM C1396/C1396M,

regular 12.7mm (1/2" ) and fire resistant (Type X) 16mm (5/8") d thickness respectfully, 1220mm or 1370mm (4'-0" or 4'-6") width in the maximum utility length, thinned edges and square ends. General use

- .1 Acceptable products:
  - .1 Sheetrock" and Sheetrock Firecode from CGC Inc.
  - .2 Georgia-Pacific Canada ToughRock and ToughRock Fireguard Type X
  - .3 Easi-Lite 1/2 " and Type X (5/8 ") from CertainTeed

## 2.2 FASTENERS

- .1 Fasteners for Drywall Structures: Screws and staples according to ASTM C1002, ASTM C954 and as recommended by the panel manufacturer, flathead screws, type, length and diameter depending on panel and substrate.
- .2 Fasteners for furrings and other interior metal elements in masonry: masonry anchors, galvanized, recessed-head, of appropriate length, penetrating at least 38mm (1 1/2" ) into concrete.
  - .1 Acceptable Products: Buildex Tapcon by ITW Construction Products

## 2.3 ADHESIVES

- .1 CGC Company Pre-Mixed Chemical or Composite Adhesive Adhesives and Asbestos-Free Panel Manufacturer's Recommendations.
- .2 Plaster Adhesive: A homopolymeric vinyl acetate emulsion bonding agent according to ASTM C631.
  - .1 Acceptable Products: USG Plaster Bonder (CGC Inc.)

## 2.4 CORNER REINFORCEMENTS

- .1 **RF/AC type.1** - Complies with ASTM C1047, 0.5mm (0.02" ) base thickness min. Placed at a rate of a full length section in places of installation. In commercial grade sheet steel, electroplated galvanized metal, 0.0196" (0.5 mm) thick, galvanized finish, with sturdy paper tape.
  - .1 Acceptable Products: As manufactured by Bailey Metal Products Ltd. or CGC Inc. or CertainTeed

## 2.5 CONTROL AND EXPANSION JOINTS

- .1 Gypsum board control gaskets with non-sealing, fire-resistant molding: zinc-plated, 44mm (1 3/4" ) wide and 13mm (1/2") deep.
  - .1 Acceptable Products: As manufactured by Bailey Metal Products Ltd. or CGC Inc. or CertainTeed

## 2.6 JOINT

- .1 **Type RB.J.1** - Joint tape, regular: cross-fiber paper tape, for gypsum board joints of all types except as otherwise indicated.
  - .1 Acceptable products:
    - .1 CGC Joint Tape Inc.
    - .2 CertainTeed Marco Spark Perf Ribbon

## 2.7 JOINT COMPOUNDS

- .1 **Type COMP.JT.1** - Gypsum board joint compound, to ASTM C 475, asbestos free, regular, general purpose. The light type is to be avoided.
  - .1 Acceptable products:
    - .1 CGC All Purpose Joint Compound.
    - .2 Georgia-Pacific Canada Toughrock Premixed Joint Compound.
    - .3 CertainTeed Joint Compound
- .2 **Type COMP.JT.2** - Chemical Gypsum Board Drywall Compound, ASTM C 475, asbestos free, fast setting 1-

2 hours, adherent grade.

.1 Acceptable products:

- .1 CGC Sheetrock 90.
- .2 Toughrock Sandable 90 from Georgia-Pacific Canada.
- .3 LITE Sand 90 by CertainTeed

.3 **Type COMP.JT.3** - Chemical Gypsum Board Drywall Compound, ASTM C 475, asbestos free, fast setting 1-2 hours, adherent grade.

.1 Acceptable products:

- .1 Durabond 90 from CGC.
- .2 Toughrock Sandable 90 from Georgia-Pacific Canada.
- .3 High Density 90 by CertainTeed

.4 **Type COMP.JT.4** - Gypsum board joint compound, with dust control, to ASTM C 475, asbestos free, low shrinkage. When sanding, the dust settles more quickly on the floor.

.1 Acceptable products:

- .1 CGC Brand Seal Compound Dust Control.

## 2.8 OTHER MATERIALS

- .1 Sealants: See section 07 92 00 Sealants
- .2 3mm (1/8" ) thick, 12mm (1/2") wide, rubber-coated, closed-cell neoprene insulating tape, one side coated with a permanent self-adhesive, in length appropriate.
- .3 Sound absorbing wool: see Section 07 21 10 - Insulation
- .4 Section 07 10 00 - Air/Moisture Sealing

## Partie 3 Implementation

### 3.1 GENERAL

- .1 Run the work according to ASTM C754 and ASTM C840 and according to the recommendations of the manufacturers.
- .2 Verification of conditions: Before proceeding with the installation of joint sealants, ensure that the condition of surfaces/supports previously implemented under other sections or contracts is acceptable and allows the work to be carried out according to the written manufacturer's instructions.
- .3 When determining the final position of the interior partitions, immediately inform the Departmental Representative of any condition likely to modify or compromise the arrangement of the partitions provided on the drawings and await his instructions before proceeding with the implementation of the studs.
- .4 Allow the gypsum boards to acclimatize for 2 weeks in the ambient temperature of the work place, before starting the installation.
- .5 Cut and install gypsum boards at the junction of existing cladding and different materials and around the perforations of mechanical and electrical services as well as structural elements and these must be executed carefully with a uniform 6mm joint ( 1/4" ) wide to allow the installation of a bottom seal and sealant at all joints for full sealing. Check on site to be fully familiar with all equipment penetrating gypsum board and ceilings where applicable and to shape all joints. Also consider structural deflections.
- .6 Repair or patch existing surfaces, affected or not by other trades with materials and thicknesses such as existing.
- .7 When cutting panels, if mechanical tools are used, they must have a low velocity and be equipped with a sealed collector to prevent the spread of dust.

- .8 At junctions with door and panel frames, perform the work to avoid thickening of the partition.
- .9 Coordinate with other Sections for integrated items such as door frames, lighting fixtures and other electrical, mechanical, access doors, service panels, fire cabinets, wall cabinets, accessories, etc., as well as for sealing against the area and smoke, etc. Provide adequate supports for these items.
- .10 Where fire resistance is required on drawings or Code requirements, provide for assemblies with materials that comply with ASTM E119 and CAN/ULC-S101 standards and that must be acceptable to authorities having jurisdiction.
- .11 Install all accessories and moldings needed to properly perform the work, whether indicated or not.

**3.2****INSTALLATION OF TILES AND METALLIC FURRING**

- .1 Unless otherwise specified, install framing members to allow installation of screwed panels per ASTM C754.
- .2 Lay the slats on the floor and/or concrete bases, and on the ceiling, aligning them precisely and attaching them to a maximum of 16" (400 mm) oc.
- .3 Install a waterproofing compound under the bottom rails of partitions resting on floor slabs and/or concrete bases.
- .4 Install continuous insulating strips to separate the posts in contact with uninsulated surfaces to break the thermal bridge.
- .5 Install studs upright at 16" (400 mm) oc and 2" (50 mm) at most adjacent walls and on both sides of openings and corners. Secure the posts with screws in the upper and lower rails. Counter steel poles, if necessary, to ensure rigidity of the frame, according to the manufacturer's instructions.
- .6 The maximum permissible deviation between the installed metal poles is 1: 1000.
- .7 Coordinate the installation of the columns with the installation of the service lines. Lay the posts so that the openings in their webs are aligned.
- .8 Coordinate the installation of the posts with that of door frames and other supports or anchors for structures prescribed in other sections.
- .9 Double the posts, over the entire height of the room, on each side of the openings whose width is greater than the center distance prescribed for the posts. Attach the twin studs to each other at a distance of 2" (50 mm) using approved clips or other fasteners located along the frame anchors.
- .10 Mount the rails over the door bays and the side panels so that the intermediate posts can be fixed. Secure the rails at each end of the poles according to the manufacturer's instructions. Lay the intermediate posts above and below the bays in the same way and at the same spacing as the posts forming the wall frame.
- .11 Mount frames around all four sides of building openings, built-in hardware, cabinets and access panels. Extend the frames in the plays. Verify clearance requirements from equipment suppliers.
- .12 Nailing Fund and Anchor Fund:
  - .1 Coordinate the placement of 1 5/8" (41 mm) furring profile or wood nailing backs between the studs or on the face of the pole flanges if required in the drawings, having the appropriate dimensions to allow the fixing of the items listed below (non-exhaustive list):
    - .1 Junction boxes for electrical installations;
    - .2 Integrated furniture and other accessories.
    - .3 All other works that require non-visible, strong and durable nailing funds
  - .2 In the absence of having installed all the required anchorages, whether or not specified, the Contractor must open the partition or wall in order to install them at his own expense. Provide an inspection by the Departmental Representative prior to the closing of the walls and partitions.
- .13 Install steel studs or furring profiles between the main columns to allow attachment of junction boxes for electrical or other installations.

- .14 Install furring or timber studs on the vertical face of the fallout in or at the end of the ceilings.
- .15 Install all accessories and supports indicated on the drawings.
- .16 Do not install electrical or communication boxes back to back, but overlap them by min. 460mm (18" ).
- .17 Install continuous smooth joints to isolate poles coming into contact with non-insulated surfaces.
- .18 Insert the insulating mats between the uprights so as to obtain continuous acoustic protection. Coordinate the installation of mat insulation with the metal studs and interior door and window frames to properly fill the void inside the frames with insulation. Fill the splines of the steel bridge with insulation to meet the partitions. In thick bulkheads, maintain mat insulation with mechanical fasteners, as recommended by the manufacturer and approved by the Departmental Representative.

### 3.3 INSTALLATION OF PANELS

- .1 Verification of conditions: Before proceeding with the installation of joint sealants, ensure that the condition of surfaces/supports previously implemented under other sections or contracts is acceptable and allows the work to be carried out according to the written manufacturer's instructions.
- .2 Install panels after frames, anchors, holds, acoustic mattresses and electrical and mechanical installations have been viewed.
- .3 Unless otherwise noted, install and finish gypsum board, concrete, and intermediate coatings according to applicable ASTM standards and recommendations in the " Gypsum CGC Construction Manual".
- .4 Abut the panels against each other on the four (4) sides, without forcing them.
- .5 Leave a space of 6mm (1/4" ) below the panels at floor level, and meet with adjacent surfaces of concrete, concrete block, steel or with integrated skirting applied to separate panels (according to the details).
- .6 When encountering the exposed steel deck or concrete structure, cut the panels so that they follow the exact profile of the deck or concrete in both directions.
- .7 Provide clearance below the structural elements to prevent structural loads from being transmitted to the studs.
- .8 Ensure that panels and vertical joints between panels are supported on continuous, properly anchored, metal support members, except when encountering structural framing, steel deck or concrete slab.
- .9 Clearly finish all internal and external openings and corners, and all ends at junctions with other surfaces, with accessories and joint compound, corners and trim or other moldings. Do not use exposed " J" or " L" trim, but only concealed trim, as specified, fully embedded in the joint compound.
- .10 Mount the accessories aligned, plumb, level, rigid and level. Use full length pieces if possible. Run tight joints, carefully aligned and securely fastened. Attach and adjust corners thoroughly, free of unfinished borders. Secure using a contact-type adhesive over the entire length.
- .11 Where lighting fixtures or fixtures are recessed in fire-rated walls, such fixtures and fittings must be provided with walls having fire resistance equivalent to those of the bulkhead at the locations indicated. Coordinate with Mechanics and Electricity.
- .12 Unless otherwise specified, use panels of maximum size in one or two thicknesses and attach to metal or wood framing, on each stud (or upright) and perimeter using screw anchors at each 300mm (12mm)." ) vertically, or less, according to the recommendations of the manufacturers, and according to the distance of the studs (or uprights) horizontally.
  - .1 Single layer coating
    - .1 Lay the gypsum board on the ceiling first and then coat the walls according to ASTM C840.
    - .2 Install gypsum boards vertically or horizontally, in the direction that will provide the least amount of joints.
- .13 Place the butt joints on the support elements. Offset vertical joints on different posts on each side of the wall.

- .14 Avoid joints between panels along door frames or other openings in walls or ceilings.
- .15 The joints between the panels on either side of the partitions must be made on different posts.
- .16 Install gypsum panels on the ceiling in the direction that will provide the least amount of butt joints. Offset the end joints by at least 250mm.
- .17 Install gypsum boards vertically on walls to eliminate butt joints. With the exception of areas where local codes or assemblies with fire resistance require vertical installation, gypsum board must be installed in stairways and other areas with large wall surfaces. horizontal and the butt joints must be staggered on the posts.
- .18 Apply a 12 mm diameter continuous bead of acoustical sealant around the perimeter of each partition wall at the meeting point of the gypsum board and the framing where the partitions abut the fixed elements of the building. Perfectly seal all cut-outs around electrical boxes, ducts in partitions whose perimeter is lined with an acoustic sealant.
- .19 Glue the gypsum boards with a post adhesive applied to the furrings, furring and framing members, and an adhesive applied to the first layer of gypsum board.
- .20 Lay out flush moldings at the junction of drywall and non-jointed surfaces, as well as at the various locations indicated. Seal the joints with a sealant.
- .21 Install continuous insulating strips at the edges of plasterboards and outcropping at their junction with the metal frames of windows and exterior doors so that there is no thermal bridge.
- .22 Lay the gypsum boards with the facing side facing out.
- .23 Do not lay damaged or damp gypsum board.

### 3.4 TREATMENT OF JOINTS AND SURFACES

- .1 Verification of conditions: Before proceeding with the installation of joint sealants, ensure that the condition of surfaces/supports previously implemented under other sections or contracts is acceptable and allows the work to be carried out according to the written manufacturer's instructions.
- .2 Prepare surfaces to be coated according to ASTM C1396/C1396M.
- .3 Compliance: Comply with the manufacturer's written requirements, recommendations and specifications, including the technical bulletins and installation instructions specified in the product catalogs and packaging cartons, and the specifications in the data sheets.
- .4 Finish joints between gypsum board and inside corners with the following products: joint compound, joint tape and tape coating. Apply these products according to the manufacturer recommendations and smooth by slimming everything to catch the surface finish of the panels.
- .5 Cover corner moldings, shrink joints and, if necessary, trim, two (2) layers of joint compound and one (1) coat of smoothed and thinned tape to catch up with finished the surface of the panels.
- .6 Fill the holes in the screw heads with joint compound and tape to obtain a uniform surface and flush with the adjacent surfaces of the panels, so that these hollows are invisible. once the coating is applied.
- .7 Lightly sand sharp edges and other imperfections. Avoid sanding adjacent surfaces that do not require it.
- .8 Once the installation is complete, the structure must be smooth, level or plumb, free from ripples and other defects, and ready to be finished with a finishing coat.
- .9 Mix the joint paste to obtain a slightly less consistent mixture than when finishing the joints.
- .10 Allow the plaster to dry completely.
- .11 Remove edges by sanding lightly or wiping with a damp cloth.
- .12 Apply level finish plaster and plaster, respecting a maximum tolerance of 3 mm per distance of 2.5 m in all planes.

- .13 Finish panel joints, and obtain a Level 4 finish, according to ASTM C840 and GA-214 standards of the Gypsum Association.

### **3.5 JOINTS OF CONTROL, CONSTRUCTION AND OTHER JOINTS**

- .1 Make shrinkage joints formed from prefabricated elements or two back-to-back flush moldings embedded in the panel cladding, and attached independently to each side of the joint.
- .2 Lay a black polyethylene continuous web (forming a dust screen) behind the removal joint and overlapping it.
- .3 Place the shrinkage joints where indicated, where there is a change in the nature of the support, and approximately  $\pm 32'$  (10 meters) along the long corridors each  $\pm 50'$  (15 meters) ceilings. Offer the location of the joints to the Departmental Representative for approval when these joints are apparent.
- .4 Shape movement joints at the location of the building's structural expansion joints and when a long wall, panel or ceiling surface is covered with panel according to manufacturers' requirements and applicable standards. Cover them with a continuous dust screen if joint covers for this purpose are not provided.
- .5 Make the joints of square and alignment.

### **3.6 INSULATION AND SEALING**

- .1 Unless otherwise indicated, install acoustical insulation in all bulkheads and door frames that are part of these partitions, according to the manufacturer's instructions. The insulation must fill the cavity entirely, but only be slightly compressed.
- .2 Install two rubberized continuous strips under the floor plate and over the top plate, with studs against a wall, and under the recessed bases, to obtain seals that are dust and sound tight.
- .3 Apply a 13mm (1/2" ) continuous bead of the appropriate sealant per Section 07 92 00 - Sealants, perimeter of gypsum board, at the meeting point with the framing, and places where the partitions abut the fixed elements of the building.
- .4 Caulk or seal fastener or plumbing orifices and abutments between dissimilar materials.
- .5 Seal perfectly on both sides of the partitions all the cut-outs around electrical boxes, ducts, and other elements passing through the partition.

### **3.7 OTHER ACTIVITIES**

- .1 Install inspection hatches for electrical and mechanical equipment specified in the appropriate sections. Secure frames to furrings or structural members.

### **3.8 CLEANING**

- .1 Upon completion, remove excess materials and leave the site clean and free of debris and dust.

**END OF SECTION**

**Partie 1            General considerations****1.1                CONNECTED SECTIONS**

- .1        Section 07 92 00 - Joint Sealing
- .2        Section 08 20 00 –Metal Doors and Frames
- .3        Section 09 20 00 - Drywall Work

**1.2                REFERENCES (LAST PUBLICATIONS)**

- .1        American Society for Testing Materials (ASTM)
  - .1        ASTM C307, Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts and Monolithic Surfaces.
  - .2        ASTM C413, Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfaces and Polymer Concretes.
  - .3        ASTM C579, Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfaces and Polymer Concretes.
  - .4        ASTM C580, Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfaces, and Polymer Concretes.
  - .5        ASTM D635, Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
  - .6        ASTM D790, Standard Test Methods for Flexible Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
  - .7        ASTM D2047, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
  - .8        ASTM D2240, Standard Test Method for Rubber Property-Durometer Hardness.
  - .9        ASTM D4060, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
  - .10       ASTM E831, Standard Test Method for Thermal Thermal Expansion of Solid Materials by Thermomechanical Analysis.

**1.3                DOCUMENTS AND SAMPLES TO SUBMIT**

- .1        Submit: Product data sheets, installation instructions and general manufacturer recommendations for each type of epoxy flooring to be installed.
- .2        Samples:
  - .1        A 300 mm x 300 mm (12" x 12") sample on a rigid board to approve the finish.

**1.4                QUALITY ASSURANCE**

- .1        Obtain epoxy flooring primer materials, including primers, resins, curing agents, topcoats, or protective coatings from a single manufacturer. This manufacturer must have at least ten years of proven experience in the manufacture and installation of the main materials described in this section. The Installer must have completed at least five (5) jobs of similar size and complexity. Provide only secondary materials of the type and source recommended by the manufacturer of the priming materials.

**1.5                IMPLEMENTATION CONDITIONS**

- .1        Follow the manufacturer recommendations.

**1.6 TRANSPORT, HANDLING AND STORAGE**

- .1 Transport and store materials in original containers and packaging with the recipient and manufacturer label intact. Protect materials against water, moisture and frost; do not place them directly on the ground or on a floor.
- .2 Follow all the manufacturer recommendations.

**1.7 EXTENDED WARRANTY**

- .1 According to Section 01 33 00 - Documents and samples to submit , in addition to the manufacturer standard warranty, submit a **ten (10) year** written warranty against defects in workmanship and materials, ensuring that the sealants will not leak, crack, crush, melt, shrink, loosen or stain adjacent surfaces from the date of substantial completion of the work.

**Partie 2 Products****2.1 MATERIALS**

- .1 Anti-slip flooring without epoxy joints
  - .1 **RS/EPX** Type: 5 mm (3/16 in) thick 0 VOC coating made from 100% solids. This coating comprises a penetrating epoxy primer (two components), a smoothed base composed of epoxy resin, a curing agent and fine siliceous granulate (three components), an epoxy undercoat (two components), a granulate brightly colored quartz silica (sprinkled) and a very strong transparent epoxy sealant (two components).
  - .2 Grain: medium size.
  - .3 Acceptable product: Stonshield HRI, from Stonhard.
- .2 Color:
  - .1 Type : **RS.EPX.1**: Stonshield HRI FLAGSTONE color
- .3 Plinth
  - .1 Type **RS / EPX.PL**: Same finish and color as epoxy-free anti-slip floor covering, to form a 100 mm (4") baseboard.
    - .1 Acceptable product: Stonshield HRI, from Stonhard.

**Partie 3 Implementation****3.1 PREPARATION**

- .1 Substrate: Using a blast machine (Blastrac), remove adhering materials such as hardening agents and laitance from the concrete substrate.

**3.2 LAYING**

- .1 General considerations
  - .1 Apply each layer of epoxy flooring according to the manufacturer's instructions to obtain a monolithic, strong and thick surface, without cut-off except where separating strips, sawed joints or other types of joints (the case appropriate) are indicated or prescribed.
- .2 Primer
  - .1 Mix the two components of the primer and apply it to the substrate prepared strictly according to the process and application rate indicated by the manufacturer. Coordinate the application of the primer with that of the smoothed base to ensure optimum adhesion of the epoxy coating to the substrate. Manufacturer: Stonhard, STANDARD PRIMER.
- .3 Smoothed base

- .1 Mix the three components of the base according to the manufacturer process. Spread the base evenly on the substrate using a special smoother designed by the manufacturer and adjusted to the height specified in the process. Smooth the material with a stainless steel trowel. Manufacturer: Stonhard, STONSHIELD HRI BASE.
- .4 Underlayer
  - .1 Correct imperfections by lightly grinding the hardened base, then vacuuming. Mix the two components of the underlay and apply it strictly according to the process and application rate indicated by the manufacturer. Manufacturer: Stonhard, STONSHIELD UNDERCOAT.
- .5 Aggregate
  - .1 Immediately sprinkle the quartz silica granulate onto the cool underlayment using the manufacturer spray gun. It is essential to strictly adhere to the application method and rate indicated by the manufacturer. Manufacturer: Stonhard, STONSHIELD AGGREGATE.
- .6 Coating barrier
  - .1 Correct imperfections by grinding the hardened underlay lightly, then vacuuming to remove unglued aggregate. Mix the two components of the sealant and apply to the squeegee strictly according to the process and rate of application specified by the manufacturer. Manufacturer: Stonhard, STONSHIELD SEALER.
- .7 Wherever the floor is not bounded by a vertical surface, cut a chamfer 13-19 mm wide by 6 mm deep.
- .8 Baseboard: Install a 10 cm (4" ) baseboard in continuity with the floor. As per the plans, flush all baseboards with the plinth edge designed by the manufacturer. Manufacturer: Stonhard, STONSHIELD COVE.
- .9 Caulking: Fill the manufacturer epoxy or urethane caulking joints to match the finish of the coating. Manufacturer: Stonhard.

### **3.3 WORK SITE QUALITY CONTROL**

- .1 Always refer to the manufacturer's guidelines.

### **3.4 CURING, PROTECTION AND CLEANING**

- .1 Harden the epoxy flooring according to the manufacturer's instructions, taking care to prevent any contamination during the various laying steps prior to complete hardening of the finished coating. Close access to the area where the flooring has been laid for at least 24 hours.
- .2 Protect the epoxy floor covering from damage or wear during construction. Where temporary protection is necessary for this purpose, follow the manufacturer recommendations for the choice of protective materials and their method of application.

### **3.5 CLEANING**

- .1 Remove the temporary protection and clean the epoxy floor covering before the final inspection. Use cleaners and methods recommended by the epoxy coating manufacturer.

**END OF SECTION**

**Partie 1           General considerations****1.1               SECTION CONTENT**

- .1 All new surfaces, whether or not shown in the drawings, or specifically specified, must be painted unless otherwise indicated.
- .2 Stainless steel, aluminum and prefinished surfaces must not be painted.
- .3 See also mechanical and electrical equipment for electromechanical elements to be painted.
- .4 When applying wall finishes, provide for the painting of all ducts, mechanical, electrical and other equipment, such as the adjacent wall finish.
- .5 Provide protection and patching if necessary, all the different finishes (coatings) wall when painting ceilings and their equipment.
- .6 See Section 09 91 00-T - Paint Systems for Specified Systems and Table of Finishes for Architectural Drawings, for the colors and location of the different systems.

**1.2               CONNECTED SECTIONS**

- .1 Section 08 11 00 - Metal Doors and Frames
- .2 Section 09 20 00 - Drywall Work
- .3 Divisions 22, 23 and 26 - Mechanical and electrical conduits

**1.3               REFERENCES (LAST PUBLICATIONS)**

- .1 Environmental Protection Agency (EPA)
  - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24, (for Surface Coatings).
- .2 ASTM International
  - .1 ASTM D3960, Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
- .3 Green Seal (GS)
  - .1 GS-11, Standard Green Seal for Paints and Coatings
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS)
- .5 The Master Painters Institute (MPI).
  - .1 MPI Architectural Painting Specifications Manual.
- .6 National Fire Code of Canada
- .7 Society for Protective Coatings
  - .1 SSPC Manual, Volume Two, 8th Edition, Systems and Specifications Manual.
- .8 Transport Canada (CT)
  - .1 Transportation of Dangerous Goods Act, 1992, c. 34

**1.4               QUALITY ASSURANCE**

- .1 The work must be performed by a work force with at least five (5) years of experience, according to the professional standards and according to manufacturer's instructions, working under the direction of a qualified foreman .

**1.5 DOCUMENTS AND SAMPLES TO SUBMIT**

- .1 Datasheets
  - .1 Submit the data sheets and instructions required for each type of paint or coating used in the coating.

**1.6 TRANSPORTATION, STORAGE AND HANDLING**

- .1 Materials must be premixed at the factory and delivered to the site in their original containers; the manufacturer labels and seals must be intact. The label must indicate the type of paint, color, manufacturer name, CGSB Standard number, BNQ or other recognized standards body and all mixing, dilution and application requirements.
- .2 Store materials and products in a safe, clean, heated, dry and tidy storage area at an ambient temperature of 10 ° C to 26 ° C. Make sure the ventilation of the room is adequate.

**1.7 IMPLEMENTATION CONDITIONS**

- .1 Keep toxic or volatile products in closed containers when not in use. Strictly observe the manufacturers' instructions for handling diluents and volatile solvents.
- .2 Protect against stains and splashes all appliances, equipment, furniture, plumbing fixtures and piping with a permanent finish: glazed surface, enamelled cast iron, polished bronze, nickel, copper, aluminum or stainless steel. During the painting process, remove switch and socket plates and all hardware applied to the surface. Remove the recessed door silencers from the jambs.
- .3 Observe the manufacturer's instructions regarding the ventilation and temperature of the premises.
- .4 No paint must be applied when the relative humidity of the substrates, measured hygrometer, is greater than the following values:
  - .1 2% for plaster, gypsum boards, scrim, concrete and concrete blocks;
- .5 Do not apply paint where work is or will be done that gives off dust. Interrupt the work if necessary.
- .6 Provide continuous ventilation for seven (7) days after completion of the work.
- .7 Allow the installation of equipment and appliances only after the paint dries.
- .8 Provide adequate fire extinguishers in working order and in sufficient number according to fire regulations.

**Partie 2 Products****2.1 GENERAL CONSIDERATIONS**

- .1 Any acceptable manufacturer, supplier or product name mentioned below is for reference only to a minimum quality threshold.
- .2 The same paint mark must be used for all paint layers.

**2.2 MATERIALS AND EQUIPMENT**

- .1 For the performance of this work, use only paint materials listed on approved product lists issued by the CGSB or MPI, and according to the standards prescribed in Section 09 91 00-T - Paint Systems.
- .2 The materials of each paint, varnish or lacquer system must come from one and the same manufacturer.
- .3 Use the paint materials listed in the finish system requirements described in the Paint Systems, and according to the Finishes Table.
- .4 All paint products must meet the regulatory requirements for flammability characteristics of surfaces.
- .5 All paint must be lead free.

- .6 Products of comparable properties by manufacturers other than those listed in Section 09 91 00-T - Paint Systems may be acceptable.
  - .1 Acceptable products such as manufactured by:
    - .1 SICO
    - .2 Rust-Oleum
    - .3 Benjamin Moore
    - .4 Sherwin-Williams
    - .5 Dulux
    - .6 MF Paint

### **2.3 MIXTURES AND DYES**

- .1 Paint products must be premixed at the factory and delivered to the job site, except those with multiple components that must be mixed at the job site according to the manufacturer's instructions.
- .2 All paints must be mixed thoroughly to obtain a uniform consistency, leaving no deposit at the bottom of the containers.
- .3 Mix and dye, using appropriate size containers of nonferrous metal or plastic, and using manufacturer recommended dyes for each type of paint.
- .4 For bright colors and accents, according to the manufacturer recommendations, provide a tinted base coat and the number of layers required until optimum opacity of the color is obtained.

### **2.4 COLOURS**

- .1 Wall and ceiling: such as Sico's" Cottonseed Oil 6186-11"
- .2 Door frame: such as Sico's 6210-83 grand piano
- .3 Interior doors: such as Sico's" bass clarinet 6210-73"

### **2.5 PAINT SYSTEMS**

- .1 See Section 09 91 00-T - Paint Systems Table.

## **Partie 3 Implementation**

### **3.1 COORDINATION**

- .1 Coordinate with subsequent trades to ensure finishes are dried prior to the application of other related work.
- .2 Ensure that shop-primed substrates have received compatible primers.

### **3.2 GENERAL CONSIDERATIONS**

- .1 Comply with manufacturer's written recommendations or instructions, including product bulletins and data sheets, and instructions for handling, storing and implementing products
- .2 Perform preparatory work, primer application, finishing, job protection and cleaning according to manufacturer's instructions and recommendations and good practices to produce quality work.
- .3 Make sure that the defects have been repaired properly and that the surfaces to be painted are clean, in good condition and that other factors such as temperature and ventilation are adequate for the job. Notify Professionals, if any.
- .4 Do not start the application before making sure the joint compounds and plaster products are completely dry and set ready to receive the finish.
- .5 Before starting to paint, remove cover plates, lighting fixtures, door hardware, doorstops, and other fixtures

and fixtures. Put these items in a safe, secure place, and reinstall them once the painting is done.

- .6 The beginning of the painting work will imply an unconditional acceptance of the surfaces concerned and the Contractor will be held responsible for the condition of the finish, if it is unsatisfactory or of the highest quality.
- .7 As work progresses, place "PEINTURE FRAÎCHE" signs in the occupied areas, to the satisfaction of the Departmental Representative.
- .8 Ensure that the ambient lighting is similar to the permanent lighting conditions of the building.

### 3.3

#### PROTECTION

- .1 Protect existing surfaces of the building and equipment that are not to be painted from speckles, marks and other damage. If such surfaces are damaged, clean and repair them as directed by the Departmental Representative.
- .2 Cover or mask floors and decorative hardware near surfaces to be painted to protect them from paint dripping and spotting. Use cover means that do not stain.
- .3 Protect items that are permanently attached, such as door and frame fire rating labels.
- .4 Protect equipment and finished products in the factory.
- .5 Protect all surfaces, including surfaces to receive sealants, from paint splashes and other damage that may result from work. Use a sufficient number of protective covers and self-adhesive, non-staining, detachable masking tape.
- .6 Cover surfaces to receive sealants.
- .7 Provide occupant protection for the building located in and around the building.
- .8 Mechanical and electrical works:
  - .1 Paint plywood mounting panels for equipment.
  - .2 Keep the finish with the original baked enamel of the equipment while making the necessary edits.

### 3.4

#### CLEANING SURFACES TO PAINT

- .1 Clean all surfaces to be painted as follows.
  - .1 Remove dust, dirt and other foreign matter with a vacuum cleaner; then wipe with clean, dry rags or blow with compressed air.
  - .2 Wash surfaces with a solution of trisodium phosphate bleach and clean hot water using a stiff brush to remove dirt, oil and other surface contaminants.
  - .3 After thoroughly brushing surfaces, rinse with clean water until no foreign matter or powdery deposit remains.
  - .4 Allow the surfaces to drain and dry thoroughly.
  - .5 To prepare surfaces for waterborne paints, it is recommended to use water-based cleaning agents rather than organic solvents.
  - .6 Fill spray hoses with trigger sprayers.
  - .7 Many water-based paints can not be removed with water once they have dried. However, use as little as possible of kerosene or other organic solvents.
- .2 Before applying the primer or printing coat and between other layers, prevent the cleaned surfaces from being contaminated with grease, oil, solvents, salts, alkalis, acids and other corrosive agents. Apply primer or primer, basecoat or other primer as soon as possible after cleaning, before the surface deteriorates.
- .3 Sand and dust surfaces between layers as needed to ensure proper adhesion of the next layer and to eliminate any visible defects within 1000mm.
- .4 Ensure galvanized steel surfaces are properly degreased before applying paint.

**3.5 PREPARATION OF SURFACES-GENERAL**

- .1 Painted surfaces must be smooth and free of blisters, cracks, peelings, wrinkles and other defects. No paint must be placed until all surfaces have been prepared to ensure the specified finish.
- .2 Sand and dust between the application of each coat of paint to correct visible defects from a distance of 1m.
- .3 After fitting the doors, finish all the edges and door frames according to the instructions for the door itself.
- .4 Avoid painting sealants that are part of fire/smoke systems.

**3.6 PREPARATION OF METAL SURFACES/SUBJECTILES**

- .1 Cleaning new metal surfaces:
  - .1 Remove rust, mill scale, dirt, welding slag, oil, grease and other foreign substances using the following methods to achieve the level of preparation established by the SSPC and the recommendations of the paint manufacturer.
    - .1 Solvent: SSPC-SP-1.
    - .2 To the manual tool: SSPC-SP-2.
    - .3 To the mechanical tool: SSPC-SP-3.
    - .4 Commercial jet stripping: SSPC-SP-6.
    - .5 Light sandblasting: SSPC-SP-7.
- .2 Remove any traces of pickling product from the surfaces; clean the corners and troughs with clean bristle brushes suitable for the substrate, a jet of compressed air or a vacuum cleaner.
- .3 Retouch according to CAN/CGSB 85.10-99, using a primer that meets the requirements of the applicable section, surfaces that have been primed in the workshop. Touch-ups must also include cleaning and painting junctions, welds, rivets, nuts, washers and bolts, as well as rusted areas and damaged paints.
- .4 Do not apply paint until the prepared surfaces are adequate for the application.

**3.7 APPLICATION**

- .1 Apply paint evenly without scratches, sags, brush or roller marks, or other defects. The paint strands must adhere strongly to the substrate.
- .2 All paint layers must be dry before applying the top coat.
- .3 Primers, sub-layers and intermediate layers must be sanded until the surface is smooth before applying the top coat.
- .4 Paint walls and ceilings before installing new mechanical and electrical equipment; touch up painted surfaces after installation.
- .5 A primer must be applied to the back of the woodwork before installation.
- .6 Do not paint labels and instruction plates and/or signs.
- .7 Check with Professionals the finish required for surfaces not mentioned in the specifications.
- .8 Apply additional primer to built-in elements.
- .9 Sand and wipe between the application of each coat of paint to correct apparent defects at a distance of 1500mm (5'-0" ).
- .10 Unless otherwise specified, apply at least two (2) coats of paint to all surfaces to be painted, in addition to primer and base coats if applicable. If necessary, apply additional layers to cover imperfections and if defects are visible after the application of basecoats. Request that the work be inspected before applying the final topcoat.
- .11 The method of application used must be accepted by the Departmental Representative. Apply paint by roller, brush or brush or with an airless high-pressure spray gun (approval only). Unless otherwise indicated, apply the product according to the manufacturer's instructions.

- .12 Brush, brush and roller application:
  - .1 Apply an even coat of paint with a suitable brush, brush and/or roller (according to data sheet and table 09 91 00T).
  - .2 Bring the paint into cracks, crevices and corners of the elements.
  - .3 Apply the paint with a gun, pad or sheepskin on surfaces and in inaccessible corners with a brush or brush. Use a brush or brush, pad or sheepskin when it is impossible to paint certain surfaces or corners with a roller.
  - .4 Remove scallops and drips with a brush, brush or roller and iron over left marks. Roller-painted surfaces must be free of roller marks and excess paint.
  - .5 Remove festoons, drips and brush or brush marks on finished surfaces, and take up these surfaces
- .13 Use a pad or sheepskin, or soak only if there are no other ways to paint hard-to-reach surfaces.
- .14 Apply each coat of paint to obtain a continuous film of uniform thickness. Resume stripped surfaces or covered with a film too thin before applying the next layer.
- .15 Allow the surfaces to dry and harden properly after cleaning and between each successive coat, waiting for the minimum recommended by the manufacturer.
- .16 Sand and dust off the surfaces between each layer to eliminate visible defects.
- .17 Finish surfaces that are above and below sightlines according to the requirements for adjacent surfaces, including areas such as the tops of cabinets and closets and projecting Ship-lapped edges
- .18 Repaint all door surfaces that need to be refurbished, including upper, lower and side edges.
- .19 Finish the interior of cabinets and wardrobes, as shown, for exposed surfaces.
- .20 Finish alcoves and storage, as indicated, for adjoining rooms.
- .21 Finish the top, bottom, edges and door openings according to the requirements applicable to the facing surfaces of doors after they have been adjusted.

### 3.8

#### ELECTRICAL AND MECHANICAL EQUIPMENT

- .1 Unless otherwise indicated, apply the paint product to the piping, electrical conduits, ventilation ducts, brackets/hangers and other exposed interior electrical and mechanical components so that the color and finish of the painted surfaces harmonize with those of contiguous surfaces. **Refer to electromechanical drawings for locations and quantity of apparent equipment.**
- .2 Boiler rooms and mechanical and electrical installations: paint piping, electrical conduits, ventilation ducts, supports/suspensions and other visible electrical and mechanical components.
- .3 Other unfinished areas: leave piping, electrical conduits, ventilation ducts, brackets/suspensions, and other apparent electrical and mechanical components in their original condition, and touch only scratches and other marks on covers existing.
- .4 Touch up scratches and marks on factory applied coatings using the product supplied by the equipment manufacturer.
- .5 Do not paint the nameplates.
- .6 Apply a printing product and a coat of matte black paint to the interior surfaces of the ventilation ducts that can be seen through the grilles, registers and diffusers.
- .7 Paint all the piping in the fire protection network red.
- .8 Apply a red enamel paint on the switches of the fire alarm system and emergency exit lighting system.
- .9 Paint all piping in the natural gas network yellow.

- .10 Paint both sides and sides of electrical and telephone equipment wiring boards prior to installation. Leave the equipment in its original condition with the exception of any necessary retouching and paint the ducts, mounting hardware and other unfinished components.

### **3.9 TOLERANCES OF IMPLEMENTATION**

- .1 Walls: no visible defects at a distance of 1000 mm, at an angle of 90 degrees to the surface examined.
- .2 Ceiling: no visible defect by an observer on the ground, at an angle of 45 degrees to the surface under examination, under the final lighting provided.
- .3 The color and gloss of the topcoat must be uniform over the entire surface being examined.

### **3.10 TOUCH UPS**

- .1 Perform all the alterations to the site once the assemblies are made and put in place and once the welds, bolting, screwing and fastenings of all kinds completed.
- .2 Plan multiple interventions. Coordinate with different disciplines and all trades.

### **3.11 CLEANING**

- .1 Remove dripping, burrs, splashes, paint drippings, as well as excess paint as work progresses, using materials and methods that will not damage the surface finish referred.
- .2 Be sure to quickly clear the work area of surplus materials and debris, as well as tools, materials and equipment that are no longer needed.
- .3 Remove combustible waste and empty paint containers from the site daily, and dispose of them safely according to the requirements of the appropriate authorities.
- .4 Clean equipment and equipment used. Subsequently, wash the products with water, solvents used for cleaning in the case of oil products as well as cleaning and protective materials and materials (rags, screens, ribbons -caches and others), paint products, thinners, paint strippers and other stain removers, according to the requirements of the safety authorities and the instructions set out in this section.
- .5 Clean paint materials and equipment in sealed containers for deposition and subsequent collection of particulate matter. Residues collected at the end of the cleaning work must be recycled or disposed of in a manner acceptable to the competent authorities.
- .6 Recycle unused paint and coatings during paint refinishing as indicated.
- .7 At the end of the work, clean paint stains on surfaces that have not been painted (floors, walls, hardware, equipment or accessories).

### **3.12 CLEAN-UP OF SITE**

- .1 Clean and reinstall all removed hardware to facilitate painting.
- .2 Remove guards and warning signs as soon as possible after completion of work.
- .3 Remove splashes on exposed surfaces that have not been painted. Remove burrs and speckles as work progresses with a compatible solvent.
- .4 Protect freshly painted surfaces from drips and dust to the satisfaction of the Departmental Representative and avoid scratching new coatings.
- .5 Return the premises used for the storage, mixing and handling of paints and the cleaning of tools and equipment used in their initial state of cleanliness, to the satisfaction of the Departmental Representative.

**END OF SECTION**

<b>Acceptable products:</b> compliant or corresponding to the standards listed below			
<b>LEGEND</b>			
Canadian Government Standards Board GPS: Green Performance Standard GS: GreenSeal (certified) MPI: Master Painters Institute (MPI category)		N/A: Not Applicable N: Gloss category TQRM: As recommended by the manufacturer CFIA: Approved by the Canadian Food Inspection Agency	
	<u>Description of finishes</u>	<u>Unit shining at 60 degrees</u>	<u>85 degree gloss unit</u>
N1	Matte Finish	At most 5	Not more than 10 from 10 to 35 mm <sup>2</sup> from 10 to 35 mm <sup>2</sup> At least 35.
N2	Velvet	Not more than 10	
N3	Eggshell	10- 25%	
N4	Satin finish (beaded, melamine)	20 to 35	
N5	Semi-gloss finish (semi-gloss)	From 35 to 70	
N6	Brilliant	70 to 85	
N7	Very bright finish	More than 85%	
	PRIMER (1 layer)	BACKGROUND (min.1 layer)	FINISHING (at least 2 layers)
<b>indoor work</b>			
<b>ON ALUMINUM AND/OR GALVANIZED METAL, NOT RUSTED</b>			
<b>ACCRUED 5.4H</b>	<b>100% acrylic latex product</b>		
	Ultra-adherent latex primer, ultra-hiding and ultra-resistant. CFIA SICO Corrostop Ultra 635-045		100% acrylic latex paint Glossy finish (N6) MPI # 43/CFIA SICO Expert 876-6XX Synthetic bristle brush and roll 13mm
<b>ON GYPSUM AND/OR CONCRETE PANELS (SMOOTH SURFACES)</b>			
<b>INT 9.2.A1</b>	<b>100% acrylic latex product, zero VOC (walls)</b>		
	Latex primer-sealer MPI # 149/GS-11/CFIA SICO Ecosource 850-130		100% acrylic latex paint Eggshell MPI # 144/GS-11/CFIA SICO Ecosource 853-6XX Synthetic bristle brush and roll 10mm
<b>ACCRUED 9.2.A2</b>	<b>100% acrylic latex product, zero VOC (walls)</b>		
	Latex primer-sealer MPI # 149/GS-11/CFIA SICO Ecosource 850-130		100% acrylic latex paint Matt finish (N1) CAN/GCSB.1-100 MPI # 143/GPS-1/GS-11/CFIA SICO EcoSource 851-116 Synthetic bristle brush and roll 13mm
<b>outdoor work</b>			
<b>ON ALUMINUM AND/OR GALVANIZED METAL, NOT RUSTED</b>			
<b>EXT.5.4H</b>	<b>100% acrylic latex product</b>		
	Ultra-adherent latex primer, ultra-hiding and ultra-resistant. SICO Corrostop Ultra 635-045		waterborne base coat Glossy finish (N6) SICO Expert 632-XXX Synthetic bristle brush and roll 10mm

**END OF SECTION**

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.
  - .2 Sustainable requirements for construction and verification.

**1.2 RELATED REQUIREMENTS**

- .1 Divisions 01, 06 à 09, 23, 31 à 33, 40, A and D

**1.3 REFERENCE STANDARDS**

- .1 Canadian Gas Association (CGA)
  - .1 CSA/CGA B149.1-15, Natural Gas and Propane Installation Code.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
  - .2 CAN/CGSB-24.3-92, Identification of Piping Systems.

**1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Product data to include paint colour chips, other products specified in this section.
- .2 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Samples to include nameplates, labels, tags, lists of proposed legends.

**1.5 QUALITY ASSURANCE**

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

**1.6 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

- .2 Waste Management and Disposal:
  - .1 Construction/demolition waste management and disposal according to section 01 74 11.
  - .2 Do not dispose of unused paint into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

## Part 2 Products

### 2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers raised or recessed.
- .3 Information to include, as appropriate:
  - .1 Equipment: manufacturer's name, model, size, serial number, capacity.
  - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

### 2.2 SYSTEM NAMEPLATES

- .1 Colours:
  - .1 Hazardous: red letters, white background.
  - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
  - .1 3 mm thick white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
  - .1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

- .2 Use maximum of 25 letters/numbers per line.
- .4 Locations:
  - .1 Terminal cabinets, control panels: use size # 5.
  - .2 Equipment in Mechanical Rooms: use size # 9.

- .5 Identification for PSPC Preventive Maintenance Support System (PMSS):
  - .1 Use arrangement of Main identifier, Source identifier, Destination identifier.
  - .2 Equipment in Mechanical Room:
    - .1 Main identifier: size #9.
    - .2 Source and Destination identifiers: size #6.
    - .3 Terminal cabinets, control panels: size #5.
  - .3 Equipment elsewhere: sizes as appropriate.

### **2.3 EXISTING IDENTIFICATION SYSTEMS**

- .1 Identify works added or improved according to the existing identification system to be coordinated with the Owner.
- .2 Where existing identification system does not cover for new work installed, use identification system specified this section following the Owner's approval.

### **2.4 PIPING SYSTEMS GOVERNED BY CODES**

- .1 Identification:
  - .1 Natural gas: to CSA/CGA B149.1.

### **2.5 PIPING IDENTIFICATION**

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Pictograms:
  - .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend:
  - .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- .4 Arrows showing direction of flow:
  - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
  - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
  - .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
  - .1 To full circumference of pipe or insulation.
  - .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
  - .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

- .2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

- .1 Where not listed, obtain direction from the Departmental Representative.  
.2 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Condenser water supply	Green	COND. WTR. SUPPLY
Condenser water return	Green	COND. WTR. RETURN
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Boiler feed water	Yellow	BLR. FEED WTR
Safety valve vent	Yellow	STEAM VENT
Domestic hot water supply	Green	DOM. HW SUPPLY
Domestic cold-water supply	Green	DOM. CWS
Waste water	Green	WASTE WATER
Hydraulic oil	Yellow	HYDRAULIC OIL
Natural gas	to Codes	
Ventilation – Pressure Regulator	Green	COMP. AIR [      ]

## 2.6 IDENTIFICATION DUCTWORK SYSTEMS

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.  
.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

## 2.7 IDENTIFICATION OF VALVES

- .1 Brass labels, with punched inscription, in 12 mm characters, painted in black.  
.2 Provide, for each piping network, functional drawings of approved format, with diagrams and lists of labelled elements, specifying the type of valves, the network, the function, the location and the normal position of elements operating.

## 2.8 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.  
.2 Inscriptions to include function and (where appropriate) fail-safe position.

## 2.9 LANGUAGE

- .1 Identification in French.

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

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

**3.2 TIMING**

- .1 Provide identification of networks and devices only after installation and insulation work has been completed.

**3.3 INSTALLATION**

- .1 Unless otherwise specified, identify networks and devices in accordance with CAN/CGSB-24.3.

**3.4 NAMEPLATES**

- .1 Locations:
  - .1 The plates shall clearly identify the devices and/or piping networks and shall be placed in conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Spacers:
  - .1 On hot and/or insulated surfaces, provide spacers under the identification plates.
- .3 Protection:
  - .1 Do not paint, insulate or cover nameplates.

**3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS**

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

- .9 Identification easily and accurately readable from usual operating areas and from access points.
  - .1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

**3.6 VALVES, CONTROLLERS**

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Number valves in each system consecutively.

**3.7 CLEANING**

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

**END OF SECTION**

**Part 1           General****1.1               RELATED REQUIREMENTS**

- .1     Division 01
- .2     Section 31 05 16 – Granulats.

**1.2               REFERENCE STANDARDS**

- .1     American Society for Testing and Materials International (ASTM)
  - .1     ASTM C127-04, Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate.
  - .2     ASTM D698-00ae1, 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  - .3     ASTM D1557-02e1, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>(2,700 kN-m/m<sup>3  - .4     ASTM D4253-00, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.</sup></sup>

**1.3               DEFINITIONS**

- .1     Corrected maximum dry density is defined as:
  - .1      $D =$
  - .2      $D = (F1 \times D1) + (0.9 \times D2 \times F2)$
  - .3     Where: D = corrected maximum dry density kg/m<sup>3</sup>.
    - .1     F1 = fraction (decimal) of total field sample passing 4.75mm sieve
    - .2     F2 = fraction (decimal) of total field sample retained on 4.75mm sieve (equal to 1.00 - F1)
    - .3     D1 = maximum dry density, kg/m<sup>3</sup>of material passing mm sieve determined in accordance with Method of.
    - .4     D2 = bulk density, kg/m<sup>3</sup>, of material retained on mm sieve, equal to 1000G where G is bulk specific gravity (dry basis) of material when tested to ASTM C127.
  - .4     For layers of permeable materials, determine the maximum dry density M1 of aggregates according to ASTM D4253 by using, at the request of the Departmental Representative, the dry or wet soil method.

**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      Division 01.
- .2      Section 31 00 00 – Earthwork
- .3      Section 32 11 23 – Aggregate base courses.

**1.2                REFERENCE STANDARDS**

- .1      Scope of work and general specifications for road infrastructures (CCDG) — Construction and repair. (most recent edition).
- .2      Standards of the Ministère des Transports, de la Mobilité durable et de l'Électrification des transports:
  - .1      Tome VII —Matériaux (most recent edition).
- .3      Bureau de normalisation du Québec (BNQ):
  - .1      NQ 2560-114, Travaux de génie civil — Granulats.

**1.3                DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1      Submit the required documents and samples in accordance with Section 01 33 00- Submittal Procedures.
- .2      Data sheets:
  - .1      Submit the required datasheets and manufacturer's instructions and documentation for aggregates. The datasheets must indicate the characteristics of the products, the performance criteria, physical size, finish and limitations.
- .3      Samples:
  - .1      Take the necessary measures for the continuous collection of samples of aggregates by the laboratory mandated during their production.
  - .2      Ensure access to the source of supply and prepared materials to the laboratory mandated for sampling.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1      Deliver, store and handle materials and equipment in accordance with Section 01 61 00- Common Product Requirements.
- .2      Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.
- .3      Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

**Part 2 Products****2.1 MATERIALS**

- .1 Characteristics of aggregates: of good quality, hard, resistant, free from platelets, needles, soft or laminated particles, organic materials, clay lumps, minerals, adherent films, harmful quantities of disintegrated pieces or other harmful substances.
- .2 Platelets and needles, in the case of large aggregates: According to the ASTM D4791 specifications:
  - .1 Elements whose largest face is at least five (5) times larger than the smallest.
- .3 Fine aggregates satisfying requirements of applicable section shall consist of one or a mixture of the following materials:
  - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
  - .2 Natural sand.
- .4 Large aggregates satisfying the requirements of applicable section shall consist of one or a mixture of the following materials:
  - .1 Crushed rock.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
  - .3 Light weight aggregate, including slag and expanded shale.
- .5 The following materials shall be used:

Stone, gravel or bank-run sand, screening or crushing:

Designation of screen	MG-20	MG-112
Use	Foundation	Subbase
112 mm		-
56 mm		-
40 mm		-
31,5 mm	100	100
20 mm	90-100	-
14 mm	68-93	-
5 mm	35-60	12-60
1,25 mm	15-38	-
315 µm	5-17	-
80 µm	2-7	0-10

- Particle size within the limits indicated above in tests conducted in accordance with standards NQ 2560-114.

**2.2 SOURCE QUALITY CONTROL**

- .1 Inform the Departmental Representative of the proposed source of supply for aggregates and provide access for sampling at least two (2) weeks before starting production.

- .2 If materials from proposed source of supply do not meet, or cannot reasonably be processed to meet, specified requirements, find another source of supply.
- .3 Advise the Departmental Representative 1 week minimum in advance of proposed change of material source.
- .4 Material accepted at its source of supply may nevertheless be refused thereafter if it does not meet the specified requirements, if the quality or properties of the material delivered are not uniform or if the performance of the materials on site is not satisfactory.

### **Part 3 Execution**

#### **3.1 PREPARATION**

- .1 Preparation of aggregates:
  - .1 Prepare aggregates in a uniform manner, using methods that prevent their contamination, segregation and deterioration.
  - .2 If necessary, a mixture of aggregates, including recovered materials that meet the physical requirements of the specifications, is permitted to provide the particle size, particle shapes or percentage of prescribed crushed particles:
    - .1 Use only methods and materials approved in writing by the Departmental Representative.
- .2 In the presence of layered deposition, use material and excavation methods to obtain aggregates of homogeneous and uniform grain sizes.
- .3 If necessary, jig, crush, wash, classify and process the aggregates with appropriate equipment complying with the requirements:
  - .1 Use only materials approved in writing by the Departmental Representative.
- .4 Piles:
  - .1 Unless otherwise indicated, place the aggregates in piles at site, at the indicated locations. Do not stack aggregates on hard coated surfaces.
  - .2 Pile up enough aggregates to be able to meet the work schedule.
  - .3 Aggregates shall be pile up on level and well-drained land, having sufficient bearing and stability to support the pile materials and the handling material.
  - .4 Unless the materials are piled up on an acceptable stabilized surface, the base of the pile shall consist of a compacted sand layer with a minimum thickness of 300 mm to prevent contamination of the aggregates. Put the aggregates in piles on the floor, but do not incorporate into work the material layer of 300 mm thick at the base pile.
  - .5 To avoid mixtures of aggregates, sufficiently space the piles of different aggregates or separate them by strong bulkheads and full-height partitions.
  - .6 It is forbidden to use mixed or contaminated materials. Remove and dispose the rejected materials within 48 hours of refusal, as directed by the Departmental Representative.
  - .7 Put the materials into piles by forming uniform layers of 300 mm maximum thickness.

- .8 Unload aggregates into uniform piles brought into lot by truck and shape the piles in accordance with the requirements.
- .9 It is forbidden to mount lots in cone or to have materials hurtle down either side of piles.
- .10 During winter work, prevent ice and snow from mixing with piles or extracted materials.

### **3.2 CLEANING**

- .1 Cleaning during work: Perform cleaning work in accordance with section 01 74 11 – Cleaning:
  - .1 Leave work area clean at end of each day.
- .2 Final cleaning: Dispose of the materials/surplus materials, waste, tools and equipment in accordance with section 01 74 11-Cleaning.
- .3 Clean the place where the aggregates have been piled in order to leave a clean, well-drained ground free from any accumulation of stagnant water.
- .4 Carefully place unused aggregates into compact piles.
- .5 Upon temporary or definitive abandonment, the source of aggregate supply must be rehabilitated to the satisfaction of the competent authorities.
- .6 Restrict public access to abandoned piles, temporary or permanent manner, using a means accepted by the Departmental representative.

**END OF SECTION**

**Part 1           General**

**1.1               RELATED REQUIREMENTS**

- .1       Division 01.
- .2       Section 31 23 33-01 – Excavation and backfill.

**1.2               REFERENCE STANDARDS**

- .1       U.S. Environmental Protection Agency (EPA)/Office of Water.
  - .1       EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**Part 2           Products**

**2.1               NOT USED**

- .1       Not Used.

**Part 3           Execution**

**3.1               TEMPORARY MEANS OF EROSION AND SEDIMENTATION CONTROL**

- .1       Establish temporary means to control erosion and sediments deposition, intended to prevent soil loss that may result from stormwater runoff or wind erosion, and the driving of this soil on properties and adjacent walkways.
- .2       Inspect the control methods put in place, maintenance and reparation, if necessary, until permanent vegetation has been well established
- .3       Remove control methods at the appropriate time, repair and stabilize the disturbed surfaces during work.

**3.2               STRIPPING OF TOPSOIL**

- .1       Remove topsoil before construction begins to prevent it from being compacted.
- .2       Place topsoil stockpile by constituting piles at locations determined by the Supervisor.
- .3       Protect topsoil piles from contamination and compaction.

**3.3               DEFORESTATION, GRUBBING AND ASSARTEMENT**

- .1       Contractor shall perform the deforestation, grubbing and complete assartement on all areas indicated by the Departmental Representative of the project and authorized by the Supervisor. Unless otherwise indicated, this work is carried out over the entire width of the right-of-way.

- .2 This work consists of completely rid the terrain of trees, stumps, branches, roots, mosses and other plant debris as well as black earth, topsoil or other unacceptable material.
- .3 Waste materials are the Contractor's property and must be transported outside the work site. In addition, the Contractor must obtain permission from the Departmental Representative of the field on which one he intends to deposit the waste materials.

**END OF SECTION**

**Part 1            General****1.1                RELATED REQUIREMENTS**

- .1     Division 01
- .2     Section 33.05.16 – Cast-Iron Utility Pipe.
- .3     Section 33 31 13 – Site Sanatary Sewerage Gravity Piping.
- .4     Section 33 34 00 – Onsite Wastwater Disposal.
- .5     Section 33 41 00 – Subdrainage.

**1.2                MEASUREMENT FOR PAYMENT PURPOSES**

- .1     Excavated materials are paid in cubic metres in their original location.
- .2     Trench excavation is paid in linear metre according to the excavated length.

**1.3                REFERENCE STANDARDS**

- .1     American Society for Testing and Materials International (ASTM)
  - .1     ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2     ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3     ASTM D422-632002, Standard Test Method for Particle-Size Analysis of Soils.
  - .4     ASTM D698-00ae1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5     ASTM D1557-02e1, 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 D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2     Canadian General Standards Board (CGSB)
  - .1     CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2     CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3     Canadian Standards Association (CSA International)
  - .1     CAN/CSA-A3000-F03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1     CSA-A3001-F03, Cementitious Materials for Use in Concrete.
  - .2     CSA-A23.1/A23.2-F04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

**1.4 DEFINITIONS**

- .1 Excavation classes: two (2) classes of excavation will be recognized; common excavation and rock excavation.
- .1.1 Rock: solid material in excess of 1.00m<sup>3</sup>. Frozen material not classified as rock.
- .1.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .4 Unsuitable materials:
- .1 Weak, chemically unstable, and compressible materials.
- .2 Frost susceptible materials:
- .1.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM C136 ASTM D422: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
- .1.2 Table:
- | Sieve Designation | % Passing |
|-------------------|-----------|
| 2.00 mm           | 100       |
| 0.10 mm           | 45 – 100  |
| 0.02 mm           | 10 - 80   |
| 0.005 mm          | 0 - 45    |
- .1.3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

**1.5 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Make submittals of documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
- .1 Submit a report of existing conditions.
- .2 Submit for review by Departmental Representative proposed dewatering heave prevention methods as described in PART 3 of this Section.
- .3 Advise the Departmental Representative when bottom of excavation is reached.
- .4 Submit to Departmental Representative the inspection results as described in PART 3 of this Section.

- .3 Preconstruction Submittals:
  - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
  - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 At least 4 weeks prior to beginning Work, inform the Departmental Representative source procurement proposed for backfill.

## 1.6 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Submit calculations and supporting data at least 2 weeks prior to beginning Work.
- .3 Calculations and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the Province, Canada.
- .4 Keep design and supporting data on site.
- .5 Do not use soil material until written report of soil test results are reviewed by the Departmental Representative.
- .6 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## 1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Divert excess aggregate materials from landfill to local facility as directed by the Departmental Representative.

## 1.8 EXISTING CONDITIONS

- .1 Buried services:
  - .1 Before commencing work establish location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

- .5 Prior to beginning excavation Work, notify to the Departmental Representative establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
  - .6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
  - .7 Record location of maintained, re-routed and abandoned underground lines.
  - .8 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
- .1 Conduct, with the Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
  - .3 Where required for excavation, cut roots or branches as directed by the Departmental Representative.

## Part 2 Products

### 2.1 MATERIALS

- .1 Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:
  - .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 Gradations to be within limits specified when tested to ASTM C117 ASTM C136. Sieve sizes to CAN/CGSB-8.2.
  - .3 Table:

Sieve Designation	% Passing
Type 1	Fill
75 mm	100
50 mm	
37.5 mm	
25 mm	
19 mm	
12.5 mm	
9.5 mm	
4.75 mm	
2.00 mm	
0.425 mm	0 - 30
0.180 mm	
0.075 mm	0 - 8

**Part 3 Execution****3.1 EROSION AND SEDIMENTATION CONTROL MEANS**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways. These temporary measures shall conform with requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 PREPARATION/PROTECTION**

- .1 Protect existing elements.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 When soil can variate in volume due to water content, cover and protect it to the satisfaction of the Departmental Representative.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

**3.3 STOCKPILING**

- .1 Stockpile fill materials in areas designated by the Departmental Representative:
  - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

**3.4 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for approval Departmental Representative details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 1 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or portion of Work completed or under construction.

- .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

### 3.5 EXCAVATION

- .1 Excavation must not interfere with bearing capacity of adjacent foundations.
- .2 Do not disturb soil within branch spread of trees or shrubs that are to remain:
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .3 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .4 Restrict vehicle operations directly adjacent to open trenches.
- .5 Dispose of surplus and unsuitable excavated material off site.
- .6 Do not obstruct flow of surface drainage or natural watercourses.
- .7 Notify the Departmental Representative when bottom of excavation is reached.
- .8 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Departmental Representative.
- .9 Correct unauthorized over-excavation as follows:
  - .1 Establish under other areas with Type 2 fill compacted to not less than 95% of corrected Standard Proctor maximum dry density in accordance with Section 31 05 10 - Corrected Maximum Dry density fir Fill.
- .10 Hand trim, make firm and remove loose material and debris from excavations:
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
  - .2 Clean out rock seams and fill with concrete mortar or grout to approval of the Departmental Representative.

### 3.6 BACKFILLING

- .1 Vibratory compaction equipment:
- .2 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading.

**3.7 FOUNDATION, COATING AND BACKFILL OF PIPES**

- .1 Contractor shall use granular materials MG 20b or GC 14, complying with BNQ 2560-114 standard, according to conditions of bottom excavation. Foundation must be compacted to 90% under the structures, elsewhere the foundation and coating compacted to 90% of the maximum dry density obtained in the laboratory or by a reference board at site according to material type. The thickness of foundation, the coating and the filling must be made according to standard BNQ 1809-300/2018.

**3.8 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 21 - Construction/Demolition Waste Management and Disposal, trim slopes, and correct defects as directed by the Departmental Representative.
- .2 Replace topsoil as indicated by the Departmental Representative.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by the Departmental Representative.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Division 01
- .2 Section 31 05 10 — Corrected Maximum Dry Density for Fill.
- .3 Section 31 05 16 — Aggregate Materials.

**1.2 MEASUREMENT AND PAYMENT**

- .1 Measure granular sub-base in cubic metres. Only material incorporated into Work and accepted by the Departmental Representative will be considered.

**1.3 REFERENCE STANDARDS**

- .1 ASTM International:
  - .1 ASTM C117-04, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils.
  - .5 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .6 ASTM D1557-09, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup>) (2,700kN-m/m<sup>3</sup>).
  - .7 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .8 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Bureau de normalisation du Québec (BNQ):
  - .1 Norme NQ 2560-114-II/2002, Travaux de génie civil — Granulats – Partie II : Matériaux pour fondation, sous-fondation, couche de roulement et accotement.

**1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

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

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Storage and Handling Requirements:
  - .1 Replace defective or damaged materials with new.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Granular sub-base material: in accordance with Section 31 05 16 - Aggregate Materials.

**2.2 EXAMINATION**

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

**2.3 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, sediments carried by runoff or dust and wind-driven particles, in according to authorities having jurisdiction.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**2.4 PLACING**

- .1 Place granular sub-base after subgrade is inspected and approved by the Departmental Representative.
- .2 Construct granular sub-base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Begin spreading sub-base material on crown line or high side of one-way slope.
- .6 Place granular sub-base materials using methods which do not lead to segregation or degradation.

- .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding 300mm compacted thickness.
  - .1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
- .9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .10 Remove and replace portion of layer in which material has become segregated during spreading.

## **2.5 COMPACTION**

- .1 Compaction equipment to can obtain required material densities.
- .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from the Departmental Representative before use.
- .3 Compact up to at least 95% of the maximum dry density for the MG-112 layer and at least 98% of the maximum dry density for the MG20 layer.
- .4 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .5 Apply water as necessary during compaction to obtain specified density.
- .6 In areas not accessible to rolling equipment, compact to specified density with mechanical.
- .7 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

## **2.6 CLEANING**

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

## **2.7 SITE TOLERANCES**

- .1 Finished sub-base surface to be within 10mm of elevation as indicated but not uniformly high or low.

## **2.8 PROTECTION**

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

**END OF SECTION**

**Part 1           General****1.1               RELATED REQUIREMENTS**

- .1       Division 01.

**1.2               MEASUREMENT FOR PAYMENT**

- .1       The supply and installation of chain link fences shall be measured in metres, based on the number of fence meters installed.
- .2       The supply and installation of fence barriers shall be measured at the unit, based on the number of barriers of each dimension installed.

**1.3               REFERENCE STANDARDS**

- .1       CCDG 2018.
- .2       ASTM International:
  - .1       ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2       ASTM A90/A90M-09, Standard Test Method for Weight [Mass]of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
  - .3       ASTM A121-07, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
  - .4       A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .5       ASTM C618-08a, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
  - .6       ASTM F1664-08, Standard Specification for Poly(Vinyl Chloride) (PVC)-Coated Steel Tension Wire Used with Chain-Link Fence.
  - .7       ASTM A123/A123M-09, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.

**1.4               DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1       Data sheets:
  - .1       Submit the required data sheets, as well as the instructions and documentation from manufacturer. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finish.

**Part 2 Products****2.1 MATERIALS**

- .1 Materials shall conform to the requirements of the CCDG after the installation of the materials.
- .2 The Contractor shall provide and install a 2.44-metre-high hot-dip galvanized chain link fence (Frost) as well as swing barriers and single barriers at locations and in accordance to details shown in drawings pursuant to section of this specification.

**Part 3 Execution****3.1 INSTALLATION OF FENCES AND GATES**

- .1 The Contractor shall perform the work in accordance with the technical specifications of section 18.6 of the CCDG, only with respect to the technical clauses that apply, including but not limited to:

Fences and gates; Article 18.10 of the CCDG and amended by the following text:

"The Contractor must":

- .1 Deforest and grubbing on a width of 4 m or according to the width indicated in the plan, where required, to permit the installation of fence.
- .2 Remove debris and level the land along the route of fence to be installed to provide a gentle and uniform slope between the poles. Provide a clearance of 75 mm between the bottom of the fence and the ground surface.
- .3 Erect the fence along the specified route and in accordance with plans.
- .4 Place additional reinforcing poles at significant elevation and at locations designated by the Supervisor.
- .5 Place a reinforcement pole every 30m maximum.
- .6 Place a corner post when the change in alignment exceeds 20 degrees.
- .7 Place end posts at the end of the fence and near the buildings. Install gate post on either side of openings intended to receive barriers.
- .8 Pour concrete into the post holes and then install them at the indicated depth. Bring the concrete to a height of 50 mm above the ground level and finish the sloping surface to divert the water from the poles. Support the poles to keep them plumb, in the alignment and at the prescribed level, until the concrete is taken.
- .9 Allow the concrete to harden at least five (5) days before proceeding with the screen fence.
- .10 Install the support bars as shown in drawings.
- .11 Deploy the screen fence, tender it strongly to the manufacturer's recommended tension and attach it to end poles, angle, barrier and reinforcement poles, with a tension bar attached to each pole by means of flanges placed at 400 mm interval. Place the folded edge at the bottom and twisted border at the top.
- .12 Fix wire fence as shown in the drawings.

**3.2 TOUCH UP**

- .1 The Contractor shall clean damaged surfaces with wire brush to remove loose and cracked coating layers. Apply two coats of organic zinc-rich paint on the damaged areas. Before painting the damaged surfaces, pre-treat them according to the manufacturer's instructions for zinc-rich paint.

**3.3 CLEANING**

- .1 Cleaning during work: Perform cleaning work in accordance with section 01 74 11- Cleaning.
- .2 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

**3.4 QUALITY ASSURANCE**

- .1 Certificate of compliance:
  - .1 Refer to section 18.10 of the CCDG, only about the technical clauses that apply.
- .2 Reception control:
  - .1 Refer to section 18.10 of the CCDG, only about the technical clauses that apply.

**END OF SECTION**

**Part 1 General**

- .1 Division 01
- .2 Section 31 00 00.01 – Earthwork – Short Form
- .3 Section 32 92 23 – Sodding

**1.2 MEASUREMENT FOR PAYMENT PURPOSES**

- .1 Preparation of sub-grade for placing of topsoil will not be measured for payment, but will be included in the item repair of sod.

**1.3 REFERENCE STANDARDS**

- .1 Agriculture and Agri-Food Canada
  - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
  - .1 PN1340-2005, Guidelines for Compost Quality.
- .3 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.4 DEFINITIONS**

- .1 Compost:
  - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
  - .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
  - .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 25), and contain no toxic or growth inhibiting contaminants.
  - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

**1.5 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals:
  - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
  - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**Part 2 Products****2.1 TOPSOIL**

- .1 Topsoil for seeded areas: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth:
  - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70% sand, minimum 7% clay, and contain 2 to 10% organic matter by weight.
  - .2 Contain no toxic elements or growth inhibiting materials.
  - .3 Finished surface free from:
    - .1 Debris and stones over 50 mm diameter.
    - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
  - .4 Consistence: friable when moist.

**2.2 SOIL AMENDMENTS**

- .1 Fertilizer:
  - .1 Fertility: major soil nutrients present in following amounts:
    - .1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
    - .2 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
    - .3 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
  - .2 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
  - .3 Ph value: 6.5 to 8.0.
- .2 Peatmoss:
  - .1 Derived from partially decomposed species of Sphagnum Mosses.
  - .2 Elastic and homogeneous, brown in colour.
  - .3 Free of wood and deleterious material which could prohibit growth.
  - .4 Shredded particle minimum size: 5 mm.
- .3 Sand: washed coarse silica sand, medium to course textured.
- .4 Fertilizers: A current product accepted by industry, containing nitrogen, phosphorus, potassium and any other micronutrients suitable for plant species or specific applications, or determined based on soil analyses.

**2.3 SOURCE QUALITY CONTROL**

- .1 Advise the Departmental Representative of sources of manufactured topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Testing of topsoil will be carried out by an independent testing laboratory:

- .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

### **Part 3 Execution**

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

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways. These temporary measures shall conform with requirements of authorities having jurisdiction.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

#### **3.2 PREPARATION OF EXISTING GRADE**

- .1 Preparation of existing foundation soil:
  - .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by the Departmental Representative.
  - .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
  - .3 Remove debris, roots, branches, stones in excess of 50mm diameter and other deleterious materials:
    - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
    - .2 Remove debris which protrudes more than 75mm above surface.
    - .3 Dispose of removed material off site.
  - .4 Cultivate entire area which is to receive topsoil to minimum depth of 100mm:
    - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

#### **3.3 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL**

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15mm below finished grade.
- .4 Spread topsoil as indicated to following minimum depths after settlement:
  - .1 150mm for seeded areas.
  - .2 135mm for sodded areas.
  - .3 300mm for flower beds.
  - .4 500mm for shrub beds.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

**3.4 LEVEL FINISHING**

- .1 Level the ground to eliminate hollows and asperities and to promote good water flow:
  - .1 Make a layer of friable soil by ameublissant the soil and raking it.
- .2 Firming the soil layer to obtain the prescribed apparent density, using the material approved by the Departmental Representative:
  - .1 Leave smooth, uniform and firm surfaces so that it does not form deep traces under the weight of a person.

**3.5 ACCEPTANCE**

- .1 The Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

**3.6 SURPLUS MATERIAL**

- .1 Dispose of materials except topsoil not required off site.

**3.7 CLEANING**

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

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Division 01
- .2 Section 31 00 00.01 – Earthwork
- .3 Section 32 91 19 13 – Topsoil Placement and Grading

**1.2 MEASUREMENT FOR PAYMENT**

- .1 The sodding shall be subject to an amount based on a price per square metre. The price will have to include the set up of topsoil.

**1.3 REFERENCE**

- .1 Normes du Ministère des Transports, de la Mobilité durable et de l'Électrification des transports :
  - .1 Tome IV —Abords de route (Édition la plus récente).

**1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Work Schedule:
  - .1 Establish schedule for the laying of sod so that it coincides with the preparation of the surfaces.
  - .2 Establish schedule so that the laying of sod takes place once the ground thawed.

**1.5 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit the required documents and samples in accordance with section 01 33 00 - Documents/samples to be submitted.
- .2 Data Sheets:
  - .1 Submit the required data sheets and the manufacturer's instructions and documentation for the sod. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finish.
- .3 Certificates: Submit the documents signed by the manufacturer certifying that the products, materials and equipment meet the requirements for the physical characteristics and performance criteria of the seed mixture, the purity and sod quality.
- .4 Test reports: Submit test reports certifying that the products, materials and equipment meet the requirements for the physical characteristics and performance criteria of seed mixture, seed purity, and sod quality.

**1.6 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: Deliver materials and equipment to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with supplier's recommendations.
  - .2 Replace defective or damaged materials with new.

**Part 2 Products****2.1 MATERIALS**

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop:
  - .1 Turf Grass Nursery Sod types:
    - .1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
    - .2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
    - .3 Number One Named Cultivars: Nursery sod grown from certified seed.
  - .2 Turf Grass Nursery Sod quality:
    - .1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.
    - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
    - .3 Mowing height limit: 35 to 65 mm.
    - .4 Soil portion of sod: 6 to 15 mm in thickness.
- .2 Commercial Grade Turf Grass Nursery:
  - .1 Mow sod at height directed by the Departmental Representative within 36 hours prior to lifting, and remove clippings.
  - .2 Not more than 5 broadleaf weeds and up to 20% native grasses per 40 square metres.
- .3 Fertilizer:
  - .1 To Canada "Fertilizers Act" and Fertilizers Regulations.
  - .2 Slow-acting synthetic compound fertilizers containing 65% of nitrogen content in water-insoluble form.

**2.2 SOURCE QUALITY CONTROL**

- .1 Once the proposed source of sod is approved, no other source may be used without the written authorization of the Departmental Representative.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of conditions: Before proceeding with sod installation, make sure that condition of surfaces/supports previously implemented under other Sections or Contracts is acceptable and allows the work to be carried out in accordance with Manufacturer's written instructions:
  - .1 Visually inspect surfaces/supports in presence of the Departmental Representative.
  - .2 Inform the Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 PREPARATION**

- .1 Ensure that the soil pattern is adequate and that the surfaces to sod are prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading and finishing leveling. Inform the Departmental Representative of any discrepancy with drawings and wait for the Departmental Representative's instructions before commencing the work.
- .2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .3 Perform the finishing leveling of surfaces to achieve a low and uniform slope, free from hollows and asperities.
- .4 Remove weeds, debris, stones of 50 mm in diameter and above, soil contaminated with oil, gasoline or other harmful products and evacuate them from site in accordance with section 01 74 21 - Waste management and disposal Construction/Demolition.

**3.3 SOD PLACEMENT**

- .1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.
- .2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .4 Roll sod as directed by the Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

**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 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris always.
- .2 Final Cleaning: Upon completion remove surplus materials rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .1 Clean and reinstate areas affected by Work.

**3.5 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform the following maintenance work from the date of installation of sod until the reception of work:
  - .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
  - .2 Cut grass to 50 mm when or prior to it reaching height of 75 mm.
  - .3 Maintain sodded areas weed free 95%.

**3.6 RECEPTION OF WORK**

- .1 Surfaces covered with cultivated sod shall be accepted by the Departmental Representative if the following conditions are met:
  - .1 Sodded areas are properly established.
  - .2 Sod is free of bare and dead spots.
  - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.
  - .4 Sodded areas have been cut minimum 2 times prior reception of work.
- .2 Areas sodded in fall will be accepted in following spring one (1) month after start of growing season provided acceptance conditions are fulfilled.
- .3 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.
- .4 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

**END OF SECTION**

**Part 1            General****1.1                RELATED REQUIREMENTS**

- .1        Division 01
- .2        Section 31 23 33 01 – Excavation and Backfill.
- .3        Section 33.31.13 – Site Sanitary Sewerage Gravity Piping.
- .4        Section 33 41 00 – Subdrainage.

**1.2                MEASUREMENT FOR PAYMMENT PURPOSES**

- .1        Measure manholes in units, depending on the number provided and installed.
- .2        Measure gratings in units provided and installed.

**1.3                REFERENCE STANDARDS**

- .1        Refer to Standard BNQ 1809-300/2018.
- .2        ASTM International:
  - .1        ASTM A48/A48M-03(2012), Standard Specification for Grey Iron Castings.
  - .2        ASTM A123/A123M-2012, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .3        ASTM C117-13, Standard Test Method for Materials Finer than 75-mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .4        ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .5        ASTM C139-11, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
  - .6        ASTM C478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).
  - .7        ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>(600 kN-m/m<sup>3</sup>)).

**1.4                DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1        Data Sheets:
  - .1        Submit the required data sheets as well as the manufacturer's documentation for manhole and catch basins. Data sheets must indicate the characteristics of products, the performance criteria, physical size, limitation and finish.
- .2        Shop Drawings:
  - .1        Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Quebec, Canada.

**1.5 QUALITY ASSURANCE**

- .1 Submit the required documents in accordance with Section 01 45 00 - Quality Control.
- .2 Certifications:
  - .1 At least four (4) weeks prior the beginning of work, submit the results of tests carried out by the manufacturer and the certificate stating that the materials meet the requirements. Include manufacturer's drawings, information and shop drawings where pertinent.
  - .2 Certificates: Submit certificates signed by the manufacturer stating that products, materials and equipment meet the requirements for physical characteristics and performance criteria.
  - .3 Manufacturer's Instructions: Submit manufacturer's installation instructions provided by the manufacturer, including any indication of specific handling, installation and cleaning methods.

**Part 2 Products****2.1 MATERIALS**

- .1 Manhole:
  - .1 Manholes shall be prefabricated reinforced concrete with a minimum diameter of 1 200 mm and complying with requirements of standard BNQ 2622-420. All manholes (beginning or end of work) shall have a cunette equivalent to half the diameter of the outlet pipe as described in article 6.3.15.2 of BNQ 1809-300/2018.
  - .2 Frameworks and covers of 775 mm in diameter are "Autostable" type as manufactured by Les Produits Sinoco or equivalent approved. The assembly consists of an SN-CA775 (270 mm) ductile iron frame, an sn-TSAB775 or sn-TPAB775 with no anti-tipping legs in ductile iron.
  - .3 The SN-CHC775 (152 mm) conical guide frame is of grey cast iron. The frame should not have legs that are used to support safety grates. All components come from the same manufacturer.
  - .4 Rubber rings are allowed up to 100 mm thick.
- .2 Sump 600 mm diameter connected:
  - .1 The contractor shall supply and install sumps of 600 mm in diameter with a minimum height of 2.1 metres with frame and grate in accordance with plans and requirements of standard BNQ 1809-300/2018.
  - .2 The connection line must be 150 mm in PVC DR-28 diameter and the door must be cast iron.
- .3 Protective membrane of sewer manhole and sumps against freezing:
  - .1 The Contractor shall provide and install a Tex-O-Flex 40-12 membrane of TEXEL or equivalent approved around the sewer manhole and sumps on a depth of 1.8 metre above the concrete.
- .4 Granular material and fill materials: According to the requirements of section 31 05 16 - aggregates and satisfying the following requirements:

- .5 Granular bedding and backfill: In accordance with Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 CG 14-type materials conform to requirements BNQ 2560-114-III/2014 compacted to 90% of modified Proctor.

### **Part 3 Execution**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: Before proceeding with the manholes and manhole covers installation, verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for maintenance holes and catch basin structures installation in accordance with manufacturer's written instructions:
  - .1 Visually inspect surfaces/supports in presence of the Supervisor.
  - .2 Inform the Supervisor of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

#### **3.2 EXCAVATION AND BACKFILL**

- .1 Perform excavation and backfill in accordance with section 31 23 33.01- Excavating Trenching and Backfilling as indicated.
- .2 Excavation works must be approved by the Supervisor prior to the installation of manholes or sewer vents.

#### **3.3 INSTALLATION**

- .1 Contractor shall perform the work in accordance with the technical specifications of standard BNQ 1809-300/2018.

#### **3.4 FIELD QUALITY CONTROL AND CLEANING**

- .1 Contractor shall have an independent specialized firm approved by the Supervisor to carry out cleaning, deflection tests and CCTV inspection of pipes, accessories and manhole before the first paving layer on complete section, either manhole to manhole. In addition, the exfiltration tests must be carried out on pipes, fittings and sanitary manholes on complete sections.
- .2 The Company to carry out these tests must be qualified and trained to work according to the latest version of CERIU/NASSCO (SCAP & MACP). The data and information contained in the report must be based and carried out using the CERIU/NASSCO (Scap & MACP) method.
- .3 The cleaning of network and the exfiltration tests on pipes, accessories and manholes must be carried out according to the requirements of standard BNQ 1809-300/2018.

**END OF SECTION**

**Part 1            General****1.1                RELATED REQUIREMENTS**

- .1        Division 01.
- .2        Section 31 23 33 01 – Excavation and Backfilling.
- .3        Section 33 05 16 – Maintenance Holes and Catch Basin Structures.

**1.2                MEASUREMENT FOR PAYMENT**

- .1        Measure excavation and backfill operations in accordance with section 31 23 33.01-Excavation, trenching and backfilling.
- .2        Measure in metres the supply and installation of sanitary sewer and pipeline, including execution test, excavation and backfill. Pipes and pipelines will be measured horizontally from manhole face to manhole face, for each depth class and each pipe diameter installed.

**1.3                REFERENCE STANDARDS**

- .1        Refer to standards BNQ 1809-300/2018.
- .2        American National Standards Institute/American Water Works Association (ANSI/AWWA)
  - .1        ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .3        ASTM International
  - .1        ASTM C12-09, Standard Practice for Installing Vitrified Clay Pipe Lines.
  - .2        ASTM C14M-07, Standard Specification for Nonreinforced Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
  - .3        ASTM C76M-10a, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
  - .4        ASTM C117-04, Standard Test Method for Material Finer Than 75 [MU]m (No. 200) Sieve in Mineral Aggregates by Washing.
  - .5        ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .6        ASTM C425-09, Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
  - .7        ASTM C428-05(2006), Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.
  - .8        ASTM C443M-07, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
  - .9        ASTM C663-98(2008), Standard Specification for Asbestos Cement Storm Drain Pipe.
  - .10      ASTM C700-09, Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.

- .11 ASTM C828-06, Standard Test Method for Low-pressure Air Test of Vitrified Clay Pipe Lines.
- .12 ASTM D698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft<sup>4</sup>-lbf/ft<sup>3</sup>(600 kN-m/m<sup>3</sup>)).
- .13 ASTM D1869-95(2005) e1, Standard Specification for Rubber Rings for Asbestos Cement Pipe.
- .14 ASTM D2680-01(2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- .15 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .16 ASTM D3350-10, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

#### **1.4 DOCUMENTS/SAMPLE TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Data Sheets:
  - .1 Submit the required data sheets as well as the manufacturer's instructions and documentation for hoses and backfill. The data sheets must indicate the products characteristics, the performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
  - .2 Indicate on drawings proposed method for installing carrier pipe for undercrossings.
- .3 Certificates:
  - .1 Certification to be marked on pipe.

### **Part 2 Product**

#### **2.1 SANITARY SEWER LINE**

- .1 Pipeline may be either:
  - .1 PVC Type DR-35 minimum with seal or equivalent. The entire pipelines of a same project must come from the same supplier. When using PVC for drinking water pipelines, the material must be green or white.

#### **2.2 FITTING**

- .1 Fittings shall be of same material and category as main pipelines and must come from the same supplier.

**2.3 GRANULE MATERIAL**

- .1 Bedding material and coating for pipelines:
  - .1 Materials of type MG 20b or CG 14 conforming, by type of aggregate used, to the requirements standard BNQ 2560-114-II/2014, part II (MG 20b) or part III (GC 14), compacted to 90% of modified Proctor.
  - .2 Where water is present, the material used shall be of 20 mm net stone placed on a membrane and covered with a membrane. The membrane must be of type VI of Ministère des Transports, de la Mobilité durable et de l'Électrification des transports. This work must be approved by the Supervisor.
- .2 Coated materials around structures:
  - .1 CG 14-type materials conforming to requirements BNQ 2560-114-III/2014 compacted to 90% of modified Proctor.

**Part 3 Execution****3.1 GENERAL**

- .1 The Contractor shall perform the work in accordance with the technical specifications of standard BNQ 1809-300/2018.
- .2 The Contractor shall use a working method to preserve the physical integrity of pipeline at all installation stages (trenching, assembly, backfill and compaction).

**3.2 ON-SITE CLEANING, TESTING AND INSPECTIONS**

- .1 The Contractor shall have an independent specialized firm approved by the Supervisor to carry out cleaning, strain tests and TV inspection on pipelines, accessories and manhole before the first paving layer on complete sections, either manhole to manhole. In addition, the exfiltration tests must be carried out on pipelines, fittings and sanitary sewer manholes on complete sections, either manhole to manhole. The Contractor shall notify the Supervisor at least two days prior carrying out of tests so that they may be done in the presence of the Supervisor.
- .2 The firm hire to achieve these tests must be qualified and trained to work according to the latest version of CERIU/NASSCO (SCAP & MACP). Data and information contained in the report must be based and carried out using the CERIU/NASSCO (Scap & MACP) method.
- .3 The cleaning of network and the exfiltration tests on pipelines, fittings and manholes must be carried out according to the requirements of standard BNQ 1809-300/2018.
- .4 The strain tests on PVC pipelines shall be carried out in accordance with requirements of article 11.6 of standard BNQ 1809-300/2018.
- .5 Before reception of provisional work and final acceptance of work, the Contractor shall perform the cleaning of network (including pipelines, manhole and sumps) and TV inspection of pipelines and deformation verification without any measure of exfiltration on complete sections, either manhole to manhole.

- .6 For all these tests and TV inspections, the Contractor shall provide a summary report 2 weeks prior to provisional acceptance.
- .7 If, during a TV inspection, a defect or breakage of rating 2 or greater than the SCAP is detected, a repair or change of the section shall be performed in accordance with the method approved by the Supervisor. A complete inspection of section (manhole to manhole) must be carried out and a report must be produced.
- .8 If, during a TV inspection, a rubberpacking is clearly badly positioned, the section shall be corrected by digging. A complete inspection of section (manhole to manhole) must be carried out and a report must be produced.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Division 01.
- .2 Section 31 23 33 01 – Excavation and Backfilling.
- .3 Section 33 05 16 – Cast-Iron Utility Pipe.

**1.2 MEASUREMENT OF PAYMENT**

- .1 Measure trenching and backfilling under Section 31 23 33.01- Excavating, Trenching and Backfilling.
- .2 Measure in metres the supply and installation of sanitary sewer lines and pipelines, including test execution, excavation and backfill. The pipes and pipelines will be measured horizontally from manhole to manhole, for each type and size of pipe installed.

**1.3 REFERENCE STANDARDS**

- .1 Refer to standard BNQ 1809-300/2018.
- .2 American National Standards Institute/American Water Works Association (ANSI/AWWA):
  - .1 ANSI/AWWA C104/A21.4-08, Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water;
  - .2 ANSI/AWWA C111/A21.11-06, Standard for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings;
  - .3 ANSI/AWWA C151/A21.51-09, Standard for Ductile-Iron Pipe, Centrifugally Cast;
  - .4 ANSI/AWWA C207-07, Standard for Steel Pipe Flanges for Waterworks Service, Sizes 4 Inch Through 144 Inch (100 mm Through 3,600 mm);
  - .5 ANSI/AWWA C600-10, Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances;
  - .6 ANSI/AWWA C900-07, Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 Inch Through-12 Inch (100 mm-300 mm), for Water Transmission and Distribution.
- .3 ASTM International:
  - .1 ASTM A240, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications;
  - .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates;
  - .3 ASTM C117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing;
  - .4 ASTM D698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort ((12,400 ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>));

- .5 ASTM D2241-09, Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series);
- .6 ASTM D2310-06, Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe;
- .7 ASTM D2992-06, Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fitting;
- .8 ASTM D2996-01(07) e1, Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber- Reinforced Thermosetting Resin Pipe);
- .9 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

#### **1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Data Sheets:
  - .1 Submit the required data sheets as well as the manufacturer's instructions and documentation for pipes and backfill. The data sheets must indicate the products characteristics, the performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
  - .1 Workshop drawings shall indicate the method proposed for the installation of carrier pipe for undercrossings.
- .3 Certificates:
  - .1 Certification to be marked on pipe.

### **Part 2 Products**

#### **2.1 DISCHARGE LINES**

- .1 Discharge lines are IPS in DR-17 HDPE with watertight seals or equivalent approved in accordance with ANSI/AWWA C906-07. All fittings, Accessories (elbow, tee, etc.) must come from the same supplier as the main lines.

#### **2.2 VALVE**

- .1 The valves are of an eccentric type with a cast iron casing with internal rubber cover. The exterior is covered with 12mils of epoxy paint.
- .2 The casing is covered with chloroprene.
- .3 The valve body will be tested and certified waterproof for 150 psi water.
- .4 The valve has a manual steering wheel actuator. The superstructure of the valve is made of stainless steel and allows the change of manual actuator for a pneumatic or electric actuator without the need to change the superstructure.

- .5 A stainless steel pedestal with steering wheel and opening gauge, and an extension of 3.048 M is installed with the valve.
- .6 The eccentric valve shall be branded Dezurik, series PEC, or equivalent approved, according to the following diameters:
  - 100 mm : PEC, 4, F1, CIS, NBR, CR, SD0\*GB-4-N, SB16, FSDIR1;
  - 150 mm : PEC, 6, F1, CIS, NBR, CR, SD0\*GB-6-N, SB16, FSDIR1;
  - 200 mm : PEC, 8, F1, CIS, NBR, CR, SD0\*GB-8-N, SB16, FSDIR1.

### **2.3 CONNECTIONS TO EXISTING PIPE**

- .1 All connections to existing pipe shall conform to BNQ 1809-300.

### **2.4 GRANULAR MATERIAL**

- .1 Bedding and coating materials for conduits:
  - .1 Materials of type MG 20b complying, by type of aggregate used, with the requirements of standard BNQ 2560-114-II/2014, part II (MG 20b) or part III (GC 14), compacted to 90% of modified Proctor.
  - .2 Where water is present, the material used shall be of the 20 mm clean stone placed on a membrane and covered with a membrane. The membrane must be of type VI of the Ministry of Transport, Sustainable mobility and Transportation electrification. This work must be approved by the Supervisor.

## **Part 3 Execution**

### **3.1 GENERAL**

- .1 The Contractor shall perform the work in accordance with the technical specifications of standard BNQ 1809-300/2018.
- .2 The Contractor shall use a working method to preserve the physical integrity of the pipe at all installation stages (trenching, assembly, backfill and compaction).

### **3.2 CLEANING, LEAK TESTING OF THE DISCHARGE LINE**

- .1 The Contractor shall have an independent specialized firm approved by the Supervisor to carry out cleaning and exfiltration tests. The Contractor shall notify the Supervisor at least two days prior to carrying out the tests so that they are done in the presence of the Supervisor.
- .2 The cleaning of the discharge pipelines shall be carried out in accordance with the specification of articles 11.1.2.1 and 11.1.2.2 of general technical clauses NQ 1809-300-2018. Leak tests are carried out in the same way as for drinking water pipes. The water pressure is 690 kPa.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Division 01.
- .2 Section 31 23 33 01 – Excavating, Trenching and Backfilling.
- .3 Section 33 05 16 – Cast-Iron Utility Pipe.
- .4 Section 33 31 13 – Site Sanitary Sewerage Gravity Piping.

**1.2 PRICE AND TERMS OF PAYMENT**

- .1 Measurement procedures:
  - .1 Measure excavation and backfill under Section 31 23 33.01- Excavating, Trenching and Backfilling.
  - .2 Measure in metres the supply and installation of sanitary sewer pipelines and piping, including test execution, excavation and backfill. Conduit and piping will be measured horizontally from manhole to manhole, for each depth class and each diameter of pipe installed.

**1.3 REFERENCE STANDARDS**

- .1 ASTM International:
  - .1 ASTM C12-09, Standard Practice for Installing Vitrified Clay Pipe Lines.
  - .2 ASTM C14M-07, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
  - .3 ASTM C76M-10a, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
  - .4 ASTM C117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .5 ASTM C136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .6 ASTM C425-04 (2009), Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
  - .7 ASTM C428-97 (06), Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.
  - .8 ASTM C443M-10, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
  - .9 ASTM C506M-10b, Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.
  - .10 ASTM C507M-10b, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe (Metric).
  - .11 ASTM C663-98 (2008), Standard Specification for Asbestos-Cement Storm Drain Pipe.

- .12 ASTM C700-11, Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- .13 ASTM D698-07 e1, 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>)).
- .14 ASTM D1056-07, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
- .15 ASTM D1869-95 (2010), Standard Specification for Rubber Rings for Asbestos-Cement Pipe.
- .16 ASTM D2680-01 (2009), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- .17 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .18 ASTM F405-05, Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.
- .19 ASTM F667-06, Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.
- .20 ASTM F794-03 (2009), Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- .2 Bureau de normalisation du Québec (BNQ):
  - .1 BNQ-3624-115-2004, Polyethylene (PE) Pipe and Fittings - Flexible Corrugated Pipes and Drainage - Characteristics and Test Methods

#### **1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Data Sheets:
  - .1 Submit the required data sheets and manufacturer's instructions and documentation for pipes and backfill. The data sheets must indicate the product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the province of Quebec, Canada.
  - .2 Shop drawings to indicate proposed method for installing carrier pipe for undercrossings.
- .3 Certificates:
  - .1 Certification to be marked on pipe.

### **Part 2 Products**

#### **2.1 STORM SEWER PIPELINE**

- .1 Rain pipes with a diameter of less than 450 mm may be either:
  - .1 Class IV reinforced concrete in accordance with requirements of standard BNQ 2622-126.

- .2 In thermoplastic of type PVC DR-35 in accordance with requirements of standard BNQ 3624-135.
- .3 Of HDPE with a smooth inner wall and a ringed or smooth outer wall with a minimum stiffness of 320 kPa and complying with requirements of BNQ 3624-120.
- .2 Rain pipes, with a diameter of 450 mm up to 900 mm may be either:
  - .1 Class IV reinforced concrete in accordance with requirements of standard BNQ 2622-126.
  - .2 Of HDPE with a smooth inner wall and a ringed or smooth outer wall with a minimum stiffness of 320 kPa and complying with requirements of BNQ 3624-120.
- .3 Rain pipes, with a diameter greater than 900 mm, are of class IV reinforced concrete conforming to the requirements of standard BNQ 2622-126.
- .4 HDPE pipes are made of a polyethylene resin conforming to the 324420C PE properties classification, as defined by ASTM D3350.
- .5 All pipelines of the same project must be of the same supplier.

## **2.2 DRAIN**

- .1 The drains are in high-density polyethylene with a minimum stiffness of 300 kPa with a type 6 geotextile membrane from the Ministère des Transports, de la Mobilité durable et de l'Électrification des transports. The overlap of membranes must be 300 mm minimum. The filter floor consists of a 19-mm net crushed stone.

## **2.3 DRAINAGE BOX CULVERT**

- .1 Provide a set of valves for directing the juices or water from the handling slab to the mixing pit or to storm drain.

## **2.4 CONNECTIONS**

- .1 Fittings shall be of the same material and category as the main pipelines and must come from the same supplier. HDPE pipes are connected to concrete structures. The connection is made using a monolithic HDPE adapter, as required by standard BNQ 1809-300/2018, the exterior of which is fitted with a smooth wall and the end of a double bell integrated gasket clips. PVC or urethane adapters are not permitted.

## **2.5 GRANULAR MATERIAL**

- .1 Bedding materials and coating pipes:
  - .1 Materials of type MG 20b or CG 14 conforming, by type of aggregate used, to the requirements of standard BNQ 2560-114-II/2014, part II (MG 20b) or part III (GC 14), compacted to 90% of modified Proctor.
  - .2 Where water is present, the material used shall be of the 20 mm net stone placed on a membrane and covered with a membrane. The membrane must be of type VI of the Ministère des Transports, de la Mobilité durable et de l'Électrification des transports. This work must be approved by the Supervisor.
- .2 Coating material around the structures:

- .1 CG 14-type materials conforming to the requirements of BNQ 2560-114-III/2014 compacted to 90% of modified Proctor.

### **Part 3 Execution**

#### **3.1 GENERAL**

- .1 The Contractor shall perform the work in accordance with the technical specifications of standard BNQ 1809-300/2018.
- .2 The Contractor shall use a working method to preserve the physical integrity of the pipe at all installation stages (trenching, assembly, backfill and compaction).

#### **3.2 SITE CLEANING, TESTS AND INSPECTIONS**

- .1 The Contractor shall have an independent specialized firm approved by the Supervisor to carry out cleaning, deformation tests and TV inspection of the pipes, accessories and sewer manholes before the first layer of paving on complete sections, either manhole to manhole. In addition, the exfiltration tests must be carried out on pipes, fittings and sanitary sewer manholes on complete sections, or manhole to manhole. The Contractor shall notify the Supervisor at least two days prior to carrying out the tests so that they are done in the presence of the Supervisor.
- .2 The firm engaged to carry out these tests must be qualified and trained to work according to the latest version of CERIU/NASSCO (SCAP & MACP). The data and information contained in the report must be based and carried out using the CERIU/NASSCO (Scap & MACP) method.
- .3 The cleaning of network and the exfiltration tests on pipes, accessories and sewer manholes must be carried out according to the requirements of standard BNQ 1809-300/2018.
- .4 The deformation tests on PVC pipes shall be carried out in accordance with the requirements of article 11.6 of standard BNQ 1809-300/2018.
- .5 Before the provisional acceptance of work and before the final acceptance of work, the Contractor shall perform the cleaning of the network (including conduits, manhole and sumps) and a TV inspection of the pipelines and verification of deformations without any measure of exfiltration on complete sections, or manhole to manhole.
- .6 For all such tests and for TV inspections, the Contractor shall provide a summary report, 2 weeks prior to provisional acceptance.
- .7 If, during a TV inspection, a defect or breakage of rating 2 or greater than PACP is detected, a repair or change of the section shall be carried out in accordance with the method approved by the Supervisor. A complete inspection of the section (manhole to manhole) must be carried out and a report must be produced.
- .8 If, during a TV inspection, a rubber gasket is visibly poorly positioned, the section shall be corrected by digging. A complete inspection of the section (manhole to manhole) must be carried out and a report must be produced.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Divisions 01, 06 à 09, 23, 31 à 33, 40, A et D

**1.2 SUMMARY**

- .1 This section presents the functional requirements of the elements surrounding the biogas process.
- .2 It shall be used in conjunction with the conceptual plans provided and sections of the applicable divisions to carry out the detailed manufacturing and construction plans.

**1.3 REFERENCE STANDARDS**

- .1 Refer to the related requirements.

**1.4 PERFORMANCE**

- .1 The purpose of the contract is a complete, proven, finalized and ready installation for an effective operation. This also includes all items, parts, equipment, tools, services, labor, accessories, etc., which are not specifically indicated in specifications or drawings, but which are required for proper operation.
- .2 Plans and sketches provided are indicative, they define the result to be obtained. They indicate schematically the approximate location of devices and the connection piping. In no case should it be used as erection drawings. The responsibility for the preparation of these drawings rest with Contractor.
- .3 All appliances shall be installed according to manufacturer's recommendations.

**1.5 CONCRETE WORK AND STRUCTURE**

- .1 Mixing pit.

The mixing pit has the function of receiving all the inputs, allowing them to be crushed and then forwarded to the bioreactor.

This structure must:

- .1 Total and net volume, refer to drawing R082975.001-M05-PN.
- .2 Have at least 75% of its useful depth underground.
- .3 Be covered and be rain-proof.
- .4 Allow the automatic hydraulic door to be installed.
- .5 To allow the installation of equipment and instruments as required by the specifications and shown in conceptual plans.
- .6 Allow the Macerator pump to be installed on the cover of the pit.
- .7 Allow the possible installation of a filter (filter excluded from the contract) for the attenuation of odors.

- .8 Be provided with a floor heating circuit and a heating circuit in the walls allowing input heating as described in section D3020 for details on the heat source.
- .9 Allow manure to be fed via a 150-mm diameter pipe.
- .10 Allow fresh water to be supplied via a pipe of at least 25 mm.
- .2 Biogas Blower Slab:
  - .1 The slab shall meet the requirements of the selected equipment see workshop drawings provided with tender.
- .3 Flare slab:
  - .1 The slab shall meet the requirements of the selected equipment see Workshop drawings provided with tender.
- .4 Condenser Slab:
  - .1 The slab will have to meet the dimensional requirements of the selected equipment see with the person in charge of section D3020.
- .5 Input handling Slab:
  - .1 The handling slab is used to receive the organic material from the farm or external institution to pre-treat if necessary and to direct it to the mixing pit without contact with the surrounding soil.

This structure must:

- .1 Allow the following equipment to travel and dump their contents into the mixing pit via the main door.
  - .1 dump trailer Lépine 712D.
  - .2 John Deere 6150M tractor with John Deere 640R type charger.
- .2 Collect leaked solid and liquid residues from the transport equipment and allow them to be transported to a gutter before being directed to the mixing pit.
- .3 Receive up to 4 tons of organic matter per day delivered by dump truck.
- .4 Allow manipulation by a tractor with a John Deere 640R type charger.
- .5 Meet all the design criteria listed in this specification.
- .6 Allow for the eventual installation (excluded from the contract) of a fixed organic material shredder as described below.
- .7 In addition to performing all these functions, the structure must have a minimum projected surface of  $120 \text{ m}^2$ .
- .6 Fixed organic material grinder (description for foundation design only):
  - .1 Wheelbase of the equipment (center to center distance between end plates):
    - .1 Length (East-west): 2.5 m;
    - .2 Width (north-South): 1.5 m.
  - .2 Height of equipment (top of feed hopper): 3.5 m.
  - .3 Total weight distributed equally between the turntables (4): 3500 Kg.
  - .4 Electric crusher power: 45 KW.

**1.6 MIXING PIT DOOR**

- .1 Refer to the R. 082975.001-M05-PN plan and the 41 50 10 retail specifications.

**1.7 ORGANIC SLUDGE PIPING NETWORK**

- .1 The organic mud network (slurry, manure, food residue, etc.) allows the transfer of farm inputs and ground food residues between the existing pre-pit, the existing storage pit, the mixing pit and the bioreactor.
- .2 The pig manure shall be able to be transferred to the existing storage pit or to the mixing pit. The direction to be taken by the manure will be determined by the operator, no automation is required.
- .3 The organic sludge contained in the mixing pit shall be able of being directed either towards the bioreactor or directly to the existing storage pit. The design of the bioreactor allows the sludge to be routed to different heights in the bioreactor.
- .4 Macerator and transfer pump, refer to retail specification 43 26 10.
- .5 Organic mud piping, refer to specification 40 23 44 and drawings R.082975.001-M01-PN and R.082975.001-M03-PN.

**1.8 MANURE PIPING NETWORK**

- .1 A deviation must be made on the PVC line between the pig complex's temporary manure storage and the manure storage pit. The deviation must be used to direct the manure pumped from the existing temporary manure storage to the manure storage tank or to the new mixing pit. The operator shall be able to direct the manure to either of the pits via a set of at most two valves positioned ergonomically above the ground level. Refer to Section 33 05 16, 33 31 13 and 33 34 00.

**1.9 BIOGAS PIPING NETWORK**

- .1 The biogas network shall allow the biogas from the gas holder to be routed to the blower, the dehumidification field, the flare and the biogas boiler as shown in plan R. 082975.001-M02 to M03. Refer to Section 40 21 13 for biogas piping.
- .2 The biogas blower is provided by the Departmental Representative, see Workshop drawing attached to this specification.

**Part 2 Product****2.1 NOT APPLICABLE****Part 3 Execution****3.1 OPERATION SEQUENCE**

This section presents the operation sequences to be provided for the whole operation of the process.

This operation sequence must be revised and completed with the Departmental Representative no later than 8 weeks before the start-up.

- .1 Bioreactor:
  - .1 All functions available at the control panel provided with the bioreactor must be accessible and changeable from the main interface.
  - .2 Among other things, the user must be able to adjust:
    - .1 The parameters of duration, frequency and agitation intensity shall be changeable by the operator.
    - .2 Which heating coils should be used to maintain set temperature.
  - .3 On high-level liquid detection of the bioreactor, the PP-01 pump is set to OFF and the exhaust system is switched on until it reaches an acceptable level.

## Alarms:

Type	Name	Level	Local	Central
LAL	Bioreactor fluid level low	ND	x	
LAH	Bioreactor fluid level high	ND	x	
LAHH	Bioreactor fluid level very high	ND	x	x
PAH	Gas holder pressure high	ND	x	x
PAL	Gas holder pressure low	ND	x	x
LAH	Gas holder fluid high	ND	x	
TAH	Bioreactor temperature high	ND	x	
TAL	Bioreactor temperature low	ND	x	x
TALL	Bioreactor temperature very low	ND	x	x
	Fault of the gas holder blower			
	Fault of the agitator or the exhaust pump		x	x

- .2 Biogas Network (Gas holder, boiler, condenser, purification and flare).
 

The controller must maximise the use of biogas by prioritizing the supply of the boiler and must limit the use of flare to emergency situations.

  - .1 The flare must be in operation on high pressure detection in the biogas network according to the manufacturer's recommendation.
  - .2 The H<sub>2</sub>S treatment system (air injection and r chloride) is self-contained and is monitored by the bioreactor controller.
  - .3 The biogas cooling system is autonomous and its operation is carried out by its own controller.
  - .4 In normal operation:
    - .1 The biogas blower maintains a pressure of 14 kpa at the inlet of the boiler and flare.
    - .2 The boiler has a signal to operate.
    - .3 When the gas holder reaches 90% of its capacity, the controller gives the condenser permission to turn on. Permission is withdrawn when the gas holder reaches a capacity of 50%.

- .5 The operator must have access to a "maintenance" mode to allow interviews on the glycol network. In maintenance Mode:
- .1 The biogas blower maintains a pressure of 14 Kpa at the inlet of the flare.
  - .2 Permission to operate is removed from the boiler.
  - .3 An operating permission is given to the flare and blower to maintain the level of the gas holder at 50%.
- .6 Alarms:

Type	Name	Level	Local	Central
FAHH	Flow of biogas very high	ND	x	x
PAH	Gas holder high pressure	ND	x	x
LAH	Gas holder low pressure	ND	x	
	Fault of the gas holder, the condenser, the purification system and the drying of the biogas or the flare.		x	x

- .3 Heating system, boiler, heat users and condenser.
- The control of the heating system must be done to prioritize the different users of heat.
- .1 The operator shall be able to choose which of the heating coils shall be used for heating the inputs in the mixing pit.
  - .2 The operator must be able to choose which of the heating pumps is to be used.
  - .3 The operator must be able to put all heat users in "maintenance" mode. When in maintenance mode, the controller does not allow glycol to be assigned to the selected users.
  - .4 The Controller prioritizes heat users by sending heat only when the higher user in the priority list has reached its setpoint or is in maintenance mode. Users must be served in the following order:
    - .1 Bioreactor.
    - .2 Control Building (serpentines – unless temperature under 12 C, then it becomes priority no 01).
    - .3 Mixing Pit.
    - .4 Swine complex (future).
    - .5 Condenser.
  - .5 The boiler receives permission to use natural gas only if the following two conditions are met:
    - .1 The level of the gas holder is less than 20%.
    - .2 The bioreactor, the control building or/and the mixing pit have a need in heat.
  - .6 Permission to use natural gas is withdrawn when the gas holder reaches a level of 50%.

.7 Alarms:

Type	Name	Level	Local	Central
	Fault of pump, fault of boiler, fault of actuator of valve.		x	x

.4 Transfer of the pit to the bioreactor:

- .1 The filling and control of the inputs in the mixing pit is done manually by the operator. The operator can add an alarm to be notified when the level of the mixing pit reaches a threshold that it defines.
- .2 The mixture and preparation of the recipe is done via local controls. The interface allows to start the pump and program a timed shutdown.
- .3 At the time of transfer from the pit to the bioreactor, the automatic valve at pump discharge is opened and pump PP-01 is put into automatic mode.
- .4 The Controller ensures that the bioreactor is filled with inputs and that the digestate is emptied simultaneously to maintain the level of operation of the bioreactor  $\pm 5\%$ .
- .5 The transfer stops when the level of the mixing pit reaches the low-level alarm value. The pump is then stopped and the automatic valve at the pump discharge is closed.

.6 Alarms:

Type	Name	Level	Local	Central
LAH	Level of the pit mixture high	ND	x	
LAHH	Level of the pit mixture very high	ND	x	x
	Lack of pump		x	x

.5 Control heating and ventilation of control building:

- .1 See Section D3000.

**END OF SECTION**

**1.1 SUMMARY**

- .1 Contents of the section:  
Materials, equipment and installation methods associated with biogas piping, accessories and other components of such networks.

**1.2 RELATED REQUIREMENTS**

- .1 Divisions 01 and 40.

**1.3 REFERENCE STANDARDS**

- .1 All work and equipment provided shall conform to the codes and standards mentioned in the general technical documents and in the plans and other documents attached to the specifications.
- .2 If conflicting information or differences between the various documents arise, the Contractor must seek clarification from the Client's representative. The Contractor must obtain a written decision from the Client's representative prior to the beginning of the work on the part referred.
- .3 American Society of Mechanical Engineers (ASME).
- .4 American Society for Testing and Materials International (ASTM).
- .5 Underwriter Laboratory of Canada (ULC).
- .6 Manufacturers Standardization Society (MSS) – Standard Practice SP-58 and SP-59
- .7 Canadian Standards Association (CSA)/CSA :
  - .1 ANSI/CSA b 149.6-15 Code for the production and use of digestion gases, landfill gas and biogas.
- .8 National Building Code of Canada (NBCC).
- .9 National Research Council Canada (CNRC)
- .10 National Plumbing Code-Canada 2015 (NRC).
- .11 Quebec Occupational Health and Safety Act (CNESST).

**1.4 PERFORMANCE**

- .1 Biogas piping systems must be designed and their components must be installed in accordance with the requirements of this specification.
- .2 The networks shall be designed to be able to carry the volume of biogas provided for by the process equipment. The slope of the horizontal exhaust pipe must be at least 2% in the direction of flow.
- .3 Piping must be installed in an orderly manner, depending on the established slopes.
- .4 Apparent above-ground piping shall be routed parallel to adjacent building walls and components.

- .5 All suspensions, brackets and additional steel shall be designed to meet all the static and service conditions to which the piping and equipment may be subjected. The media assemblies shall be so designed as to anticipate and control (subject to the requirements of the piping configuration) the free or expected movement due to the expansion and thermal contraction of the piping and equipment which is attached. Do not use suspensions where vibrations in the piping are provided.
- .6 In addition to supporting the weight of the piping, the selected piping support system must also perform the following functions:
  - Protect fatigue-sensitive equipment such as pumps, turbines and compressors.
  - Check the movement of the piping.
  - Maintain axial alignment.
  - Ensure proper operation of the expansion loops and the misalignment.
  - Prevent excessive expansion of expansion joints and decoupling of flexible couplings.
  - Avoid excessive fatigue and/or exaggerated stress at reduced diameter piping sections.
  - Protect sections of piping that may suffer from undue strain.
  - Insulate mechanical vibrations.
  - Avoid resonant pipe lengths.
  - Reduce effects due to transitional dynamic loads.
  - Prevent gravitational creep from pipes;
  - Ensure predictability of the piping system under normal and abnormal operating conditions.

## **1.5 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.
- .2 Data sheets:
  - .1 Submit the required technical data sheets as well as the manufacturer's specifications and documentation concerning the products.
  - .2 Submit material safety data sheets required under the Workplace Hazardous Materials Information System (WHMIS). The data sheets must indicate the VOC emission rate of the adhesives and solvents, during the application of these products and the period of cure.
- .3 Workshop drawings:
  - .1 Submit the required workshop drawings, which must indicate the layout of work and the following information:
    - .1 The location of the horizontal and vertical piping, as well as the level dimensions and details of connections.
    - .2 Relevant details relating to the connection of equipment, such as pumps and tanks.

- .3 Workshop drawings of components and accessories such as: valves, gaskets, pipe support, etc.
- .4 Also submit a list of the different devices and elements, indicating the location of each.
- .4 Test reports: Submit the reports of tests issued by recognised independent laboratories certifying that the products, materials and equipment meet the requirements for physical characteristics and performance criteria.
- .5 Certificates: Submit documents signed by the manufacturer certifying that the products, materials and equipment meet the requirements for physical characteristics and performance criteria.
- .6 Instructions:
  - .1 Submit the manufacturer's instructions relating to the installation of the equipment and appliances;
  - .2 Submit the manufacturer's instructions concerning the commissioning of materials and equipment covered by this section.
- .7 Documents/elements to hand over for the completion of work: provide the required technical data sheets and maintenance records, and attach them to the manual referred to in section 01 78 00 – Closeout Submittals.

## **1.6 TRANSPORTATION, STORAGE AND HANDLING**

- .1 Refer to Section 01 61 00.

## **1.7 GUARANTEE**

- .1 See administrative terms.

## **Part 2 Product**

Piping and accessories for biogas must comply with the ANSI/CSA B 149.6-15 code for the production and use of digestion gases, landfill gas and biogas.

## **2.1 MATERIALS/EQUIPMENT**

- .1 Piping installed above ground:
  - .1 Pipe:
    - .1 ½ ''-30 '' NPS:  
Material: Stainless steel 316 (316l if welded on site), ASME b 36.19 m  
Caliber 10S Min;  
Prep. of the Ext.: Butt welding, ASME B 16.9 and MSS SP-43  
Thick. of wall: 10S caliber.
  - .2 Flanges:
    - .1 Soldering and weld-on type, of type bushel on welded collar or ANSI weld-on type with flat face in stainless steel class 150, ASME b 16.5.

- .3 Connection:
  - .1 The 12.7 to 50.8 mm NPS size pipes can be provided with threaded fittings. The pipe must be of 40S standardized number at least, welded or seamless, ASME b 36.19M.  
Fittings must be class 3000 with threaded ends, ASME B16.
- .4 Bolt and nuts:
  - .1 All Dimensions:  
Material: Stainless steel. 316 ASME B 18.2.1.  
Type: Unified threads in inches, UNC.  
Class 2 fitted with hex nuts. Heavy.
- .5 Gaskets:
  - .1 All gaskets must be neoprene at least 3.17 mm thick with a type "A" Shore hardness of at least 40 or other material that can withstand the action of biogas.
- .6 Manual Shutoff Valve:
  - .1 Tapered plug valve, eccentric type, lubricated (CGA 3.11), ball valve or high-performance butterfly type (CGA 3.16 and API 607). The valve must be lockable:  
Less than 2 ' ' of diam.  
Material: Ductile iron, SS 316 ball, Teflon seats.  
NOTE: Eccentric-type non-lubricated plug valves should not be used outdoors or in a surrounding environment where they may be subjected to frost.
- .2 Piping under the ground:
  - .1 Pipe:
    - .1 Material: Polyethylene or reinforced thermosetting resin using glass fibre satisfactory to CSA B 137.4 or ASTM D2996.  
Conn. : In accordance with CSA Z662.  
Thick. Wall: Minimum wall thickness conforming to CSA B 137.4 Series 60.  
NOTES:
      - .1 Plastic pipes and fittings must be installed outdoors only.
      - .2 Plastic pipes must be protected from frost and corrosion.
      - .3 Plastic pipes must be installed in accordance with the manufacturer's approved installation instructions.
      - .4 ASTM F2619-compliant polyethylene piping or manufactured from the compound prescribed in CSA B 137.4, item 4.1.1, may be used in installations where the pressure is negative.
      - .5 The polyethylene piping used in installations where the pressure is positive, shall conform to ASTM D2513.
      - .6 Calculations relating to the installation of plastic pipes shall consider the expansion and removal of materials in accordance with the manufacturer's instructions.

- .7 Plastic hoses shall not be exposed to external or internal temperatures exceeding their nominal temperature/pressure.
- .2 Gaskets:
  - .1 All gaskets must be neoprene at least 3.17 mm thick with a type "A" Shore hardness of at least 40 or other material that can withstand the action of biogas.
- .3 Bolt and nuts:
  - .1 All Dimensions:  
Material: Stainless steel. 316 ASME B 18.2.1.  
Type: Unified threads in inches, UNC.  
Class 2 fitted with hex nuts. Heavy.

## 2.2 **INSTALLATION**

- .1 General information:
  - .1 Manufacture and install all aboveground and buried piping and accessories as shown in drawings and in accordance with the requirements of this specification.
  - .2 Install the buried piping at a depth below the frost line, unless the piping is protected. Against the frost.
  - .3 Provide and install the supports.
  - .4 Perform the required cleaning and testing.
  - .5 Identify the line number of the new piping installed.

## 2.3 **QUALITY CONTROL ON SITE**

- .1 Inspection of welded:
  - .1 The Contractor shall schedule and perform the inspections of the welds (visual, X-rays, MT, PT, etc.) as the work progresses.
  - .2 At the end of the work, a copy of all laboratory and inspection test results shall be given to the Owner's representative in the project binder.
  - .3 All welds deemed suspicious by the Owner's representative may be inspected by a third party to ensure that the integrity and quality of the welds are not affected. The Contractor shall provide access to the Owner's representative and/or his/her inspector at any time.
  - .4 The Contractor shall repair all work rejected because of a test indicating that a weld does not comply with the minimum code requirements. Repairs must be inspected to ensure that no anomalies are present.
  - .5 After being notified by Client, the Contractor has a period of twenty-four (24) hours to remove from the site any part that does not meet the requirements of the contract.

## 2.4 **DRAINING, CLEANING, TESTING AND COMMISSIONING**

- .1 The Contractor shall perform and document, in addition to tests and verifications prescribed according to the rules of good practice and practices, the tests requested in the presence of a representative of the Owner.

- .2 Inspections and testing of fabricated and installed piping shall be carried out in accordance with specifications and any other contractual documents such as isometric drawings, pipelines registers, etc.
- .3 All steel piping shall be inspected in accordance with the requirements of ASME B 31.3 during manufacture and during construction.
- .4 **HYDROSTATIC TEST:**
  - .1 All piping shall undergo a hydrostatic test in accordance with code ASME B 31.3 and DEP 74.00.10.10 – Shop and Field Pressure testing of Piping Systems. (For steel piping). The Contractor is responsible for preparing and installing any equipment and accessories required to perform the hydrostatic testing of piping.
  - .2 The test pressure shall be 1.5 X the design pressure and shall be maintained without decreasing for 30 minutes and for any additional period that may be required to carry out the inspection to determine if there are leaks. Any observed leaks must be repaired.
  - .3 Immediately after each hydrostatic test, the piping or section shall be drained and completely dried.
  - .4 No test shall be carried out through mechanical equipment or instruments. Full flanges must be installed on each of the equipment before each test and the equipment must be temporarily removed or bypassed.

**END OF SECTION**

**1.1 SUMMARY**

- .1 Contents of the section:
  - .1 Materials, equipment and installation methods associated with piping for process sludge, including insulating, accessories and other components of such networks.
  - .2 Insulation for piping.

**1.2 RELATED REQUIREMENTS**

- .1 Divisions 01 and 40.

**1.3 REFERENCE STANDARDS**

- .1 All work and equipment provided shall conform to the codes and standards mentioned in General Technical Documents and in the plans and other documents attached to the specifications.
- .2 If conflicting information or differences between the various documents arise, the Contractor must seek clarification from the Client's representative. The Contractor must obtain a written decision from the Client's representative prior to the beginning of the work on the part referred.
- .3 American Society of Mechanical Engineers (ASME):
  - .1 ASME B31.3 Process Piping;
  - .2 ASME B16.5 Steel Pipe Flanges and Flanged Fittings;
  - .3 ASME B16.9 Factory Made Wrought Butt welding Fittings;
  - .4 ASME B31.1 Power Piping;
  - .5 ASME B31.9 Building Services Piping;
  - .6 ASME BPVC Section V Non-destructive Examination;
  - .7 ASME BPVC Section IV Welding and Brazing Qualifications.
- .4 American Society for Testing and Materials International (ASTM):
  - .1 ASTM A53 pipe, steel, black and zinc-coated hot galvanizing, welded and seamless.
  - .2 ASTM A183 carbon steel bar nuts and bolts.
  - .3 ASTM A234 Standard specification for pipe ends or forged carbon steel and alloy steel.
  - .4 ASTM A449 hardened and tempered steel studs and bolts;
  - .5 ASTM A536 cast pieces of spheroidal graphite.
  - .6 ASTM F1476 Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
- .5 American Water Works Association :
  - .1 AWWA C-060 Grooved and shoulder seals.
- .6 Underwriter Laboratory of Canada (ULC).
- .7 Manufacturers Standardization Society (MSS) – Standard Practice SP-58 and SP-59

- .8 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB 51-GP-52M-89, vapor-proof casing and coating material for thermal insulation of pipes, pipelines and equipment.
- .9 Canadian Standards Association (CSA)/CSA:
  - .1 ANSI/CSA B149.6-15 Code for digester gas, landfill gas, and biogas generation and utilisation.
- .10 National Building Code of Canada (CNBC).
- .11 National Research Council of Canada (NRC):
  - .1 National Plumbing Code-Canada 2015 (NOC).
- .12 Quebec Occupational Health and Safety Act (CNESST).

#### 1.4 PERFORMANCE REQUIREMENTS

- .1 Process sludge piping systems shall be designed and their components shall be installed in accordance with the requirements of this specification.
- .2 Networks shall be designed to be able of conveying the volume of sludge provided by the process equipment. The slope of the horizontal exhaust pipe must be at least 2% in the direction of flow.
- .3 Piping must be installed in an orderly manner, depending on the established slopes.
- .4 Apparent over-ground piping shall be routed parallel to adjacent walls and building elements.
- .5 All suspensions, brackets and additional steel shall be designed to meet all the static and service conditions to which the piping and equipment may be subjected. The media assemblies shall be so designed as to anticipate and control (subject to the requirements of the piping configuration) free or expected movement due to the expansion and thermal contraction of the piping and equipment which is attached. Do not use suspensions where vibrations in the piping are provided.
- .6 In addition to supporting the weight of the piping, the selected piping support system must also perform the following functions:
  - .1 Protect fatigue-sensitive equipment such as pumps, turbines and compressors.
  - .2 Control the movement of the piping.
  - .3 Maintain axial alignment.
  - .4 Ensure proper operation of the expansion loops and off-axis.
  - .5 Prevent excessive expansion of expansion joints and decoupling of flexible connectors.
  - .6 Avoid excessive fatigue and/or exaggerated stress at the reduced diameter piping sections.
  - .7 Protect sections of piping that may suffer from undue stress.
  - .8 Insulate mechanical vibrations.
  - .9 Avoid resonant pipe lengths.
  - .10 Reduce effects due to transient dynamic loads.
  - .11 Prevent gravitational creep from pipes.

- .12 Ensure predictability of the piping system under normal and abnormal operating conditions.

## **1.5 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.
- .2 Data sheets:
  - .1 Submit the required technical data sheets as well as the manufacturer's specifications and documentation concerning the products.
  - .2 Submit material safety data sheets required under the Workplace Hazardous Materials Information System (WHMIS). The data sheets must indicate the VOC emission rate of the adhesives and solvents, during the application of these products and the period of cure.
- .3 Workshop drawings:
  - .1 Submit the required workshop drawings, which must indicate the layout of work and the following information:
    - .1 The location of the horizontal and vertical piping, as well as the level dimensions and details of connections.
    - .2 Relevant details relating to the connection of equipment, such as pumps and tanks.
    - .3 Workshop drawings of components and accessories such as: valves, gaskets, pipe support, etc.
  - .2 Also submit a list of the different devices and elements, indicating the location of each.
- .4 Test reports: Submit the reports of tests issued by recognised independent laboratories certifying that the products, materials and equipment meet the requirements for physical characteristics and performance criteria.
- .5 Certificates: Submit documents signed by the manufacturer certifying that the products, materials and equipment meet the requirements for physical characteristics and performance criteria.
- .6 Instructions:
  - .1 Submit the manufacturer's instructions relating to the installation of the equipment and appliances;
  - .2 Submit the manufacturer's instructions concerning the commissioning of materials and equipment covered by this section.
- .7 Documents/elements to hand over for the completion of work: provide the required technical data sheets and maintenance records, and attach them to the manual referred to in section 01 78 00 – Closeout Submittals.

## **1.6 TRANSPORTATION, STORAGE AND HANDLING**

- .1 Refer to Section 01 61 00.

**1.7 GUARANTEE**

- .1 See administrative terms.

**Part 2 Product**

Piping and accessories for biogas must comply with the ANSI/CSA B 149.6-15 code for the production and use of digestion gases, landfill gas and biogas.

**2.1 MATERIALS/EQUIPMENT**

- .1 Piping installed above ground:
  - .1 Pipe:
    - .1 Less than 2" diam. (See note 4 & 6):  
Material: Carbon steel, ERW ASTM A53, Gr. B Type E.  
Prep. of the Ext.: threaded or beveled end.  
Thick. Of wall: Standard caliber.
    - .2 2.5"-18" (see note 5):  
Material: Carbon steel, ERW ASTM A53, Gr. B Type E.  
Prep. of the Ext.: Bevel End.  
Thick of wall: Standard caliber.
    - .3 More than 20" (see note 5):  
Material: carbon-made steel, EFW, ASTM A139, Gr. A Type E.  
Prep. of the Ext.: Bevel End.  
Thick of wall: Standard caliber.
  - .2 Nipples:
    - .1 Less than 2" diam. (see note 6):  
Material: Carbon steel, ERW ASTM A53, Gr. B Type E;  
Prep. of the Ext.: Threaded or beveled end;  
Thick. of wall: Extra strong caliber.
  - .3 Fitting:
    - .1 Less than 2" diam. (See Note 4 & 6):  
Material: Malleable iron ASTM A197 or ASTM A47 Gr. 32510, ASME B16.3;  
Conn.: Threaded;  
Class: 150.
    - .2 Less than 2" diam. (See Note 6):  
Material: Forged steel ASTM A105, ASME b 16.11;  
Conn.: Socket weld;  
Class: 3000.
    - .3 2.5"-24" diam.:  
Material: Carbon steel ASTM A234 Gr. B, ASME b 16.9;  
Conn.: Butt weld;

- Thick. Of wall: Standard caliber, Extra strong (under the structure).
- .4 30" of diam and more:  
Material: Manufactured carbon steel ASTM A139 Gr. A, Standard design 4S-01.02.  
Conn.: Butt weld.  
Thick. Wall: 0.375, 0.500 (under structure).
- .4 Pipe fitting:  
.1 2.5" of diam. And more (see Note 12):  
Material: Steel coupling c/a standard fittings and gaskets  
Dresser Style 38 or equivalent approved.
- .5 Unions:  
.1 2" from diam. and less:  
Material: Ductile iron ASTM A197 or ASTM A47 Gr. 32510, ASME B 16.39;  
Conn.: Threaded, iron, union connection;  
Class: 150.
- .6 Threadolets & Sockolets dimension reducer:  
.1 Less than 2" diam. (See Note 6):  
Material: Forged steel ASTM A105, ASME B16.11.  
Class: 3000.
- .7 Weldolets dimension Reducer:  
.1 2.5" of diam. and more:  
Material: Forged steel ASTM A105, ASME B16.9;  
Thick. Of wall: Standard caliber.
- .8 Flanges:  
.1 2.5" of diam. and more:  
Material: Forged steel ASTM A105, ASME B16.5;  
Thick. Of wall: Standard caliber.  
.2 30" from diam. and more (see Note 10):  
Material: ASTM A-36 manufactured steel plate, Standard design 4S-01.02, Table ' B ' ;  
Conn. Welded  
Type: Flat-faced breakthrough;  
Class: 150.
- .9 Bolt and nuts:  
.1 All dimensions:  
Material: ASTM A307 Gr. B carbon steel for bolts, ASTM A563 Gr. A for Nuts, ASME B 1.1, ASME B 18.2.1 & B 18.2.2;  
Type: Unified threads in inches, UNC;  
Class 2 fitted with hex nuts. Heavy Gaskets:

- .10 Gaskets:
  - .1 Material: non-metal, asbestos-free ASME B16.21:  
1/16" Thickness (24" & Less) Garlock 3400 or approved;  
1/8". The same thickness (30" & more);  
Type: flat ring sealing ring;  
Class: 150.
- .11 Valves:
  - .1 Ball:  
Less than 2" of diam.;  
Material: Ductile iron, SS 316 ball, Teflon seats;  
Conn. Threaded  
Class: 150;
  - .2 Gate:  
Less than 2" of diam.;  
Material: ductile iron;  
Conn. Threaded  
Class: 125;  
2.5" and more than diam. (see note 8);  
Material: ductile iron;  
Conn.: to Flange;  
Class: 125.
  - .3 Check Valve:  
Less than 2" of diam.;  
Material: malleable, swinging cast iron;  
Conn. Threaded  
Class: 300;  
3"-24";  
Material: 316 SS body, disc and trim;  
Type: Full-bore tilting disc;  
Conn. : to Flange;  
Class: 150.

NOTES:

- .1 -
- .2 For the above installation, pipes and fittings must be cleaned and painted in accordance with the project paint specifications or the specifications of construction drawings.  
Unless otherwise stated on the construction plans, pipes shall be supported in accordance with standard design.
- .3 -
- .4 Includes the use of pressed nipples in any ends combination within the limits of this class card.
- .5 Pipes manufactured to stricter standards (L5, etc.) but rejected due to non-compliance with these standards may be acceptable for the supply and distribution of groundwater. (surplus production in the oil and gas industry is often an economic source.) Resize the tips of pipes as needed. Such a pipe must be approved by the area project engineer.
- .6 Joints in pipes and fittings 2 in. and less and installed underground must be welded together. Threaded connections are acceptable for surface installation.
- .7 -
- .8 Butterfly valves directly buried with a suitable gearmotor, with 2 in. nut and valve box shall be standard for underground installations, unless otherwise indicated on the drawings.
- .9 Butterfly valves must be installed with the rod in the horizontal position and the lower part of the disc open in the direction of water flow.
- .10 When used for the installation of butterfly valves, the inner diameter of the flanges must be the same as the standard carbon steel pipe, to ensure that the integrated seal/gasket of the butterfly valves is well-supported.
- .11 Valves with resilient guillotine must be bidirectional.
- .12 Couplings shall be provided to correspond to the E. D. of pipe ends within the limits of the tolerances specified by the coupling manufacturer. If such fittings are not available, the ends of the pipes must be resized.

- .2 Piping installed above ground (Victaulic):
  - .1 Materials:
    - .1 Grooved pipes: Carbon steel, Schedule 40, A53B/A106B compliant. Rolled Groove Type "OGS".
    - .2 Collars:
      - .1 Mechanical collars: conforming to the requirements of ASTM F1476-07 (2013).
        - .1 Body: Ductile iron according to ASTM A536, grade 65-45-12:
          - .1 Coating: orange enamel or hot-dip galvanized.
      - .2 Gaskets: Synthetic triple-sealing elastomer complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
        - .1 Temperature range: EPDM grade E-30oF (-34oC) to + 230oF (+ 110oC) or EPDM grade EHP-30oF (-34oC) to + 250oF (+ 121oC).
      - .3 Profile: "T" or "C".
    - .3 Bolts/Nuts:
      - .1 Bolts: Steel with domed head, conforming to the physical and chemical requirements of the ASTM A449 standard.
      - .2 Nuts: Hexagonal carbon steel, complying with the physical and chemical requirements of the ASTM A563 Grade B Standard.
      - .3 Electrolytic Coating: Zinc According to ASTM B622 ZN/FE3, Type III.
  - .2 Mechanical collars and flanges for the assembly of steel pipe:
    - .1 Rigid collars:
      - .1 Standard 1/2 "(DN15) to 12" (DN300) Rigid collar: "Ready to install" rigid mechanical collar for direct insertion installation, without dismantling:
        - .1 Body: Ductile iron According to ASTM A536, grade 65-45-12:
          - .1 Coating: Orange enamel or hot-dip galvanized.
        - .2 Sealing gaskets: Synthetic triple-sealing elastomer complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
          - .1 Temperature range: EPDM Grade EHP-30oF (-34oC) to + 250oF (+ 121oC).
          - .2 Profile: "T";

- .3 Bolts/Nuts:
- .1 Bolts: Steel with domed head, conforming to the physical and chemical requirements of the ASTM A449 standard.
  - .2 Nuts: In hexagonal carbon steel, complying with the physical and chemical requirements of the ASTM A563 Grade B Standard.
  - .3 Electrolytic Coating: Zinc According to ASTM B622 ZN/FE3 or ZN/FE5, Type III.
- .4 Maximum operating pressure steel:

	Schedule 10		Schedule 40	Schedule 80
½'' (DN15) à 2'' (DN50)	300 PSI (2068 kPa)		300 PSI (2068 kPa)	300 PSI (2068 kPa)
2'' (DN50)	750 PSI (5171 kPa)	2'' (DN50) à 5'' (DN125)	750 PSI (5170 kPa)	
2.5'' (DN65) à 4'' (DN100)	600 PSI (4135 kPa)	8'' (DN200)	600 PSI (4135 kPa)	
5'' (DN125) et 6'' (DN150)	500 PSI (3450 kPa)	10'' (DN250)	500 PSI (3450 kPa)	
8'' (DN200) et 10'' (DN250)	300 PSI (2068 kPa)	12'' (DN300)	400 PSI (2750 kPa)	
12'' (DN300)	200 PSI (1375 kPa)			

Minimum quality standard: such as Victaulic Style 107N QuickVic and QuickVic SD No. P10, No. P20, style P07, style P08, style P50.

- .2 Flexible collars:
- Vibration: For the attenuation of the transmission of noise by equipment (i.e. pumps, coolers, water tower, etc.) to the piping. Install three (3) flexible adhesives at the inlet and outlet of the equipment;
  - Expansion-contraction: for absorption of thermal dilation.
- .1 Flexible Collar 2'' (DN50) to 8'' (DN200): Flexible mechanical Collar "ready to install" for direct insertion installation, without dismantling:
- .1 Body: Ductile iron according to ASTM A536, grade 65-45-12:
    - .1 Coating: orange enamel.

- .2 Sealing gaskets: Synthetic triple-sealing elastomer complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
  - .1 Temperature range: EPDM Grade EHP-30oF (- 34oC) to + 250oF (+ 121oC).
- .3 Profile: "T".
- .4 Bolts/Nuts:
  - .1 Bolts: Steel with domed head, conforming to the physical and chemical requirements of the ASTM A449 standard.
  - .2 Nuts: In hexagonal carbon steel, complying with the physical and chemical requirements of the ASTM A563 Grade B Standard.
  - .3 Electrolytic Coating: Zinc According to ASTM B622 ZN/FE3, Type III.
- .5 Maximum operating pressure steel:

	Cédule 40
2'' (DN50) à 6'' (DN150)	1000 PSI (6900 kPa)
8'' (DN200)	800 PSI (5500 kPa)

Minimum quality standard: such as Victaulic Style 177N QuickVic.

- .2 Flexible Collar 10 "(DN250) and 12" (DN300): Flexible mechanical collar:
  - .1 Body: Ductile iron According to ASTM A536, grade 65-45-12:
    - .1 Coating: orange enamel.
  - .2 Sealing gaskets: Synthetic triple-sealing elastomer complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
    - .1 Temperature range: EPDM Grade E-30oF (- 34oC) to + 230oF (+ 110oC).
- .3 Profile: "C".
- .4 Bolts/Nuts:
  - .1 Bolts: Steel with domed head, conforming to the physical and chemical requirements of the ASTM A449 standard.
  - .2 Nuts: In hexagonal carbon steel, complying with the physical and chemical requirements of the ASTM A563 Grade B Standard.

.3 Electrolytic Coating: Zinc according to ASTM B622 ZN/FE3, Type III.

.5 Maximum operating pressure steel:

	Cédule 40
10'' (DN250) et 12'' (DN300)	800 PSI (5500 kPa)

Minimum quality standard: such as Victaulic Style 77.

.3 Mechanical collars and flanges for the assembly of steel pipe:  
 – Flanges: To be used to match ANSI class 125/150 and ANSI class 300 flanges.

.1 Flange 2 "(DN50) to 24" (DN600): Flange Adapter – Collet:

.1 Body: Ductile iron according to ASTM A536, grade 65-45-12:

.1 Coating: Black enamel or hot-dip galvanized.

.2 Sealing gaskets: Synthetic triple-sealing elastomer complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:

.1 Temperature range: EPDM Grade E-30oF (-34oC) to + 230oF (+ 110oC).

.3 Profile: "C";

.4 Maximum operating pressure standard steel:

ANSI Classe 125 / 150		ANSI Classe 300	
2'' (DN50) à 12'' (DN300)	300 PSI (2065 kPa)	2'' (DN50) à 12'' (DN300)	720 PSI (4960 kPa)

Minimum quality standard: such as Victaulic style 741 and style W741 ANSI class 125/150 and style 743 ANSI class 300.

.2 Flange 3/4 " (DN20) to 24" (DN600): Flange adapter – Nipple:

.1 Nipples: Groove Type "OGS" or "AGS".

.2 Flange:

.1 Class 125: Cast iron according to ANSI B 16.1.

.2 Class 150 and 300: Carbon steel according to ANSI B 16.5, raised or flat face.

.3 Coating: Unfinished, black enamel or hot dip galvanized.

## .3 Maximum operating pressure standard steel:

ANSI Classe 125	ANSI Classe 150	ANSI Classe 300
2'' (DN50) à 12'' (DN300)	200 PSI (1379 kPa)	285 PSI (1965 kPa)
		740 PSI (5102 kPa)

Minimum quality standard: such as Victaulic No. 41 ANSI Class 125, No. 45F, No. 45R and No. W45R, ANSI Class 150, No. 46e and No. 46R ANSI class 300.

## .3 Connections points:

- .1 2 "(DN50) x 1/2" (DN15) to 8 "(DN200) x 4" (DN100) Mechanical collar:
  - .1 Body:
    - .1 Segments: Ductile iron According to ASTM A536, grade 65-45-12;
    - .2 Coating: orange enamel or hot-dip galvanized.
  - .2 Output: Groove Type "OGS" or tapped.
  - .3 Sealing gaskets: Synthetic elastomer complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
    - .1 Temperature range: EPDM Grade E-30oF (-34oC) to + 230oF (+ 110oC).
  - .4 Bolts/Nuts:
    - .1 Bolts: Steel with domed, conforming to the physical and chemical requirements of the ASTM A449 standard.
    - .2 Nuts: In hexagonal carbon steel, complying with the physical and chemical requirements of the ASTM A563 Grade B Standard.
    - .3 Electrolytic Coating: Zinc According to ASTM B622 ZN/FE3, Type III.
  - .5 Steel maximum operating pressure: Schedule 10 and 40:500 PSI (3450 kPa).  
Minimum quality standard: such as Victaulic style 920, style 920N and style 920 cross.
- .2 Mechanical stitching without collar 4" (DN100) and more x 1/2 "(DN15) or 3/4" (DN20):
  - .1 Body: Ductile iron According to ASTM A536, grade 65-45-12:
    - .1 Coating: black enamel.
  - .2 Flange: Hot-rolled, stripped and oiled steel conforming to ASTM A569.
  - .3 Electrolytic Coating: Zinc according to ASTM B633.
  - .4 Output: tapped

- .5 Sealing gaskets: Synthetic triple-sealing elastomer complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
- .1 Temperature range: EPDM Grade E-30oF (-34oC) to + 230oF (+ 110oC).
- .6 Maximum operating pressure steel:

	Schedule 10	Schedule 40
4'' (DN100) à 8'' (DN200)		300 PSI (2065 kPa)
10'' (DN250) et plus	300 PSI (2065 kPa)	300 PSI (2065 kPa)

.4 Valves:

- .1 Ball Valves: 1/2" (DN15) to 2" (DN50) Ball Valves:
- .1 Body: Wrought brass ASTM B16.
- .2 Ticket and Rod: Brass ASTM B16, chrome plated.
- .3 Stem Seal cartridge: C36000 brass.
- .4 Bearing: Glass fibre and 316 stainless steel with TFE coating.
- .5 O-Ring: Elastomeric fluorescent.
- .6 Maximum operating pressure: 600 PSI (4135 kPa):  
Minimum quality standard: such as Victaulic series 722, series P89.
- .2 Butterfly Valves 2" (DN50) to 12" (DN300): Butterfly valves with two-way and end-of-line operation, with non-ejectable rod. The disc must be mounted on the rod without fasteners or pins. In addition, it must be offset from the axle to allow continuous contact with the 360o with the support surface when the valve is closed. The valve must be fitted with an ISO mounting flange:
- .1 Body: Ductile iron according to ASTM A536, grade 65-45-12.
- .2 Coating: black enamel.
- .3 End Face 2" (DN50) to 6" (DN150): Ductile iron according to ASTM A536, grade 65-45-12.
- .4 Seal 8" holding Device (DN200): Ductile iron according to ASTM A536, grade 65-45-12.
- .5 Disc: Ductile Iron According to ASTM A536, Grade 65-45-12, with chemical nickel plating according to ASTM B733.
- .6 Rods: Stainless steel 416 according to ASTM A582.
- .7 Stem Seal cartridge: C36000 brass.
- .8 Bearings: Glass Fibre and 316 stainless steel with TFE coating.
- .9 Stem retention disc: carbon steel.

- .10 Lever:
    - .1 2" (DN50) to 6" (DN150): 10 position lever, galvanized carbon steel fasteners and locking plate, continuously adjustable and lockable, with adjustment stop.
    - .2 8" (DN200): lockable lever, ASTM A536-compliant painted ductile iron, grade 65-45-12, with carbon steel locking plate and galvanized carbon steel fasteners.
    - .3 10" (DN250) and 12" (DN300): Reducer steering wheel.
  - .11 Seat and rod seals: Synthetic rubber conforms to ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
    - .1 Temperature range: EPDM Grade E-30oF (-34oC) to + 250oF (+ 121oC).
    - .2 Profile: "O".
  - .12 Maximum operating pressure stainless steel: 300 PSI (2065 kPa).  
Minimum quality standard: such as Victaulic series 761 Vic300 Masterseal.
- .5 Check valves:
- .1 Check valve 2" (DN50) to 12" (DN300):
    - .1 Body: Ductile iron according to ASTM A536, grade 65-45-12:
      - .1 Coating: black enamel.
    - .2 Body Support:
      - .1 2" (DN50) to 3" (DN75): machined and nickeled surfaces per deposit.
      - .2 4" (DN100) to 12" (DN300): Nickel plated threaded support by autocatalytic deposition.
    - .3 Disc:
      - .1 2" (DN50) to 3" (DN75): The stainless steel disc is housed against the O-Ring mounted on the nickel-plated end face by autocatalytic deposition;
      - .2 4" (DN100) to 12" (DN300): Elastomer-coated disc and nickel-plated support by autocatalytic deposition.
    - .4 Axle:
      - .1 2" (DN50) to 3" (DN75): Stainless steel, Type 316.
    - .5 Spring: Stainless steel, Type 302/304.
    - .6 Shaft Cap:
      - .1 2" (DN50) to 3" (DN75): Stainless steel, Type 416.
    - .7 Tube Cap:
      - .1 4" (DN100) to 12" (DN300): Zinc plated carbon steel according to ASTM B633.

- .8 Disc coating and O-rings: Synthetic rubber complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
  - .1 Temperature range: EPDM Grade E-30oF (-34oC) to + 230oF (+ 110oC):
- .9 Maximum operating pressure stainless steel: 300 PSI (2065 kPa).  
Minimum quality standard: such as Victaulic series 716H/716 Vic-Check.
- .2 Check valve 4" (DN100) to 12" (DN300) non-return valve: Venturi check valves with flow measurement kit:
  - .1 Body: Ductile iron according to ASTM A536, grade 65-45-12:
    - .1 Coating: black enamel.
  - .2 Disc: Ductile iron conforming to ASTM A536, Grade 65-45-12, fully overmolded with EPDM grade E elastomer.
  - .3 Axle: Stainless steel, Type 316.
  - .4 Spring: Stainless steel, Type 302/304.
  - .5 Shaft CAP: Zinc plated carbon steel according to ASTM B633.
  - .6 Connection port plugs: Zinc-plated carbon steel according to ASTM B633.
  - .7 Disc Coating: Synthetic rubber complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
    - .1 Temperature range: EPDM Grade E-30oF (-34oC) to + 230oF (+ 110oC).
  - .8 Maximum operating pressure Stainless steel: 300 PSI (2065 kPa).  
Minimum quality standard: such as Victaulic series 779 venturi.
- .6 Expansion Compensator: The sliding-type expansion compensator allows an axial displacement of 3":
  - .1 Expansion compensator 2" (DN50) to 6" (DN150):
    - .1 Collars:
      - .1 Body: Ductile iron according to ASTM A536, Grade 65-45-12:
        - .1 Coating: orange or hot-dip galvanized enamel.
      - .2 End:
        - .1 Body: Carbon Steel Schedule 40, according to ASTM A53, Type E or S, Grade B.
        - .2 Coating: black enamel.

- .3 Sliding element: cold-drawn seamless tube, schedule 40, according to AISI 1015 or 1018:
  - .1 Coating: PPS/PTFE polyphenylene sulfide treated with polytetrafluoroethylene.
- .4 Gaskets: Synthetic triple-sealing rubber complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
  - .1 Temperature range: EPDM Grade EHP-30oF (- 34oC) to + 250oF (+ 121oC).
- .5 Maximum operating pressure steel: 350 PSI (2400 kPa).  
Minimum quality standard: such as Victaulic Style 150 Mover.
- .7 Expansion Joint: Expansion joint consisting of a series of grooved end nipples joined to flexible type fittings. The movement and expansion capacities of the joint are determined by the number of fittings/nipples used in the joint:
  - .1 Expansion Joint 2" (DN50) to 24" (DN600):
    - .1 Collars:
      - .1 Body: Ductile iron According to ASTM A536, grade 65-45-12:
        - .1 Coating: orange or hot-dip galvanized enamel.
    - .2 Nipples:
      - .1 2" (DN50) to 4" (DN100): Carbon steel Schedule 40, according to ASTM A53, Type F.
      - .2 5" (DN125) to 6" (DN150): Carbon steel Schedule 40, according to ASTM A53, Type E or S, Grade B.
      - .3 8" (DN200) to 12" (DN300): Carbon steel Schedule 30, according to ASTM A53, Type E or S, Grade B.
      - .4 14" (DN350) to 24" (DN600): Carbon steel 0.50, according to ASTM A53, Type S, Grade B or ASTM A 106 grade B.
    - .3 Gaskets: Synthetic triple-sealing rubber complying with ASTM D2000 standard. Recommended for cold or hot water. UL approved according to ANSI/NSF 61 for cold water at + 73oF (+ 23oC) and warm to + 180oF (+ 82oC) and according to ANSI/NSF 372:
      - .1 Temperature range: EPDM Grade E-30oF (- 34oC) to + 230oF (+ 110oC).

## .4 Maximum operating pressure steel:

2'' (DN50) à 6'' (DN150)	1000 PSI (6900 kPa)
8'' (DN200) à 12'' (DN300)	600 PSI (4130 kPa)
14'' (DN350) et 24'' (DN600)	350 PSI (2400 kPa)

Minimum standard of quality: such as Victaulic style 155 and style W155 steel piping.

## .3 Piping buried in the ground:

## .1 Pipes:

## .1 3"-54" diam.

Material: High density polyethylene (SDR-PR) ASTM F-714.

Conn.: Pressure Pipe PE 3408.

Thick. Wall: Thermal Butt Fusion.

DR-17.

## .2 Fittings:

## .1 3" - 8" diam. (molded):

Material: High density polyethylene pressure ASTM D 3261.

Conn.: Fittings ASTM D 2683.

Thick. Wall: Plain end or socket fusion EPP 3408.

To suit pressure rating of pipe.

## .2 3" &amp; more diam.:

Material: HDPE with FRP overwrap ASTM F714.

Conn.: With flanges PE 3408.

Class: According to the nominal pressure of the pipe.

## .3 Bolts and Nuts:

## .1 Any dimensions:

Material: ASTM A307 Gr. B carbon steel for bolts, ASTM A563 Gr. A for Nuts, ASME b 18.2.2;

Type: Unified threads in inches, UNC;

Class 2 fitted with hex nuts. Heavy.

## .4 Gaskets:

.1 Material: Reinforced red rubber, ASME b 16.21  
1/8" thick, full face.

## .5 Support Flange (Back-up Flange):

## .1 Material: Ductile iron, ANSI B 16.5

Class: 150

## .6 Coupling:

## .1 3"-14"

Material: Ductile iron, Victaulic style 995

Conn.: Plain End.

- .7 Transition joints:
  - .1 Material: HDPE to C.S. As manufactured by Central Plastics Co. or equivalent approved  
ASTM D2513  
Conn.: Thermal Fusion of welded or flanged x-Tips.  
Class: According to the nominal pressure of the pipe.
- .8 Mechanical Seal System:
  - .1 Material: Ductile iron/Mild steel AWWA C-219 "Aquagrip"  
As manufactured by Viking Johnson or approved equivalent  
Type: Mechanical clamp/flange, corrosion-protected.
- .9 Electro-fusion systems:
  - .1 Material: Polyethylene as manufactured by  
Central Plastics Co. or equivalent approved ASTM F1055  
Conn.: Electro-Fusion Socket Welding.
- .4 Insulating for piping:
  - .1 Material: shaped, rigid, mineral fibre sheaths, 50 mm thick.
  - .2 Aluminized Exterior overlay.
  - .3 Operating temperature: between -30 degrees Celsius and 100 degrees Celsius.
  - .4 Vapour Barrier: Factory installed, compliant with CAN/CGSB 51-GP-52Ma, type 1, sealed longitudinal seal.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 General information:
  - .1 Manufacture and install all piping shown in plans.
  - .2 Paint the steel piping.
  - .3 Provide and install support.
  - .4 Perform the required cleaning and testing.
  - .5 Perform the installation of the insulation.
  - .6 Identify the line number of the new piping installed.

#### **3.2 INSULATION INSTALLATION**

- .1 Insulate the above-ground steel piping sections at risk of frost.

#### **3.3 QUALITY CONTROL ON SITE**

- .1 INSPECTION OF WELDED:
  - .1 The Contractor shall schedule and perform the inspections of the welds (visual, X-rays, MT, PT, etc.) as the work progresses.
  - .2 At the end of the work, a copy of all laboratory and inspection test results shall be given to the Owner's representative in the project binder.

- .3 All welds deemed suspicious by the Owner's representative may be inspected by a third party to ensure that the integrity and quality of the welds are not affected. The Contractor shall provide access to the Owner's representative and/or his/her inspector at any time.
- .4 The Contractor shall repair all work rejected following a test indicating that a weld does not comply with the minimum code requirements. Repairs must be inspected to ensure that no anomalies are present.
- .5 After being notified by Client, the Contractor has a period of twenty-four (24) hours to remove from the site any part that does not meet the requirements of the contract.

### **3.4 DRAINING, CLEANING, TESTING AND COMMISSIONING**

- .1 The Contractor shall carry out and document, in addition to the tests and professional verifications, the tests requested in the presence of a representative of the Owner.
- .2 Inspections and testing of fabricated and installed piping shall be carried out in accordance with specifications and any other contractual documents such as isometric drawings, pipelines registers, etc.
- .3 All steel piping shall be inspected in accordance with the requirements of ASME B 31.3 during manufacture and during construction.
- .4 **HYDROSTATIC TEST:**
  - .1 All piping shall undergo a hydrostatic test in accordance with code ASME B 31.3 and DEP 74.00.10.10 – Shop and Field Pressure testing of Piping Systems. (For steel piping). The Contractor is responsible for preparing and installing any equipment and accessories required to perform the hydrostatic testing of piping.
  - .2 The test pressure shall be 1.5 X the design pressure and shall be maintained without decreasing for 30 minutes and for any additional period that may be required to carry out the inspection to determine if there are leaks. Any observed leaks must be repaired.
  - .3 Immediately after each hydrostatic test, the piping or section shall be drained and completely dried.
  - .4 No test shall be carried out through mechanical equipment or instruments. Full flanges must be installed on each of the equipment before each test and the equipment must be temporarily removed or bypassed.

**END OF SECTION**

**Part 1            General****1.1                RELATED REQUIREMENTS**

- .1        Divisions 01, 23, 40.

**1.2                REFERENCE STANDARDS**

- .1        CSA International:
  - .1        CSA C 22.2 number 14-18, Industrial Control Equipment.
  - .2        National Electrical Manufacturers Association (NEMA)
  - .3        NEMA ICS 1-2000 (R2015), Industrial Control and Systems: General Requirements.

**1.3                DESCRIPTION OF WORK**

- .1        The work shall include labor, supply and installation of equipment, programming, start-up, training, service during the guarantee year, tooling and any other articles necessary for the complete and careful execution of this which is described in this section and shown on the specific drawings of this project to fully respect the sequences of controls described in section 40 00 00.
- .2        Incorporate the graphics of the new phase with the existing ones.
- .3        Update the existing multi-user Web interface to include new graphics.
- .4        IP access is provided and maintained by the Owner from local F-121 of swine complex. The Contractor must establish a link between this premise and the electrical room of the control building.
- .5        The piping and instrumentation plans (P&ID) provided identify the measurement points to be provided and the main equipment to be monitored and can be used as a design basis. The final design and performance of the system remains the responsibility of the Contractor.

**1.4                DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1        Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.
- .2        Data sheets:
  - .1        Submit the required datasheets as well as the manufacturer's instructions and documentation concerning the control devices. The datasheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finishing

- .3 Workshop drawings:
  - .1 The Workshop drawings submitted shall bear the seal and signature of a competent engineer recognized or authorized to practise in the province.
  - .2 Drawings shall include the schematic diagrams, wiring and interconnection.
  - .3 Drawings must include a complete network architecture.
  - .4 Drawings shall include a control schemes for all checkpoints.
  - .5 Drawings shall include a list of exhaustive points of all physical points with their operating ranges, material and location.
  - .6 Drawings must include a list of materials with all the parts to be supplied, their model numbers and their manufacturers.
  - .7 Drawings shall include all check sequences that must be approved by the Owner or professional prior to the commencement of the work.

## **1.5 QUALITY ASSURANCE**

- .1 Refer to Section 01 45 00.

## **1.6 DOCUMENTS/ELEMENTS TO HAND OVER FOR COMPLETION OF WORK**

- .1 Submit the required documents/elements in accordance with section 01 78 00 – Closeout Submittals:
  - .1 Develop an operation manual including:
    - .1 Workshop Drawings.
    - .2 Data sheet.
  - .2 Provide the following end-of-site documents:
    - .1 Letter of Guarantee.

## **1.7 TRANSPORTATION, STORAGE AND HANDLING**

- .1 Transport, store and handle the materials and equipment in accordance with section 01 61 00 – Common Product Requirements.
- .2 Delivery and Acceptance: deliver materials and equipment to site in their original packaging, which must bear a label indicating the manufacturer's name and address.

## **1.8 CONTRACTOR'S QUALIFICATION**

- .1 The automatic control works shall be carried out by a firm specialised in the field which provides the installation, service and distribution of digital regulation systems for at least 15 years.
- .2 Contractor must be able to provide telephone support 24 hours a day, 7 days a week.
- .3 The Contractor or his subcontractor must have a licence with the following categories of specialized Contractor according to the Régie du Bâtiment du Québec:
  - .1 Annex (II):
    - .1 16 - Electrical Contractor.
    - .2 17.1 - Contractor in instrumentation, control and regulation.

- .2 Annex (III):
- .3 17.2 - Intercommunication telephony and surveillance.

## **Part 2 Product**

### **2.1 ACCEPTABLE PRODUCTS**

- .1 The control system used in the Client's facilities is branded Reliable Controls as distributed by A.C. controls INC.
- .2 For inventory and compatibility reasons, where the Reliable product range meets the requirements, Reliable equipment must be provided.

### **2.2 CONTROL PANELS**

- .1 All control panels shall be of NEMA 1 type, unless local conditions or plans require a different category.
- .2 The control panels must have ETL or CSA 22.2 certification number 14.95 and be factory pre-assembled.
- .3 They will be in minimum 14 gauge sheet, robust construction with hinged door and master key lock.
- .4 They shall be fitted with mounting plate and all control components must be on this plate. It is forbidden to install parts on the sides of the case and only parts designed to be on the front of the case can be installed there.
- .5 All cable terminations must be on connection terminals with clamping roller screws.
- .6 The control panels shall be fitted with a pass-wire chute.
- .7 All control transformers shall be of a capacity equal to or greater than 125% of the load connected.
- .8 The control panels shall include a dedicated 120 VAC low capacity electrical outlet for the laptop or modem connection.
- .9 The control panel shall include distribution terminal blocks for the supply of the controls components.
- .10 All electrical power supplies on the control panel must be protected by quick-acting fuses.

### **2.3 NETWORK MANAGER WITH INTEGRATED EXPANSION MODULE (B-BC)**

- .1 Processor:
  - .1 32-bit processor at 100 MHz.
- .2 Memory:
  - .1 8 MB RAM memory.
  - .2 4 MB of EEPROM FLASH memory for the operating system, database and configuration of the PLC.
  - .3 MB of NVRAM for dynamic history and values.

- .3 Communication port:
  - .1 1 IEEE 802.3 Ethernet Port 10/100baseT.
  - .2 2 Ports EIA-485:
    - .1 Configurable according to the application
    - .2 Adjustable speed up to 76 800 baud.
    - .3 Supports a sub-network of up to 124 controllers.
    - .4 2nd port reserved for expansion cards, up to a maximum of 7.
  - .3 1 Port EIA-232:
    - .1 Adjustable speed up to 115 200 baud.
    - .2 Allows direct connection to a computer or modem.
  - .4 1 SMART-Net Port:
    - .1 For the connection of SSL-type probes up to a maximum of 16.
  - .5 Light emitting diodes to indicate the transfer of data on the various communication ports.
- .4 Inputs:
  - .1 12 universal inputs.
  - .2 12-bit analog/digital converter.
  - .3 Plug-in screw terminals.
  - .4 Type of input supported:
    - .1 0-5 VDC.
    - .2 0-10 VDC.
    - .3 4-20 MA.
    - .4 Dry Contact.
    - .5 Thermistor.
    - .6 Pulse to 150Hz.
  - .5 Surge protection 24 VAC.
  - .6 Light emitting diode with intensity proportional to the value of the input.
  - .7 Selecting the signal type by moving a jumper.
  - .8 No external resistance or interface will be acceptable.
- .5 Outputs:
  - .1 8 Universal outputs.
  - .2 12-bit analog/digital converter.
  - .3 Plug-in screw terminal blocks.
  - .4 Output type supported:
    - .1 0-12 VDC.
    - .2 All or nothing.
  - .5 Protection against short circuits and surges 24 VAC.
  - .6 Power: 75 MA at 12 VDC.
  - .7 Light emitting diode with an intensity proportional to the value of the output.

- .6 Peripheral power supply:
  - .1 Variable power supply 15-24 VDC 200 MA.
- .7 Protocol:
  - .1 BACnet:
    - .1 BTL-B-BC Certification.
    - .2 B/IP x2 Ethernet, MS/TP and PTP.
  - .2 RCP "Reliable controls Protocol":
    - .1 For compatibility with previous generations.
  - .3 Modbus:
    - .1 RTU or TCP/IP in master or slave configuration.
- .8 Programming:
  - .1 1024 BACnet variables.
  - .2 128 Compute Loops P, PI or PID.
  - .3 Dynamically assigned memory for the following BACnet objects:
    - .1 Weekly Schedules.
    - .2 Calendar.
    - .3 Analog Histories.
    - .4 Digital Histories.
  - .4 160 display groups that can contain 80 BACnet points each.
  - .5 128 programs in "BASIC" language of 3200 bytes each.
  - .6 128 Passwords with 6 access levels.
- .9 The equipment shall allow the addition of at least 7 extensions.

## 2.4 CONTROLLER EXPANSION MODULE

- .1 Expansion modules must be compatible with the controller.
- .2 Each equipment must contain at least 12 inputs and 8 outputs.

## 2.5 TEMPERATURE SENSORS

- .1 Immersion temperature sensor (water glycol):
  - .1 The sensor must be of appropriate length.
  - .2 The sensor must be included with a stainless steel immersion well (to be supplied by Pipefitter).
  - .3 Type: Thermistor 10 000 ohms Type 3.
  - .4 Range: -40 °c to 120 °C.
  - .5 Calibration according to the application.
  - .6 Accuracy:  $\pm 0.2$  °C.
  - .7 Enclosure depending on the location of the installation and the service.

- .2 Blind room temperature sensor:
  - .1 The sensor must be mounted in a suitable cosmetic box for locating.
  - .2 Type: Thermistor 10 000 ohms Type 3.
  - .3 Range: -20 °c to 55 °C.
  - .4 Accuracy:  $\pm 0.2$  °C:
    - .1 For the mechanical room provide an additional CO2 transmitter.
  - .5 Quality required: Reliable controls SST.
- .3 Transmitter and temperature sensor for manure (mixing pit):
  - .1 The sensor shall be manure-resistant and of 3 metres in length.
  - .2 NEMA 4X enclosure.
  - .3 Type: RTD with temperature transmitter.
  - .4 Range: -50 °c to 50 °C.
  - .5 3-Point calibration certificate.
  - .6 Quality required: Custom assembly of Endress & Hauser
  - .7 Output Signal: 4 to 20 mA.

## **2.6 CURRENT TRANSDUCER**

- .1 Analog Current Transducer:
  - .1 Range: Depending on the application.
  - .2 Signal: 0-5 VDC.
  - .3 Accuracy:  $\pm 1\%$ .

## **2.7 LIQUID FLOW SWITCHES**

- .1 Liquid for glycol flow switch:
  - .1 Type: Finned.
  - .2 Relays: SPDT, 10 A to 250 VAC

## **2.8 LIQUID PRESSURE TRANSMITTER**

- .1 Static pressure transmitter:
  - .1 Range: Depending on the application.
  - .2 Accuracy:  $\pm 1\%$ .
  - .3 Output Signal: 4 to 20 mA.

## **2.9 GAS PRESSURE TRANSMITTER**

- .1 Pressure Transmitter:
  - .1 Range: 0 to 5 Kpa.
  - .2 Accuracy:  $\pm 0.3\%$ . 3 Output Signal: 4 to 20 mA.
  - .3 Nema 4X Enclosure.

**2.10 POWER VALVE**

- .1 The power valves provided by this section shall be installed by the heating section (D3000).
- .2 The construction will be chosen according to the different applications: steam, heating water, cooled water or glycol.
- .3 The operating mode will be determined according to the operation sequences.
- .4 The dimensions and pressure loss in valves will be determined in tables of the heating section. They will be of the marks or numbers indicated below or otherwise, the bidder will have to propose its own valve models and they will be subject to the approval of the Departmental Representative. The actuators ' capacity will be selected appropriately to operate according to the required pressures and flows.

**2.11 VARIABLE FREQUENCY DRIVE**

- .1 Variable frequency drive (VFD) must be installed and connected in power by the electrical contractor.
- .2 The start-up must be made by an authorized representative of the manufacturer.
- .3 The "equipment list" provided with this document, lists the equipment for which the control/electricity contractor shall provide VFDs.
- .2 Variable speed with fuse and disconnect:
  - .1 5% integrated line inductance to reduce the harmonic distortion of current supply and to increase protection against transients.
  - .2 Integrated EMI/RFI filter.
  - .3 The ACH 550 base controller has 2 programmable analog inputs that accept voltage or current signals.
  - .4 The supply voltage will be 600 VAC + 10%, -25%.
  - .5 The transient variations supported are of 120 joules.
  - .6 Three programmable frequency locking ranges to prevent the dimmer from operating a load at an unstable speed.
  - .7 Must include standard RS-485 access compatible with Modbus TCP and BACnet communication protocols.
  - .8 Control in Volts/Hertz mode or in vector mode without encoder.
  - .9 The efficiency of the minimum inverter: 98%.
  - .10 Power factor of 98 at nominal load.
  - .11 The dimmer keypad shall include an integrated clock with a calendar with a reserve battery of a minimum duration of 10 years.
  - .12 Must be able of tolerating an overload capacity of 110% for one minute per ten minutes, with an overload of 130% for two seconds.
  - .13 Acceleration and deceleration ramps shall be adjustable from 1 to 1800 seconds.
  - .14 The operator interface of the dimmer must be able to display English and French.
  - .15 Shall be able of operating in a range of – 15 degrees C up to 40 degrees C continuous. Load loss detection system (broken belt or coupling).
  - .16 Possible output frequency is -500 to 500 HZ.

- .17 The dimmer must allow automatic restart after a loss of power. By default, this option should not be enabled.
- .18 The dimmer must allow automatic restart after the following faults: Output current overcurrent, DC overvoltage, DC voltage and analog signal on an AI below the minimum. By default, this option should not be enabled.
- .19 Protection for high voltage/low voltage, phase loss, M.A.L.T. phase/phase and phase/earth fault.
- .20 Circuit breaker lockout and dimmer protection fuse.

## **2.12 LOCAL START-UP PANEL OF HYDROLIC DOOR AND MACERATOR**

- .1 Provide and install a local control panel positioned at the location shown in the R.082975.001-M05-PN drawing including:
  - .1 A selector for selecting the control (local or remote) of the transfer pump.
  - .2 Buttons for opening and closing the hydraulic door.
  - .3 Buttons for starting and stopping the transfer pump at the pre-set speed in the PLC.
  - .4 An emergency button for stopping the actions of both equipment.
- .2 All Panel functions must be lockable with a single padlock.
- .3 The Panel enclosure must comply with IP 67 (Nema4X).

## **2.13 MAGNETIC STARTER**

- .1 NEMA 1 case.
- .2 Non-combined.
- .3 Overload relays.
- .4 Control transformer.
- .5 Selector 3 positions.
- .6 Pilot light "in use" and "at fault".

## **2.14 LIQUID FLOW METER FOR ORGANIC SLUDGE**

- .1 Electromagnetic type.
- .2 Diameter DN 100.
- .3 Signal: 4 to 20 mA and pulse.
- .4 Error to measure 0.5%.
- .5 Process pressure max. PN16.
- .6 Flange material: Stainless steel.
- .7 IP 67 enclosure protection (Nema4X).

**2.15 ORGANIC MUD VALVE ACTUATOR**

- .1 For gate valves with a diameter of 150 mm, to be coordinated with piping contractor.
- .2 With open / close signal and indicator.
- .3 Electrical operation, 24 VDC.
- .4 Binary opening (no modulation required).
- .5 IP 67 enclosure protection (Nema4X).

**2.16 GAS METER**

- .1 Diaphragm type.
- .2 With a maximum pressure loss of 125 Pa at nominal flow rate.
- .3 Flow reading range from 4 to 11.5 Nm<sup>3</sup>/h.
- .4 Acceptable Product: A400 of Itron or equivalent approved according to bidder's instructions.

**2.17 HUMAN MACHINE INTERFACE (HMI)**

- .1 10-inch screen
- .2 Consultation of the graphics of centralization from the HMI.

**2.18 IDENTIFICATION**

- .1 All physical elements controlled must be identified refer to section 23 05 53.01 - Identification of networks and mechanical devices.
- .2 All control panels must be identified using a "P-Touch" type label. This identification must be the same as the one used on network architecture provided with the workshop drawings.

**2.19 GRAPHIC INTERFACE**

- .1 This section applies as much to the Web interface as to the management software interface.
- .2 Each physical point (inputs and outputs) must be present in the graphical interface.
- .3 The Contractor shall use a color code based on the nature of each point displayed in the graphical interface.
- .4 The graphical interface shall include animations for process device operation and building: bioreactor, fans, pumps, coolers, boilers, etc.
- .5 The regulatory Contractor shall, at a minimum, provide the following graphical structure:
  - .1 Aerial view of project.
  - .2 View of the control building.
  - .3 View of the organic sludge network, including manure piping, mixing pit, bioreactor and storage pit.
  - .4 View of biogas network including the flare.

- .5 View of the glycol network.
- .6 Represent all systems according to the requirements (show all points attached to them (entries, exits, points of instruction, schedules, history relating to the system in question, etc.).
- .6 Examples of graphics (3D) in-perspective will have to be provided and pre-approved by the Client.

**Part 3 Execution****3.1 REVIEW**

- .1 Verification of the conditions: Before proceeding with the installation of the control devices, make sure that the condition of the surfaces/supports previously implemented under other sections or contracts is acceptable and allows to carry out the work in accordance with the manufacturer's written instructions.
- .2 Visually inspect surfaces/supports in the presence of the Departmental Representative.
- .3 Immediately inform the Departmental Representative of any unacceptable conditions identified.
- .4 Commence installation work only after correcting the unacceptable conditions.

**3.2 INSTALLATION**

- .1 Install all necessary instruments and equipment to the control system according to the applicable codes and in accordance with the manufacturer's recommendations.

**3.3 START-UP**

- .1 Be present at the time of verification of the inputs/outputs and start-up of the project elements and provide the necessary assistance to ensure that the process controls respond to the described narrative in section 40 00 00.
- .2 Be present at the time of verification of the inputs/outputs and start-up of the project elements and provide the necessary assistance to ensure that the heating and ventilation system controls meet the requirements described in sections D3000 to D3080.

**3.4 TRAINING**

- .1 An adequate and easy training must be given to users to enable them to become self-sufficient with the numerical control system installed in accordance with section 01 79 00. This training shall include, at a minimum, the following items:
  - .1 Functional tour of control equipment and installations.
  - .2 Presentation of the Software environment.
  - .3 Presentation of the graphical interface.
  - .4 Input edit or checkpoints on the graphic operations.
  - .5 Setting up the processing software.
  - .6 Demonstration and explanation of control sequences.
  - .7 Necessary actions to make a backup copy of controllers and the operating software.
  - .8 Reloading data from the PLC (s) during a loss or update.
  - .9 Modification and edition of annual holiday schedule.
  - .10 Modification and edition of weekly schedule.
  - .11 Editing, visualization and processing of the various alarms of the system.
  - .12 Editing, visualization and processing of history.

**3.5 CLEANING**

- .1 Cleaning during work: Perform cleaning work in accordance with section 01 74 11 – Cleaning:
  - .1 Leave the premises clean at the end of each working day.
- .2 Final cleaning: Remove from the site the materials/equipment in addition, waste, tools and equipment in accordance with section 01 74 11 - Cleaning.

**END OF SECTION**

**Part 1 General****1.1 SUMMARY**

- .1 Contents of the section:
  - .1 Materials/equipment and installation method associated with the hydraulic door of the mixing pit.

**1.2 RELATED REQUIREMENTS**

- .1 Divisions 01 and 40.

**1.3 REFERENCE STANDARDS**

- .1 Equipment, instruments, materials and installations must meet the requirements of the latest editions of the codes and standards of the following organizations:
  - .1 CSA Canadian Standards Association.
  - .2 NBC National Building Code.
  - .3 EEMAC The Electrical Equipment Manufacturers Association of Canada.
  - .4 NEMA National Electrical Manufacturers Association.
  - .5 AISI American National Standards Institute
  - .6 ULC Underwriters Laboratories of Canada
  - .7 ASTM American Society For Testing and materials
  - .8 NEC National Electric Code
  - .9 Welding Code According to Csa W47.1 and W59 for steel and CSA W 47.2 and W 59.2 for aluminium.

**1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.
- .2 Data sheets:
  - .1 Submit the required technical data sheets as well as the manufacturer's specifications and documentation concerning the products.
  - .2 Submit material safety data sheets required under the Workplace Hazardous Materials Information System (WHMIS). The data sheets must indicate the VOC emission rate of the adhesives and solvents, during the application of these products and the period of cure.
- .3 Workshop drawings:
  - .1 Workshop drawings shall indicate, show or understand the following:
    - .1 General arrangement showing the main components, materials, dimensions and weights of equipment.
    - .2 Diagram of loads transferred to the foundation.

- .3 Appliances and their ancillary components, including piping, fittings and control devices, with an indication as to whether the assembly is made in the factory or on-site.
- .4 The wiring and principle diagrams of the hydraulic unit and the control elements of the door.
- .5 Installation recommendations.
- .4 Certificates: Submit the documents signed by the manufacturer certifying that the products, materials and equipment meet the requirements for physical characteristics and performance criteria.
- .5 Instructions: Submit the installation instructions provided by the manufacturer.
- .6 Submit copies of the reports of the controls performed on site by the manufacturer.
- .7 Documents/elements to submit at completion of work: provide the required technical data sheets and maintenance records, and attach them to the manual referred to in section 01 78 00 – Closeout Submittals. Data must include or indicate the following:
  - .1 The name of the manufacturer, the type, the year of manufacture, the power or the flow and the serial number of the equipment.
  - .2 The relevant details relating to the operation, maintenance and maintenance of equipment.
  - .3 A list of recommended spare parts and the name and address of the suppliers.

## **1.5 QUALITY ASSURENCE**

- .1 Pre-implementation meetings:
  - .1 At least four (4) weeks prior to the beginning of the installation work of the pump and its components, hold a meeting in accordance with Section 01 32 16.07 – Construction Progress Schedule – Bar (GANTT) Chart, during which the following shall be examined:
    - .1 The requirements of the work.
    - .2 The condition and conditions of installation.
    - .3 Coordination of work with those carried out by other building trades.
    - .4 Instructions concerning the installation and the term of guarantee offered by the latter.
- .2 Health and Safety:
  - .1 Take the necessary health and safety measures under construction in accordance with section 01 35 29.06 - Health and Safety Requirements.

## **1.6 TRANSPORTATION, STORAGE AND HANDLING**

- .1 Transport, store and handle the materials and equipment in accordance with section 01 61 00 – Common Product Requirements.
- .2 Waste management and disposal:
  - .1 Waste management and disposal shall be in accordance with section 01 74 19 – Waste Management and Disposal.

**Part 2 Product****2.1 HYDRAULIC DOOR FOR MIXING PIT**

- .1 The hydraulic door will be installed on the top of the manure mixing pit. The pit has a diameter of 6.5 meters and a depth of 4 meters. The top of the pit is at an approximate height of 30 mm above the ground. The door must be designed to allow the discharge of manure from a tipping trailer of the Machinery Lépine model 712D. The minimum size of the door will be 3 meters wide by 3 meters deep.
- .2 The manufacturer shall carry out the complete design of the door considering the application, codes and norms and the rules of the art. The plans must be signed/sealed by an engineer member of the Ordre des Ingénieurs du Québec.
- .3 The door shall have the following characteristics:
  - Door Materials: Galvanized steel with non-slip top (checker plate). Reinforcement in HSS. The opening of the door must be performed out using hydraulic cylinders.
- .4 Door design:
  - The door must be designed for an external weather-proof operation.
  - Consider loads of snow and extreme winds.
  - The anti-skid plate must be designed according to the Canadian Building Code and use a minimum load of 100 pound/square foot.
  - The door must be designed in a sturdy way.
  - Opening Angle: 90 degrees.
  - Time to open the door: 30 seconds.
  - The perimeter of the door must have a sealing gasket in order to avoid the entry of unwanted material from the outside and/or the release of material, liquid and vapour from the pit.
  - Hinge System: Extra-sturdy hinge system with high-strength chrome-plated steel axes and bronze rings with lubricating fittings.
- .5 Hydraulic system:
  - .1 The hydraulic system must allow the operation of the hydraulic cylinders for opening and closing the door. The hydraulic unit must be designed for outdoor installation and must have its own oil heating system (heat sink) for the winter operation (-40C). The hydraulic unit shall be of vertical design and must include at least the following components:
    - .1 40-gallon steel tank (volume to be confirmed by the manufacturer) with level gauge. Return filter.
    - .2 Electric Motor 575 V/3Ph, TEFC.
    - .3 Gear pump.
    - .4 Double flow control.
    - .5 Pressure relief valve.
    - .6 Double solenoid, 3 positions, spring return.
    - .7 Motor-mountable cooler.
    - .8 High pressure switch.

- .9 Drip receptacle 110%.
- .2 Control: The pump operation will be done from a local and remote button station from the control building.
- .3 The local button station will be located near the door. It must allow the start of the hydraulic unit, the opening and closing of the door and be equipped with an emergency stop button. The station will be supplied by the electric Contractor.
- .4 Hydraulic cylinder: welded double-acting cylinder for high-duty application. The actuator must include a hydraulic safety valve. Cylinder rod in hardened steel and chrome plated. Steel tube, refined with precision finish. Durable welded construction. SAE Standard Ports. Threaded head. Optimum quality seals manufactured in the US/Europe. High quality corrosion resistant paint.
- .6 Panel: The outside panels must be of Nema4X type.

### **Part 3 Execution**

#### **3.1 MANUFACTURER'S INSTRUCTION**

- .1 Conformance: Comply with the manufacturer's written requirements, recommendations and specifications, including any available technical bulletin, instructions for handling, storage and installation, and indications of data sheets.

#### **3.2 INSTALLATION**

- .1 In each case, complete mechanical installation and hydraulic connections. Electrical connections, and control devices will be made by the electrical Contractor.

#### **3.3 QUALITY CONTROL ON SITE**

- .1 Perform inspections, adjustments and pre-adjustment as recommended by the manufacturer:
  - .1 Check the power supply.
  - .2 Check the starter protection devices.
- .2 Turn on the hydraulic unit and ensure that it operates safely and appropriately.
- .3 Check the setting and operation of the control and safety devices, the audible and visual alarms, the overheating protection and other safety devices.

#### **3.4 START-UP**

- .1 General information:
  - .1 According to the requirements of section 01 91 13 – General Commissioning (CX) Requirements, about general requirements, and according to the requirements of this section.
  - .2 Procedure:
    - .1 Check the power supply.
    - .2 Perform the starting-up of the hydraulic unit according to the manufacturer's recommendations.
    - .3 Ensure that it operates in a safe and effective manner.

- .4 Check the settings and the operation of the safety devices, limit switches, overheating protection, audible and visual alarms and similar devices.
- .5 Check the operation of the local control panel switch.
- .6 Operate (raise/lower) the hydraulic part about ten cycles.
- .7 Check the installation and operation of seals. Make the necessary adjustments.
- .8 Check the lubrication oil levels.

### **3.5 REPORTS**

- .1 According to the requirements of this section 01 91 13 - General Commissioning (CX) Requirements.
- .2 The reports should relate to the following:
  - .1 Results of performance controls, presented on approved forms for this purpose.
  - .2 Product information.

### **3.6 TRAINING**

- .1 According to the requirements of this section 01 91 13 - General Commissioning (CX) Requirements.

**END OF SECTION**

**Part 1 General****1.1 SUMMARY**

- .1 Contents of the section:
  - .1 Materials/equipment and method of installation associated with the manure transfer pump from the mixing pit.

**1.2 RELATED REQUIREMENTS**

- .1 Divisions 01 and 40.

**1.3 REFERENCE STANDARDS**

- .1 Equipment, instruments, materials and installations must meet the requirements of the latest editions of the codes and standards of the following organizations:
  - .1 CSA Canadian Standards Association.
  - .2 NBC National Building Code.
  - .3 EEMAC The Electrical Equipment Manufacturers Association of Canada.
  - .4 NEMA National Electrical Manufacturers Association.
  - .5 AISI American National Standards Institute
  - .6 ULC Underwriters Laboratories of Canada
  - .7 ASTM American Society for Testing and materials
  - .8 NEC National Electric Code
  - .9 Welding Code According to Csa W47.1 and W59 for steel and CSA W 47.2 and W 59.2 for aluminium.

**1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit the required documents and samples in accordance with section 01 33 00 – Submittal Procedures.
- .2 Data sheets:
  - .1 Submit the required technical data sheets as well as the manufacturer's specifications and documentation concerning the products.
  - .2 Submit material safety data sheets required under the Workplace Hazardous Materials Information System (WHMIS). The data sheets must indicate the VOC emission rate of the adhesives and solvents, during the application of these products and the period of cure.

- .3 Workshop drawings:
  - .1 Workshop drawings shall indicate, show or understand the following:
    - .1 General arrangement drawing showing the pump and its accessories, including dimensions and weights. Piping, fittings and control devices, with an indication of whether the installation is done in the factory or on site.
    - .2 The electrical connections diagram, the control diagram and the operating logic.
    - .3 Installation drawings;
    - .4 The characteristic and actual performance curves of pumps;
    - .5 The charges forwarded to the foundation.
  - .4 Certificates: Submit the documents signed by the manufacturer certifying that the products, materials and equipment meet the requirements for physical characteristics and performance criteria.
  - .5 Instructions: Submit the installation instructions provided by the manufacturer.
  - .6 Submit copies of the reports of the controls performed on site by the manufacturer.
  - .7 Documents/elements to submit at completion of work: provide the required technical data sheets and maintenance records, and attach them to the manual referred to in section 01 78 00 – Closeout Submittals. Data must include or indicate the following:
    - .1 The name of the manufacturer, the type, the year of manufacture, the power or the flow and the serial number of the equipment.
    - .2 The relevant details relating to the operation, maintenance and maintenance of equipment.
    - .3 A list of recommended spare parts and the name and address of the suppliers.

## **1.5 QUALITY ASSURENCE**

- .1 Pre-implementation meetings:
  - .1 At least four (4) weeks prior to the beginning of the installation work of the pump and its components, hold a meeting in accordance with Section 01 32 16.07 – Construction Progress Schedule – Bar (GANTT) Chart, during which the following shall be examined:
    - .1 The requirements of the work.
    - .2 The condition and conditions of installation.
    - .3 Coordination of work with those carried out by other building trades.
    - .4 Instructions concerning the installation and the term of guarantee offered by the latter.

- .2 Health and Safety:
  - .1 Take the necessary health and safety measures under construction in accordance with section 01 35 29.06 - Health and Safety Requirements.

## **1.6 TRANSPORTATION, STORAGE AND HANDLING**

- .1 Transport, store and handle the materials and equipment in accordance with section 01 61 00 – Common Product Requirements.
- .2 Waste management and disposal:
  - .1 Waste management and disposal shall be in accordance with section 01 74 19 – Waste Management and Disposal.

## **Part 2 Product**

### **2.1 MIXING PIT MANURE TRANSFER PUMPS**

- .1 The pump shall have the following characteristics:
  - .1 Manufacturer: GEA (vertical Agi-Pompe 4 po), Jamesway (Pump 16" with agitation and propeller) or equivalent approved.
  - .2 Pit Depth: 168".
  - .3 Type: Vertical electric manure pump with integrated agitator.
  - .4 Turbine: 16" sturdy bolted turbine capable of shredding solids.
  - .5 Agitating propeller with knives to cut the fiber.
  - .6 Agitation Jet with horizontal rotation and vertical articulation.
  - .7 Control levers accessible from the top of the pump.
  - .8 Lower bearing: in oil bath with accessible oil tank mounted on the surface of the pit.
  - .9 Oil bath gasket: lubricate by means of lubricating ducts transported on the surface.
  - .10 Quick-connect 6-inch outlet for connection to the pit wall to pump the product under the freezing level.
  - .11 Mounting assembly: floor with sliding and tilting lifting device.
  - .12 Chassis: strong tubular chassis.
  - .13 Drive: Belt drive comprising a hinged fiberglass belt guard.
- .2 Flow rate: Operation: 180 USGPM Minimum to a total discharge head of 50 feet.
- .3 The product consists of a mixture of pork manure, dairy cattle manure, wood shavings from dairy cattle manure, food waste and silage waste. The product will be pumped from a 4-metre deep pit and 6.5 metres in diameter and transported in a 6-inch pipe to the bioreactor.

Here is the basic product data:

	Teneur en matières solides	Proportion nominale dans la recette (% poids)	Proportion maximale dans la recette (% poids)
Fumier de porc	0,6% to 3%	60%	70%
Copeaux de bois provenant du fumier de bovin laitier	50% to 60%	3%	7%
Fumier de bovin laitier	14% to 16%	13%	25%
Déchets alimentaires	10% to 20%	9%	16%
Déchets d'ensilage	20% to 25%	15%	30%

Food waste will be delivered without packaging and reduced to a maximum size of 50 mm.

- .4 The pump/motor/agitator assembly must be designed for outdoor operation, weather-proof (rain, snow, ice) and be able to operate at temperatures of -40 C @ +40 C. Preheating hoses are provided in the pit to warm the material in winter condition
- .5 Motor: 40 hp, 575 V, 3 Ph type TEFC equipped with overload protection and voltage drops.
- .6 Enclosure: The panels must be of the NEMA4X type.
- .7 Control: The pump operation will be carried out by a local and remote station from the control building, supplied and installed by the control Contractor. Refer to Section 40 63 00.

### **Part 3 Execution**

#### **3.1 MANUFACTURER'S INSTRUCTION**

- .1 Conformance: Comply with the manufacturer's written requirements, recommendations and specifications, including any available technical bulletin, instructions for handling, storage and installation, and indications of data sheets.

#### **3.2 INSTALLATION**

- .1 Perform the complete mechanical installation. The electrical connections of the pump, and the control devices will be carried out by the general Contractor. Refer to Section 40 63 00.
- .2 Make sure that the motor pump unit does not support piping.

#### **3.3 QUALITY CONTROL ON SITE**

- .1 Perform inspections, adjustments and pre-adjustment as recommended by the manufacturer:
  - .1 Check the power supply.
  - .2 Check the starter protection devices.
- .2 Turn the pump on and make sure it is operating safely and appropriately.
- .3 Check the setting and operation of the "MANUAL-STOP-AUTO" selector, the control and safety devices, the audible and visual alarms, the overheating protection devices and other safety features.

### **3.4 START-UP**

- .1 General information:
  - .1 According to the requirements of section 01 91 13 – General Commissioning (CX) Requirements, about general requirements, and according to the requirements of this section.
  - .2 Procedure:
    - .1 Check the power supply.
    - .2 Perform the starting-up of the pump according to the manufacturer's recommendations.
    - .3 Ensure that it operates in a safe and effective manner.
    - .4 Check the settings and the operation of the safety devices, overheating protection, audible and visual alarms and similar devices.
    - .5 Check the operation of the "MANUAL-STOP-AUTO" selector
    - .6 Run the pump continuously for a period of 12 hours.
    - .7 Check the installation and operation of the mechanical seals and packing glands. Make the necessary adjustments.
    - .8 Eliminate the conditions conducive to the development of phenomena such as cavitation, gas expansion or air drive in the pump.
    - .9 Check the lubrication oil levels.

### **3.5 REPORTS**

- .1 According to the requirements of this section 01 91 13 - General Commissioning (CX) Requirements.
- .2 The reports should relate to the following:
  - .1 Results of performance controls, presented on approved forms for this purpose.
  - .2 Product information.
  - .3 Characteristic curves of the pumps (curve families), with indication of the actual point operation.

### **3.6 TRAINING**

- .1 According to the requirements of this section 01 91 13 - General Commissioning (CX) Requirements.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Division 01, A2010 and geotechnical report.

**1.2 SUMMARY**

- .1 This section includes the design, development and manufacture of foundations, and slabs required to:
  - .1 The control building and blinding slabs.
  - .2 The mixing pit.
  - .3 The handling slab.
  - .4 The associated concrete slabs (H2S scrubber, flare and condenser).
- .2 Design, provide and implement a foundation system to properly transmit the loads of the building and the above-mentioned structures to the ground and/or the underlying bedrock.
- .3 Design, provide and implement the above-mentioned works in accordance with the functional dimensions and requirements of section 40 00 00 of drawings R 082975.001-S01-PN and R 082975.001-S02-DT.
- .4 Design the foundations for gravity loads as well as lateral wind and earthquake loads.
- .5 Provide adequate support for basement insulation and sealing systems as well as ground thrusts.
- .6 Design, supply and install a system for capturing infiltration waters.

**1.3 PERFORMANCE**

- .1 The bidder Contractor is the only responsible for the performance to be obtained and shall demonstrate that it is obtained. It is responsible for the design, construction, performance, capacity, dimensions, fittings, connections, minimum standards, availability of spare parts and delivery time.
- .2 The purpose of the contract is a completed, proven, finish installation and ready for efficient operation. This also includes all items, parts, equipment, tools, services, labor, accessories, etc., which are not specifically indicated in the specifications or drawings, but which are required for proper operation.
- .3 The plans and sketches provided are indicative, they define the result to be obtained. They indicate schematically the approximate location of the devices and the connection piping. In no case should it be used as erection drawings. The responsibility for the preparation of these drawings rests with the Contractor. The Contractor shall provide workshop drawings signed and sealed by a OIQ member engineer for the various works cited in section 1.2.1. The design of work mentioned in Section 1.2.1 will have to be carried out according to the dimensions and functional requirements of Section 400000 of specifications and drawings R082975.001-S01-PN and R082975.001-S02-DT.
- .4 All appliances shall be installed according to manufacturer's recommendations.

**1.4 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM A48/A48M-03 (2016)], Standard Specification for Grey Iron Castings.
  - .2 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .3 ASTM C136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D1751-04 (2013) e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - .5 ASTM E96/E96M-16, Standard Test Methods for Water Vapor Transmission of Materials.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
  - .3 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral-Colloid Type, Unfilled, for damp proofing and Waterproofing and for Roof Coatings.
  - .4 CGSB 51-GP-51M-81, Polyethylene Sheet for Use in Building Construction.
- .3 CSA Group
  - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CAN/CSA-A23.3-14, Design of Concrete Structures.
  - .3 CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .4 CSA G30.18-14, Carbon Steel Bars for Concrete Reinforcement.
  - .5 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .6 CSA O86-14, Consolidation - Engineering Design in Wood.
  - .7 CSA O121-17, Douglas Fir Plywood.
  - .8 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- .4 American concrete institute (ACI) :
  - .1 ACI 347-14 – Guide to formwork for Concrete.
- .5 Quebec Construction Code:
  - .1 Chapter 1 – Building (CCQ-C. 1), adopting, with modifications the National Building Code, Edition 2005 (edition 2010 If it is available at design time).
- .6 National Research Council Canada (NRC)
  - .1 National Building Code of Canada 2015 (NBC).

- .7 Reinforcing Steel Institute of Canada (RSIC)
  - .1 RSIC-2017, Manual of Standard Practice.
- .8 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

## **1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-installation meetings: in accordance with Section 01 31 19- Project Meetings.
  - .1 Conduct pre-installation meeting 2 weeks prior to start of installation with general Contractor, manufacturer and installer to:
    - .1 Examine sub-surface investigation report and recommendations.
    - .2 Discuss known underground utility lines and buried objects to be reviewed.
    - .3 Verification of the foundation soil condition, which must be firm, level, dry, free of ice, snow, frozen clods, dust and debris. Submit to the Departmental Representative a report confirming that the granular fill under the slab has been compacted;
    - .4 Verification of the leveling profile of the foundation layer, which shall conform to the established drain and drainage profile.
    - .5 Review of the requirements for the finishing of foundations and concrete slabs.

## **1.6 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data sheets:
  - .1 Submit the required technical data sheets and the manufacturer's documentation concerning the grain size and mixing formula.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer member of l'Ordre des ingénieurs du Québec.
  - .2 Drawings shall indicate the dimensions, the shape, the location and the necessary details concerning the frames.
  - .3 Drawings shall show the design details of formworks and temporary works, which must conform to CSA a 23.1/a 23.2.
- .4 Samples:
  - .1 Submit sample of the proposed insulation.

- .5 Certificates:
  - .1 Submit signed documents certifying that the concrete supplier conforms to standard CAN3-a 23.1, that it is a quality approved concrete and that the expected coefficient of variation is less than 12%:
    - .1 Indicate in writing the elapsed periods between loading and unloading the mixer.
- .6 Test Reports:
  - .1 Submit report determining granular fill beneath concrete slabs is compacted. Independent testing laboratory must indicate compliance with specifications and physical properties.
  - .2 Affidavit: maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples take. Indicate curing compounds compatible with applied concrete finish.
  - .3 Cylinders: carry out testing of concrete and concrete materials using independent testing laboratory in accordance to CSA A23.1/A23.2.
  - .4 Non-Destructive Methods: test concrete to CSA A23.1/A23.2. Make reports on form conforming to CSA A23.1/A23.2, Appendix B.
  - .5 Provide documentation verifying compatibility of ingredients in concrete mixture.
- .7 Pre-installation Meeting Report: submit report to the Departmental Representative confirming granular fill beneath concrete slabs is compacted before casting concrete on it.
- .8 Manufacturer's Reports:
  - .1 Submit copies of reports of work control carried out on site by the manufacturer or his representative.
- .9 Documents/samples to be submitted concerning the sustainable design:
  - .1 Construction Waste Management:
    - .1 Submit the Construction Waste management plan established for the project. Refer to section 01 74 19.

## **1.7 QUALITY ASSURANCE**

- .1 Licensed Professionals:
  - .1 Submit in accordance with Section 01 45 00 - Quality Control.
    - .1 Ensure sealed: formwork, falsework, cross-bracing, underpinning, dewatering systems required to complete work bears stamp and signature of professional engineer member of l'Ordre des ingénieurs du Québec.

## **1.8 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, equipment off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **Part 2 Products**

### **2.1 PERFORMANCE REQUIREMENTS**

- .1 Foundations, slabs on ground and structural:
  - .1 Design criteria:
    - .1 CAN/CSA-A23.3.
    - .2 Sub-Surface Investigation Report.
    - .3 Soil, environmental and climatic conditions.
    - .4 Destination and type of occupancy equipment;
  - .2 Climatic and Seismic Data:
    - .1 Snow:
      - $S_s$  :2.0 kPa.
      - $S_r$  :0.6 kPa.
      - Snow risk factor is : 1.0.
    - .2 Wind:
      - $q$  (1/10) : 0.25 kPa ;
      - $q$  (1/50) : 0.32 kPa ;
      - Risk coefficient  $I_w$ : 1.0.
    - .3 Earthquake:
      - $S_a$  (0,2) : 0.36.
      - $S_a$  (0,5) : 0.22.
      - $S_a$  (1,0) : 0.11.
      - $S_a$  (2,0) : 0.038.
      - PGA : 0.14.
      - Risk coefficient  $I_e$ : 1.0.
  - .3 Performance criteria:
    - .1 The design of foundations must conform to the applicable standards as well as the recommendations of the geotechnical report:
      - .1 Design the type of foundation in accordance with the "Canadian Foundation Engineering Handbook" last edited.
      - .2 Calculating the reinforced concrete elements of foundations in accordance with CSA-a 23.3.
      - .3 Ensure the durability of foundation elements through the use of suitable concrete (depending on the degree of exposure), adequate concrete

- overlay on the frame, suitable casting sequence, appropriate location of control joints, use of galvanized frame as needed, etc.
- .2 The Contractor shall ensure and demonstrate that the design of foundations meets the performance targets presented in this specification.
  - .3 Plan and carry out work in such a way as to avoid any vibrations that may affect the use of nearby buildings. In the absence of less restrictive guidelines, limit the speed of waves to 25.0 mm/sec to existing buildings.
    - .1 Soil Conditions:
      - .1 The Contractor shall consider the recommendations issued in the geotechnical report.
      - .2 He will have to use his own experts to interpret this data and to assess the difficulties in understanding the construction methods to be implemented. If necessary, have the required additional studies done at its expense.
      - .3 The Contractor shall assume full and complete responsibility for any use or interpretation it may make of the geotechnical study report.
      - .4 The inspection building shall be equipped with a freeze-proof foundation following the geotechnical study.
      - .5 The outer slabs must also be able to withstand a rigorous use and freeze-thaw conditions. Slabs should be protected from the effects of freezing appropriately following the recommendations of the geotechnical study.
    - .2 Slabs shall be designed to ensure the proper behaviour of the related equipment.
    - .3 Finishing tolerance: use leveling rule method, very flat classification according to CSA Standard a 23.1/a 23.2, article 22.
  - .4 Sealing devices:
    - .1 The handling slab and the mixing pit shall include continuous water-sealing devices.
    - .2 Sealing devices shall not be deformed or pierced, which may affect their performance.
    - .3 Be careful not to move the frames when installing the sealing devices.
    - .4 The on-site grouting of the sealing devices shall be carried out with the equipment recommended by the manufacturer of seals.
    - .5 The sealing devices shall be securely fastened in place.
  - .5 Perimeter insulation and slab:
    - .1 Rigid insulating panels complying with the CAN/ULC-S701 standard.
    - .2 The panels shall be deposited on a compacted and level embankment.

- .6 Subdrainage System:
  - .1 The bedding material shall be placed on a foundation layer whose slope conforms to the established drainage profile.
  - .2 Gradations to be within limits specified when tested to ASTM C136.
    - .1 The designation of the sieves shall conform to the standard CAN/CGSB-8.1.
  - .3 Drainage pipes shall lay on a base erected according to the established lines and levels, the lower part forming a straight line free from low points and high points:
    - .1 Pipes must rest on the base on their entire length.
  - .4 Make watertight connections to existing drains, new or existing manholes and catch basins.
  - .5 Weeping tile: corrugated, perforated PVC pipe complete with cloth filter fabric sock and washed drainage aggregate mixture of crushed stone or crushed gravel.

## 2.2 SYSTEM PERFORMANCE

- .1 As required to achieve specified performance criteria; functionally compatible with adjacent materials and components, and at minimum meet requirements and relevant standards listed under REFERENCED STANDARDS.
- .2 Slabs-on-grade of the appropriate finish, made in the spaces covered by the programme and adapted to the intended use.

## 2.3 MATERIALS/EQUIPMENT

- .1 Control building:
  - .1 Standard Slabs-on-Grade:
    - .1 Form layer: see geotechnical recommendation.
    - .2 Base layer: see geotechnical recommendation.
    - .3 Concrete: Cast in place 30 MPa, exposure class F-2 4 @ 7% air.
    - .4 Frames: Billet steel bars, of grade 400.
  - .2 Strip footings:
    - .1 Form layer: see geotechnical recommendation.
    - .2 Base layer: see geotechnical recommendation.
    - .3 Concrete: Cast in place 25 MPa, exposure class N, 0 @ 3% air.
    - .4 Frames: Billet steel bars, of grade 400.
  - .3 Foundation walls:
    - .1 Form layer: see geotechnical recommendation.
    - .2 Base layer: see geotechnical recommendation.
    - .3 Concrete: Cast in place 25 MPa, exposure class F-2 4 @ 7% air.
    - .4 Frames: Billet steel bars, of grade 400.

- .4 Floor cover slabs:
  - .1 Concrete: Cast in place 25 MPa, exposure class N, 0 @ 3% air.
  - .2 Frames: Billet steel bars, of grade 400.
- .2 Mixing pit:
  - .1 Radiant, walls and structural slab:
    - .1 Form layer: see geotechnical recommendation.
    - .2 Base layer: see geotechnical recommendation.
    - .3 Concrete: Cast in place 30 MPa, exposure class F-2 4 @ 7% air.
    - .4 Frames: Billet steel bars, of grade 400.
  - .3 Handling slab and related slabs:
    - .1 Form layer: see geotechnical recommendation.
    - .2 Base layer: see geotechnical recommendation.
    - .3 Concrete: Cast in place 35 MPa, exposure class C-1, 5 @ 8% air.
    - .4 Frames: Billet steel bars, of grade 400.
    - .5 Sealant for silane-based chlorides.
  - .4 Subdrainage System:
    - .1 Granular bedding materials: mixture of stone or crushed gravel, sifted, washed, of 25 mm nominal diameter.
  - .5 Other:
    - .1 Accessories: Sealing devices and gaskets.
    - .2 Portland Cement: According to the CSA standard A3001, type GU.
    - .3 Water: According to CSA Standard a 23.1/a 23.2.

## 2.4 QUALITY CONTROL

- .1 Installer/Supplier Qualifications:
  - .1 Submit a document proving that Contractors in concrete coatings conform to standard CAN3-a 23.1.
  - .2 Submit a document certifying that the concrete conforms to standard CAN3-a 23.1.

## Part 3 Execution

### 3.1 INSPECTION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for slab on grade installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of the Departmental Representative.
  - .2 Inform the Departmental Representative of unacceptable conditions immediately upon discovery.

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

### 3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### 3.3 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and data sheets.
- .2 Coordinate the work with the various specialties and ensure that the works allow the installation of the equipment and ancillary materials required for its operation. Cutting the slab to pass underground services is not acceptable.

### 3.4 CONCRETE IN COLD WEATHER

- .1 When the air temperature is 5 °c or less, or when it is likely to come down to that limit during the formwork or hardening period, the requirements of this sub-section concerning concrete in cold weather shall apply.
- .2 All that is necessary for the performance of the work shall be within reach when concrete is to be place in cold weather. This tool and materials must be able to maintain the required temperatures during the placing and during the hardening period of the concrete. The heating systems used shall not have harmful effects on the quality of the concrete or affect the finishing materials in any way. Heating systems releasing carbon monoxide will not be accepted.
- .3 The concrete shall not be deposited on or against formwork, ground, reinforcing steel or any surface with a temperature below 5 °C.
- .4 The temperature of fresh concrete at the time of installation shall be between 15 °C and 30 °C. When the temperature is relatively low, the temperature of concrete should approach the upper limit of 30 °C.

- .5 Effective means must be ensured to maintain the temperature of concrete on all surfaces at a minimum of 20 °C for three days or at a minimum of 10 °C for five days after the formwork. We will have to do what it takes to moisten the air in the confined space, and keep the concrete and the formworks continually damp if a dry heat is used.
- .6 The concrete shall be kept at a temperature at top of gel for a period of seven days; alternative freezing and thawing should be averted for at least fourteen days after setting up.
- .7 Methods of Protection:
  - .1 The requirements for the protection specified above may be maintained using sufficient additional insulation, by sealing the concrete surfaces by means of high tarpaulins (tarpaulins in contact with concrete are absolutely ineffective) or by completely paving the concrete while providing a space for the introduction of heat into the enclosure, if necessary.

Note: Proper protection will depend on the external temperature, wind velocity and massiveness of the concrete.
  - .2 When the outside temperature during the installation of the concrete or during the period of protection established above may fall below -12 °C, a complete wall of concrete structure and an additional source of heat should be provided.
  - .3 When the outside temperature during the installation of concrete or during the period of protection established above may fall below -4 °C, but not less than -12 °C, all concrete surfaces should be adequately covered with high tarpaulins or insulation, in addition to an additional source of heat.
  - .4 When the outside temperature during the installation of concrete or during the period of protection established above can be lowered to -4 °C, all surfaces should be adequately covered with high tarpaulins or insulation and a source of additional heat should be available.
  - .5 At the end of the specified protection period, the temperature of concrete shall be reduced gradually at a rate not exceeding 10 °C per day until the ambient air temperature has been reached.
  - .6 The use of salt or other chemicals for allegedly reducing the freezing point of concrete will not be permitted unless the Consultant has written permission.

### 3.5 IMPLEMENTATION

- .1 Implement the foundations and slabs-on-grade and all related works, products and accessories, including gutters, catch basin, footing, underground drainage system and perimeter insulation, in accordance with the written instructions of the manufacturer, the specifications of the data sheets and the requirements of the standards and the reference documents and the competent authorities.

**3.6 FIELD QUALITY CONTROL**

- .1 Manufacturer's Services:
  - .1 Ensure manufacturer's representative of products provided under this section to review the work involved in handling, installation/application, protection and cleaning, of products and submit written reports, in acceptable format, to verify compliance of Work with Contract.
  - .2 Manufacturer's Site Review: provide manufacturer's site review consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits to review Work, at stages listed:
    - .1 After delivery and storage of products, and when preparatory work, or other 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 total completion of Work, after cleaning is carried out.
  - .4 Obtain report, within 3 days of review, and submit, immediately, to the Departmental Representative.
- .2 Verification:
  - .1 Independent Concrete Inspection and Testing Agency Services:
    - .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Departmental Representative in accordance with CSA A23.1/A23.2 and Section 01 45 00 - Quality Control.
    - .2 The Departmental Representative will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.
    - .3 The Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
    - .4 When concrete is exposed to temperatures below 5 degrees C, during pouring or curing, carry out non-destructive testing to CSA A23.1/A23.2, Appendix A and related ASTM Standards to determine concrete strength prior to stripping formwork.
      - .1 Report results to the Departmental Representative.
    - .5 Inspection or testing by Departmental Representative does not augment or replace Contractor quality control nor relieve him of his contractual responsibility.
- .3 Concrete Tests:
  - .1 Notify testing agency of concreting schedule. Ensure supervisory personnel are on hand when concrete is being cast to observe placing and curing procedures.
  - .2 Use non-destructive methods to CSA A23.1/A23.2 for testing concrete.

- .3 One standard strength is required for each 50m<sup>3</sup> of concrete placed, but not less than one test for each mix design of concrete placed each day.
  - .4 One standard air entrainment test is required for each 50m<sup>3</sup> of air-entrained concrete or portion thereof placed each day.
  - .5 Make slump tests in accordance with CSA standard CSA A23.1/A23.2, Test Method CSA A23.2-5C, with each standard strength test.
- .4 Reinforcement:
- .1 Adjust reinforcement immediately before concrete placed to ensure that all bars are secured in their correct positions. Arrange to have a crew of reinforcing setters on hand as concrete is placed.
  - .2 Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
  - .3 Verify dimensions, tolerances, deflection, expansion and control joints and method of attachment with other work on-site.
  - .4 Finish concrete to manufacturer's instructions.
  - .5 Ensure concrete floors have finish hardness equal or greater than:
    - .1 Strip footing: 20 MPa;
    - .2 Foundation walls: 25 MPa;
    - .3 Slab- on-grade interior and raft floor: 30 MPa;
    - .4 Structural slab and outer slab: 35 MPa.

### 3.7 FINISHING

- .1 Use curing compounds compatible with applied finish on concrete surfaces:
  - .1 Provide written affidavit verifying compounds used are compatible.

### 3.8 CLEANING

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

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section Division 01 and Section A1030.

**1.2 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM C117-13, Standard Test Method for Materials Finer than 75-m (No. 200 Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422-63 2007 e1, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698-12e1, 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 D1557-12, 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 D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
- .3 CSA Group:
  - .1 CSA A23.1/A23.2-F09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .4 National Building Code of Canada (NBC):
  - .1 National building code – Canada 2015 (NBC)

**1.3 DEFINITIONS**

- .1 Excavation classes: 2 classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock: solid material more than 0.25m<sup>3</sup> and which cannot be removed by means of mechanical excavating equipment with 0.95 to 1.15m<sup>3</sup> bucket. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .3 Waste material: excavated material unsuitable for use in work or surplus to requirements.

- .4 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

#### **1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submit the documents and samples required in accordance with Section 01 33 00-Submittal Procedures.
- .2 Data sheets:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for grain sizes.
- .3 Samples:
  - .1 Submit 70kg samples of type of unshrinkable fill, fill specified including representative samples of excavated material.
  - .2 Ship samples to the laboratory responsible for the control of materials.
  - .3 Submit detailed description of pugging types and fill proposed for project, including sieve sizes and amount of material passing each sieve.
- .4 Certificates:
  - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Test Reports:
  - .1 Submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

#### **1.5 QUALITY ASSURANCE**

- .1 Testing Agencies:
  - .1 Testing of pugging, fill and compaction of backfill will be carried out by approved testing laboratory engaged by Departmental Representative.
    - .1 Do not commence with work until fill materials have been tested and approved.
    - .2 Engage qualified inspection company to review excavation, compaction and backfill.
- .2 Licensed Professionals:
  - .1 Professional engineer responsible for design of temporary structures to submit proof of insurance coverage for professional liability except where engineer is employee of Contractor, in which case Contractor will submit proof that work by professional engineer is included in Contractor's insurance coverage.

**1.6 DELIVERY, STORAGE AND HANDLING**

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

**Part 2 Products****2.1 OVERALL PERFORMANCE REQUIREMENTS**

- .1 Grading and Drainage:
  - .1 Engage qualified Professional Engineer licensed to practise in the Province the design work for the levelling and site drainage and the retaining structures and, fill. Leveling profiles must be determined according to the planned layout of the field and illustrated in the annexed document.
  - .2 Give field an appropriate slope to ensure effective drainage. Ensure that runoff is not evacuated to adjacent properties or structures.
  - .3 Give field a slope shaped in the opposite direction from the building.
  - .4 Provide detailed drawings to illustrate proposed methods of soil and slope stabilization bearing seal of Professional Engineer licensed to practise in the Province.
- .2 Shoring, Bracing and underpinning:
  - .1 Engage services of qualified professional engineer who is registered or licensed to practise in the Province, Canada, in which work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for work.
  - .2 Submit design and supporting data sheets at least 2 weeks prior to commencing work.
  - .3 Design and supporting data submitted to bear stamp and signature of qualified Professional Engineer registered or licensed in the Province.
- .3 Protection:
  - .1 Take precaution to protect adjacent structures, paving, services, trees, and planting from damage, movement, or settlement during work. Repair damaged or deteriorated structures and components during the performance of workd.
  - .2 Protect excavations from freezing, free of standing water, and loose soil.
  - .3 Dewater Excavations so concrete or services may be placed in dry condition.
  - .4 Maintain access roads to prevent accumulation of mud on roads.

- .5 Conduct, with Departmental Representative condition survey of existing buildings, trees and plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work prior to commencing work.
  - .6 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of the Departmental Representative.
  - .7 Where required for excavation, cut roots or branches as approved by the Departmental Representative.
- .4 Existing Utilities: verify, establish location, and protect existing utilities during course of work. Co-ordinate with and obtain approval from the Departmental Representative for rerouting of existing services entering excavation area. Maintain operational services to other buildings and properties. Record location of rerouted and abandoned services.

## 2.2 MATERIALS

- .1 Filler materials/fill type 1:
  - .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 In tests carried out in accordance with ASTM C136 ASTM C117 Standards, the material size shall be within the limits indicated below. Sieves shall conform to CAN/CGSB-8.1.
- .2 Filler materials/fill type 2:
  - .1 Crushed, pit run or screened stone, gravel or sand.
  - .2 In tests carried out in accordance with ASTM C136 ASTM C117 Standards, the material size shall be within the limits indicated below. Sieves shall conform to CAN/CGSB-8.1.
- .3 Filler materials/fill type 3: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75mm, cinders, ashes, sods, refuse or other deleterious materials.
- .4 Filler materials/fill type 4: unshrinkable fill, proportioned and mixed to provide:
  - .1 Maximum compressive strength of 0.4MPa at 28 days.
  - .2 Maximum Portland cement content of 25kg/m<sup>3</sup>.
  - .3 Minimum strength of 0.07MPa at 24 hours.
  - .4 Concrete aggregates: to CSA A23.1/A23.2.
  - .5 Portland cement: Type 10.
  - .6 Slump: 160 to 200mm.
- .5 Excavated material: non-organic excavated or graded material free of contaminants will be used as fill when approved by qualified professional engineer licensed to practise in the Province, Canada.
- .6 Shearmat: honeycomb type bio-degradable cardboard 100mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

**Part 3 Execution****3.1 INSPECTION**

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

**3.2 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to [requirements of authorities having jurisdiction] [sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Locate extent of building to be constructed under this contract.
  - .1 Set out pertinent lines, grades and levels required for proper and accurate setting out of this Work. Maintain accuracy of line and grade stakes during construction.
  - .2 Identify and protect items designated to remain.
  - .3 Disconnect, cap, and re-route utilities entering buildings to be demolished or relocated. Co-ordinate with Departmental Representative to minimize disruption to base when work on active or utilities designated to remain is required.

**3.3 STRIPPING OF TOPSOIL**

- .1 Do not strip soil while in wet or frozen condition.
- .2 Commence topsoil stripping of designated areas after work specified in Section has been completed.
- .3 Avoid mixing topsoil with sub-soil. Stockpile in locations as directed by the Departmental Representative.
- .4 Dispose of unused topsoil.

**3.4 EXCAVATION**

- .1 Excavate to lines, grades, elevations required by work.
- .2 Excavation must not interfere with normal 45-degree slope of bearing from bottom of footings.
- .3 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .4 Do not obstruct flow of surface drainage or natural watercourses.
- .5 Correct unauthorized over-excavation as follows:
  - .1 Fill under bearing surfaces with concrete of same strength as foundations.
  - .2 Fill under other areas with [list fill type compacted to not less than 98% of corrected maximum dry density.
  - .3 Excavate for slabs and paving to subgrade levels. Remove topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

**3.5 EXCAVATION AND COMPACTION**

- .1 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .2 Use filler and backfill materials types as indicated or specified below. Compaction densities obtained by compaction are percentages of maximum densities obtained from corrected maximum dry density.
- .3 Exterior side of perimeter walls: Type 3 fill to subgrade level. Compact to 95%.
- .4 Within building area: use Type 2t o underside of base course for floor slabs. Compact to 98%.
- .5 Under concrete slabs: provide 150mm compacted thickness base course of Type 1 fill. Compact base course to 100%.
- .6 Place backfill and fill material in 150mm maximum lifts.
- .7 Do not backfill around or over cast-in-place concrete within 24hours after placing of concrete.
- .8 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 300mm.
- .9 Where temporary unbalanced earth pressures are liable to develop on walls or other structures, permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure.

**3.6 RESTORATION**

- .1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as directed by the Departmental Representative.

**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.

**END OF SECTION**

**Part 1            General****1.1                RELATED REQUIREMENTS**

- .1    Division 01
- .2    Section D2010
- .3    Section D2020
- .4    Section D2030
- .5    Section D3000
- .6    Section D3010
- .7    Section D3020
- .8    Section D3040
- .9    Section D3080
- .10   Section 406300

**1.2                PERFORMANCE**

- .1    The bidder Contractor shall be responsible for the performance to be obtained and shall demonstrate it. He is responsible for the design, construction, performance, capacity, dimensions, fittings, minimum standards, availability of spare parts and delivery time.
- .2    This contract is an installation, proven, complete and ready for efficient operation. This also includes all items, parts, equipment, tools, services, labor, accessories, etc., which are not specifically indicated in the specification or drawings, but which are required for proper operation.
- .3    Plans and sketches provided are indicative, they define the result to be obtained. They indicate schematically the approximate location of the devices and connection piping. In no case should it be used as erection drawings. The responsibility for the preparation of these drawings rests with the Contractor.
- .4    All appliances shall be installed according to manufacturer's recommendations.

**1.3                MECHANICAL DESCRIPTION**

- .1    Mechanical equipment provided by the Client, see list of Section 01 11 00, the Contractor is responsible for installing, unloading, storing, unpacking. Level, assemble, set up, connect and protect the equipment supplied by the Owner.
- .2    The work of mechanical sections is described in a non-exhaustive manner as follows:
  - .1    Domestic water:
    - .1    Make connection to the Existing one.
    - .2    Provide for the necessary backflow protection.
    - .3    Provide a water heater for the sink.
    - .4    Install the sink with all accessories.
    - .5    Provide for outdoor watering outlets.

- .6 Feed the bioreactor for filling (25 mm) and the mixing tank (25 mm).
- .2 Wastewater disposal:
  - .1 Coordinate a sump with other Contractors.
  - .2 Install a submersible pump to evacuate the water, make it easier to maintain.
  - .3 The drainage fitting shall be carried out by the Owner, install the piping to the ceiling of the mechanical room with closing valve.
  - .4 Draining of sanitary appliances.
  - .5 Coordinate all work and design with automation.
- .3 Heating:
  - .1 Install the boiler supplied by Client, the chimney must be supplied and installed by the heating Contractor.
  - .2 Supply and install the fresh air intake for the gas burner.
  - .3 Ensure the distribution of the heating fluid;
  - .4 Supply and install the condenser on network.
  - .5 Provide for all accessories; expansion tank, filling system, foresee a capacity for the future on network of 50%;
  - .6 Mixing pit, install two water/glycol heating loops with all accessories, control valves etc.
  - .7 Bioreactor, connect the heating loops and install the control valves and all accessories.
  - .8 Install the piping between the control building and the pigsty see, plan for connection point.
  - .9 Coordinate all work and design with automation.
- .4 Ventilation:
  - .1 Ensure all ventilation as shown in plans.
  - .2 No air conditioning.
  - .3 All fresh air heaters will be by water/glycol.
  - .4 Coordinate all work and design with automation.
- .5 Automation:
  - .1 Refer to Section 40 63 00.

**Part 2 Products****2.1 NOT USED****Part 3 Execution****3.1 NOT USED****END OF SECTION**

**Part 1            General**

**1.1                SUMMARY**

- .1    Section Includes:
  - .1    Materials and installation for plumbing fixtures.
  - .2    Service sinks.
  - .3    Anti-backflow device.

**1.2                RELATED REQUIREMENTS**

- .1    Division 01, 23 and D.

**1.3                REFERENCE STANDARDS**

- .1    Canadian Standards Association (CSA International):
  - .1    CAN/CSA B45 Series-02, Plumbing Fixtures.
  - .2    CAN/CSA B125-01, Plumbing Fittings.
  - .3    CAN/CSA-B651-12 (R207)], Barrier-Free Design.
- .2    Health Canada/Workplace Hazardous Materials Information System (WHMIS):
  - .1    Material Safety Data Sheets (MSDS).

**1.4                DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1    Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Data sheets:
  - .1    Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
- .3    Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .4    Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties:
  - .1    Provide a drinking water analysis report at sink.
- .5    Instructions: submit manufacturer's installation instructions.

**1.5                QUALITY ASSURANCE**

- .1    Meet requirements in Section 01 45 00 - Quality Control.
- .2    Fixtures and Fittings: CSA approved, similar product type from same manufacturer, preferably Canadian made.

**Part 2            Product**

**2.1                MATERIALS**

- .1            Fixtures: free from flaws and blemishes, clear, smooth and bright surface finish.

**2.2                SINKS**

- .1            Sinks:
  - .1            Characteristics: Bowl non-staining material, made in one piece, with two (2) hole drilling in ledge back for faucet.
  - .2            Size of vessel: minimum 120 l.
  - .3            Valve and devices: chromed with swing spout, with goose neck faucet, aerator. Heavy-duty construction.

**2.3                FIXTURE PIPING**

- .1            Supply: rigid, metallic, individual shut-off valves, escutcheon at wall in exposed areas.
- .2            Waste: metallic, with P trap and cleanout on fixtures with no integral trap.

**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                INSTALLATION**

- .1            Locate plumbing fixtures at locations and in numbers indicated.
- .2            Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers and escutcheons.
- .3            Install faucets and hose connections with vacuum breakers.
- .4            Clean exposed fixtures after installation is complete.

**3.3                FIELD QUALITY CONTROL**

- .1            Site Tests/Inspection.
  - .1            Operate equipment and verify that performance criteria specified in this section has been achieved.
  - .2            Pressure test piping to same standards as domestic water piping code requirements.

**3.4 CLEANING**

- .1 Perform cleaning operations.

**END OF SECTION**

**Part 1        General****1.1            RELATED REQUIREMENTS**

- .1        Division 01, 23 and D.

**1.2            SUMMARY**

- .1        Section Includes:
  - .1        Domestic Water Piping:
    - .1        Pipe Components.
    - .2        Joint and Fitting Components.
    - .3        Unions and Flanges.
    - .4        Valves.
  - .2        Components:
    - .1        Nozzles for flexible hose.
    - .2        Drain/discharge valves.
    - .3        Shock absorber.
  - .3        Equipment/Ancillary device:
    - .1        Domestic water heater.
    - .2        Anti-frost water sockets, mural;
    - .3        Backflow prevention devices.

**1.3            REFERENCE STANDARDS**

- .1        American Society of Mechanical Engineers (ASME):
  - .1        ASME B16.18-2018, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .2        ASME B16.22-2018, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - .3        ANSI/ASME BPVC-2016- BPVC Section IX - Welding and Brazing Qualifications.
- .2        American Society for Testing and Materials International, (ASTM).
  - .1        ASTM B32-16, Standard Specification for Solder Metal.
  - .2        ASTM B88-16, Standard Specification for Seamless Copper Water Tube.
  - .3        ASTM C547-2017, Standard Specification for Mineral Fiber Pipe Insulation.
  - .4        ASTM F877-18a, Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems.
  - .5        ASTM F1807-18, Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing.

- .3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
  - .1 ASHRAE 90.1-[2001], Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .4 National Research Council Canada (NRC)
  - .1 National Plumbing Code of Canada 2015 (NBC).

#### **1.4 DESIGN PERFORMANCE REQUIREMENTS**

- .1 Size piping and select fittings: greater than minimum local plumbing code requirements.
- .2 Hot Water: size and select piping, equipment and insulation to ensure minimum hot water temperature of 50degrees C in 10 seconds or less at any domestic hot water outlet.
- .3 Insulate hot and cold-water piping to meet design temperature requirements, and to prevent condensation.

#### **1.5 DOCUMENTS/SAMBLES TO BE SUBMITTED FOR APPROVA/INFORMATION**

- .1 Submit documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data sheets: Provide technical data sheets for devices and equipment.
- .3 Operation and Maintenance Manual: submit instructions for operation and maintenance of proposed equipment and materials, and spare parts lists.
- .4 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

#### **1.6 QUALITY ASSURANCE**

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

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

- .1 Comply with Section 01 45 00 - Quality Control.
- .2 Equipment: similar product type from same manufacturer, preferably Canadian made.

**Part 2 Products****2.1 MATERIALS/EQUIPMENT**

- .1 Pipe, Joints, and Fittings.
  - .1 Copper Pipe: ASTM B88 with ASME B16.22 wrought copper or ASME B16.18 cast copper, brass and bronze fittings, ASTM B32 solder, or ASTM B664 brazed joints.
  - .2 DWV Copper (evacuation/ventilation): ASTM B306.
- .2 Joints and Fittings:
  - .1 Wrought Copper Fittings: ASME B16.22.
  - .2 Cast Copper, Brass and Bronze Fittings: ASME B16.18.
  - .3 Solder Joints: ASTM B32.
  - .4 Brazed Joints: ASTM B664.
- .3 Insulation: ASTM C547, with sufficient insulating value to prevent sweating on cold pipes, and maintain hot water temperature requirements at fixtures on hot pipes.
  - .1 Pipe: minimum 13mm thick, with vapour barrier on cold pipe.
  - .2 Equipment: size and material to maintain maximum 40 degrees C equipment surface temperature during operation.

**2.2 VALVES**

- .1 Isolation Valves: type designed for tight seal in closed position, with no measurable leakage at 150% design system pressure.
- .2 Drain Vales: same as isolation valves.
- .3 Throttling Valves: type designed to smoothly throttle flow of water from 0 to full design flow capable of withstanding 150 degrees C fluid temperature on hot piping.
- .4 Check Valves:
  - .1 Designed to prevent backflow of water as determined by plumbing code.
  - .2 Use spring loaded check valves where high upstream water pressure may prevent swing check valves from performing.
- .5 Anti-frost water socket, wall-mounted:
  - .1 Surface-mounted water socket, equipped with an incorporated vacuum breaker, of a nominal diameter flexible hose nozzle of NPS  $\frac{3}{4}$  and with a removable operating key, with a chrome finish.
- .6 Anti-backflow device:
  - .1 B64 Series CSA-compliant devices, destination dual-valve blocks, with intermediate breather vent.
- .7 Water hammer arrester: According to the PDI WH201 standard.

**2.3 DOMESTIC HOT WATER EQUIPMENT**

- .1 Heat Generation:
  - .1 System: to ASHRAE 90.1.
  - .2 Heating capacity system must be 2500 W.
  - .3 Tanks must have a volume of 20 gallons.
  - .4 Energy Supply: electricity.

**Part 3 Execution****3.1 INSTALLATION**

- .1 Install piping, material and equipment to manufacturer's recommendations.
- .2 Provide domestic water distribution system, including fittings required to service fixtures and equipment.
- .3 Insulate domestic water piping.
- .4 Piping Installation:
  - .1 Maintain minimum 2% grades.
  - .2 Provide drain capability at low points.
  - .3 Install piping to conserve headroom and space.
  - .4 Route above grade piping parallel to walls.
  - .5 Where practicable, group piping at common elevations.
  - .6 Install concealed pipes close to building structure to keep furring to a minimum.
  - .7 Avoid joints in piping below grade; use continuous length pipe.
  - .8 Shut off valves:
    - .1 Install these valves in accessible areas, if possible, to facilitate maintenance.
    - .2 Install shut off valves on the water supply lines of appliances or groups of sanitary appliances and equipment.
- .5 Water Hammer Arresters:
  - .1 Install to PDI-WH201.
  - .2 Locate in supply water lines at each fixture or group of fixtures, to prevent discernable water hammer during normal fixture operation.
  - .3 Provide with accessible isolation valve for hammer arrestor devices.
- .6 Install vacuum breakers on plumbing lines where contamination of domestic water may occur.
- .7 Weld piping to ASME Section IX.

**3.2 VERIFICATION**

- .1 Operate equipment and verify that performance criteria specified in this section has been achieved.

**END OF SECTION**

**Part 1        General****1.1            RELATED REQUIREMENTS**

- .1        Division 01, 23 and D

**1.2            SUMMARY**

- .1        Section Includes:
  - .1        Materials, equipment and installation for methods associated with sewage disposal systems, including requirements for exhaust piping, vent pipe associated, insulating, special devices and other components of such systems.
  - .2        Waste and Vent Piping Systems:
    - .1        Cast iron soil pipe.
    - .2        PVC pipe for buried pipe.
  - .3        Waste Piping Specialities:
    - .1        Clean-outs and clean-out access covers.
    - .2        Sumps.
  - .4        Waste Piping Equipment:
    - .1        Submersible bilge and sewage pumps.
  - .5        Waste Piping Insulation:

**1.3            REFERENCE STANDARDS**

- .1        American National Standards Institute (ANSI)
  - .1        ANSI B16.23-16, ANSI B16.23-16, Cast Copper Alloy Solder Joint Drainage Fittings: DWV.
  - .2        ANSI B16.29-17, Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings: DWV.
- .2        American Society for Testing and Materials International (ASTM)
  - .1        ASTM B32-08 (2014), Standard Specification for Solder Metal.
  - .2        ASTM B306-13, Standard Specification for Copper Drainage Tube (DWV).
  - .3        ASTM B664-90 (R2012)], Standard Specification for 80% Silver-20% Graphite Sliding Contact Material.
  - .4        ASTM C564-14, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
  - .5        ASTM G17-[88(1998)], Standard Test Method for Penetration Resistance of Pipeline Coatings (Blunt Rod).
- .3        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB 51-GP-52M-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

- .4 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-B70-06, Cast Iron Soil Pipe, Fittings and Means of Joining.
  - .2 CAN/CSA-B1800-18-B181.1, ABS Drain, Waste and Vent Pipe and Pipe Fittings.
  - .3 CAN/CSA-B1800-18-B182.11, Recommended Practice for the Installation of Thermoplastic Drain, Storm and Sewer Pipe and Fittings.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 National Research Council Canada (NRC)
  - .1 National Plumbing Code of Canada 2015 (NPC).
- .7 Provincial Plumbing Code.

#### **1.4 PERFORMANCE REQUIREMENTS**

- .1 Design sanitary waste systems and install components in accordance with applicable regulations of plumbing code.
- .2 Provide water and drainage connections to equipment furnished by the DCC Representative.
- .3 Design system to accommodate sanitary waste piping from fixtures in facility with allowance for modest future expansion.
- .4 Design grade for horizontal sanitary waste piping: minimum 2% in direction of flow.
- .5 Route pipes in an orderly manner, and maintain proper grades.
- .6 Design piping routing located parallel to walls and adjacent building elements.
- .7 Design building connections to street main: minimum of 1500mm below finished grade.

#### **1.5 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data sheets:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
  - .2 Submit material safety data sheets according to WHMIS Hazardous Materials Information System.
- .3 Shop Drawings:
  - .1 Submit Shop Drawings to indicate project layout:
    - .1 Vertical and horizontal piping locations and elevations and connections details.
    - .2 Drain and trap locations, size, type, anchor and installation details, and finishes.
    - .3 Submit shop drawings for packaged submersible pumps and controls.

- .2 Submit information on operating mechanisms and electrical connections, finishes and location of manufacturer's nameplates.
- .3 Submit catalogue details for types of pump illustrating profiles, dimensions and methods of assembly.
- .4 Include schedule identifying units and their locations.
- .4 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .5 Certificates: submit certificates signed by manufacturer, certifying that materials comply with specified performance characteristics and physical properties.
- .6 Instructions:
  - .1 Submit manufacturer's installation instructions.
  - .2 Submit manufacturer's instructions for commissioning activities for equipment provided in this section.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Waste and Vent Piping Systems:
  - .1 Copper tube components.
    - .1 Pipe: DWV Copper Tube: to ASTM B306.
    - .2 Joint and fitting components.
      - .1 Wrought copper fittings: to ANSI B16.29.
      - .2 Cast copper, brass and bronze fittings: to ANSI B16.23.
      - .3 Solder joints: to ASTM B32.
      - .4 Brazed joints: to ASTM B664.
  - .2 PVC Pipe Components:
    - .1 Pipe: PVC plastic pipe to CAN/CSA-B181.2.
    - .2 PVC solvent cement: to ASTM D2564.
    - .3 ABS-PVC solvent cement: to ASTM D3138.
- .2 Waste Piping Specialties:
  - .1 Clean-outs and clean-out access covers:
    - .1 Provide caulked or threaded type clean-outs extended to finished floor or wall surface. Provide bolted clean-out cover plates on vertical rainwater leaders only. Ensure ample clearance at clean-out for rodding of drainage system.

- .2 Provide access covers for floors in unfinished areas: round with nickel bronze serrated frames and plates. Provide round access covers in finished areas with depressed centre section to accommodate floor finish. Provide wall clean-outs with chrome plated caps.
- .3 Waste Piping Equipment:
  - .1 Submersible bilge and sewage pumps:
    - .1 Type: completely submersible, vertical, centrifugal.
    - .2 Casing: cast iron volute and oil filled motor chamber.
    - .3 Impeller: bronze, non-clog with corrosion resistant alloy steel shaft.
    - .4 Bearings: anti-friction ball or roller.
    - .5 Accessories: oil resistant power cord with three prong connectors on single phase, fractional horsepower units only.
    - .6 Duplex Controls: packaged pre-wired alternator with mercury type liquid level controls and control panel to cut in second pump on rising level or pump failure, and separate liquid level control for high level alarm.
  - .2 Sump: reinforced concrete sumps, complete with necessary drainage fittings, 10mm checked steel plate covers with gasket seal frames anchor bolts.

### **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 INSTALLATION**

- .1 General.
  - .1 Install components in accordance with CAN/CSA-B182.11.
  - .2 Route and install piping to maintain design grades.
  - .3 Install components to conserve headroom and space.
  - .4 Install concealed piping close to building structure to minimize furring.
  - .5 Group piping at common elevations.

**3.3 PIPE SCHEDULE**

- .1 Install sanitary drain and vent lines as follows:

SERVICE	PIPE	FITTING	JOINT
DWV, above grade	Cast Iron, Hub-less	Mechanical joint	Clamped
DWV, Copper	Cast Bronze	Soldered 50-50, tin-lead	
DWV, Copper	Wrought Copper	Soldered 50-50, tin-lead	
PVC	PVC	Solvent Weld	
DWV, Buried	Cast Iron, Hub-less	Mechanical joints	Clamped
PVC	PVC	Solvent Weld	
Special Waste	Epoxy Coated Cast Iron, Hub-less	Mechanical Joint	Clamped

**3.4 CLEANING**

- .1 Perform cleaning operations.

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Division 01, 23 and D

**1.2 REFERENCE STANDARDS**

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
  - .1 ASHRAE/IESNA 90.1-2016, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
  - .1 Material Safety Data Sheets (MSDS).
- .3 National Research Council Canada (NRC):
  - .1 National Energy Code of Canada for Buildings 2017 (NECB).
  - .2 ANSI/CSA B149.1-15 - NATURAL GAS AND PROPANE INSTALLATION CODE.
  - .3 ANSI/CSA B149.6-15 – CODE FOR DIGESTER GAS, LANDFILL GAS, AND BIOGAS GENERATION AND UTILIZATION.

**1.3 DESIGN PERFORMANCE REQUIREMENTS**

- .1 Ambient Design Conditions:
  - .1 Exterior:
    - .1 Winter: to local building code for project location, 1% January design temperature and wind velocity of 4.6 m/s.
    - .2 Summer: to local building code for project location, 2.5% July design day and wet bulb temperature, wind velocity of 2.3 m/s.
  - .2 Interior:
    - .1 General interior spaces: 21 degrees C, no workstation in premises, the relative humidity level is not controlled.
    - .2 None of the rooms shall contain materials that would require the room to be categorized as "hazardous Area" according to code. That neither biogas nor sludge from the process should pass or be stored in the building (the presence of biogas for consumption is an exception).
    - .3 All wall and roof openings will have to be waterproof.
- .2 Energy Considerations:
  - .1 Design and select mechanical systems to NECB.
- .3 Air Quality:
  - .1 Carbon dioxide: limit maximum carbon dioxide levels to 800 ppm.
  - .2 Locate fresh air intakes to prevent contamination by external sources such as road traffic, smoke stacks or exhaust outlets.

- .4 Heating:
  - .1 The design criteria for the equipment supplied and installed by Contractor shall be according to the boiler's full capacity. The performance of boiler must not be reduced;
  - .2 Heating of mixing pit, the heating system will have to increase the temperature of its contents by 15 °C in 24 hours. The max temperature of product is 30 °C:
    - .1 Pit may contain 95 000 kg of organic sludge with an average thermal capacity of 4kJ/(Kg K).
- .5 Ventilation:
  - .1 Minimum ventilation:
    - .1 Ensure a fresh air rate of 6 continuous changes/time.
    - .2 Other areas: 4.0 L/s/m<sup>2</sup> or 5 air changes per hour regardless of internal loads, whichever is greater.
    - .3 Spaces to be ventilated with new air at 100%.

#### 1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION

- .1 Submit documentation of design approach in NECB recommended format. Indicate whether building will be designed to prescriptive, performance or trade-off approaches.
- .2 Submit documentation for approval:
  - .1 Indoor design temperatures.
  - .2 Ductwork: static pressure and leakage class.
  - .3 Insulation piping and air ducts.
  - .4 Location of registers and thermostatic controls.
  - .5 Control zones/temperature and flow controls.
  - .6 Efficiency of unit and packaged heating equipment.
  - .7 Power requirements for operation of HVAC systems; air renewal rates and type of control/regulation systems.
  - .8 Types and capacities of appliances and systems for heating and cooling/air freshener, and type of control/regulation systems.
  - .9 Pumps: details of systems with variable flow.
  - .10 Heat recovery ventilators: description of characteristics.
  - .11 Sanitary water distribution networks and related control/regulation systems.
  - .12 Statement of design intent and operation for mechanical systems including:
    - .1 Intended function.
    - .2 Plans, drawn to scale, that indicate nature and extent of work to show conformance with NECB.
    - .3 System capabilities at design conditions.
    - .4 Performance characteristics.
    - .5 Distribution arrangement.
    - .6 Sequence of operation.

- .7 Start/Stop procedures.
  - .8 Adjustment procedures.
  - .9 Change over sequences.
  - .10 Start-up and shut-down sequences.
  - .11 Schematic and control diagrams of systems.
- .3 Tag schedule: submit six identification flow diagrams for each system. Include valve tag schedule, designating number, service, function and location of each tagged item and normal operating position of each valve.

## **1.5 QUALITY ASSURANCE**

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

## **Part 2 Products**

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

**END OF SECTION**

**Part 1            General**

**1.1                SUMMARY**

.1            Section Includes:

- .1            Materials, equipment, methods installation associated with devices and following elements:
  - .1            Boilers.
  - .2            Auxiliary Equipment.
  - .3            Expansion tank.
  - .4            Glycol filling system.
  - .5            Heat transfer fluid.
  - .6            Condenser.

**1.2                RELATED REQUIREMENTS**

- .1            Division 01, 23 and D

**1.3                REFERENCE STANDARDS**

- .1            American Boiler Manufacturer's Association (ABMA).
- .2            American Petroleum Institute (API):
  - .1            Standard 610-04, Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries.
- .3            American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
- .4            American Society of Mechanical Engineers (ASME) Codes.
- .5            American Society for Testing and Materials International (ASTM):
  - .1            ASTM A53/A53M-18, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - .2            ASTM A106-18, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
- .6            Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1            Material Safety Data Sheets (MSDS).
- .7            National Electrical Manufacturers Association (NEMA)
  - .1            ANSI/NEMA MG 1 (R2016), Motors and Generators.
  - .2            NEMA 250- (R2014), Enclosures for Electrical Equipment (1000 Volts Maximum).

- .8 National Fire Protection Association (NFPA)
  - .1 NFPA 90A (R2018), Standard for the Installation of Air Conditioning and Ventilating Systems.
  - .2 NFPA 255 (R2016), Standard Method of Test of Surface Burning Characteristics of Building Materials.
- .9 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102 (R2018), Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

#### **1.4 DESIGN REQUIREMENTS**

- .1 Piping: size piping and fittings to ASHRAE pipe sizing standards, to maintain conditions specified by equipment manufacturers.
- .2 Performance Requirements: ANSI Z21.13 (R2017)/CSA 4.9 (F2017) testing procedures.
- .3 Nominal heat output:
  - .1 Hot water/glycol appliances must maintain the manufacturer's original performance. All accessories must ensure the performance of equipment.

#### **1.5 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data sheets:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet for Pumps and Auxiliary Equipment.
- .3 Submit complete start-up report indicating start-up and system verification sequences.
- .4 Certificates: In collaboration with the boiler manufacturer, submit the documents signed by the manufacturer, certifying that the products, materials and equipment comply with requirements for physical properties and performance characteristics.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include data as follows:
  - .1 Indicate: brief description of heat generation equipment and components.
  - .2 Provide for units, manufacturer's name, type, year, number of units, and capacity.

#### **1.6 QUALITY ASSURANCE**

- .1 Meet requirements of Section 01 45 00 - Quality Control.
- .2 Provide products from same manufacturer.
- .3 Provide equipment with required ASME plate and stampings.

- .4 Pre-Installation Meeting:
  - .1 Convene pre-installation meeting one week prior to beginning of work in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart in which the following will be carried out:
    - .1 Verify project requirements.
    - .2 Review installation and substrate conditions.
    - .3 Co-ordination with other building subtrades.
    - .4 Review manufacturer's installation instructions and warranty requirements.
  - .5 Health and Safety:
    - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

## **Part 2 Products**

### **2.1 MATERIALS/EQUIPMENT**

- .1 Pumps:
  - .1 Materials: API 610, ASME.
  - .2 Motor: ANSI/NEMA MG 1 (R2016).
- .2 Piping and Fittings:
  - .1 Piping and Fittings: ASTM A53/A53M-18 Grade B and ASTM A106/A106M-18, Grade B.
  - .2 Steam and Hot Water Piping: Schedule 40.
  - .3 Valves and Fittings: rated for pressure of service in which they are used.
- .3 Insulation:
  - .1 Maximum flame spread 25, maximum smoke developed 50 to CAN/ULC S102 (R2018) NFPA 255 (R2006).
  - .2 Adhesives, sealers, vapour coating, mastics, laggings and bedding: material which does not soften, corrode or deteriorate in wet or dry state, of type recommended by insulation manufacturer for the proposed application.
  - .3 Provide low odour, low volatile organic compound (VOC) materials.
- .4 Expansion tank:
  - .1 Expansion tank: horizontal or vertical, steel, diaphragm, pressurized.
  - .2 Membrane: Sealed in tank, made of EPDM, able of withstanding a service temperature of 115 degrees Celsius.
  - .3 Working pressure: 520 KPa device must bear the ASME homologation stamp.
  - .4 Preload: Air at an initial filling pressure of network.
  - .5 Brackets with anchor bolts and installation templates with built-in seismic devices.
  - .6 Renewable Membrane.

- .7 Provide the capacity for the 50% network expansion.
- .5 Glycol filling system:
  - .1 Complete pressurization system with:
    - .1 Minimum tank of 200 litres.
    - .2 Pressure switch;
    - .3 Level switch.
    - .4 Gear pump.
    - .5 Control panel with alarm.
- .6 Heat transfer fluid:
  - .1 Propylene glycol solution to 50% by weight of propylene glycol and water. Propylene glycol must contain a corrosion inhibitor.
  - .2 The Contractor shall adjust the PH of the glycol according to the recommendations of the equipment manufacturer (boiler).
  - .3 A mixture quality and PH analysis report shall be provided.
- .7 Mixing pit piping and heating system:
  - .1 Pipe Materials: The pipes are in crosslinked polyethylene (XLPE):
    - .1 Oxygen Barrier: The hoses will have an oxygen barrier that can limit the migration of oxygen through their walls at a maximum rate of 0.10 g/m<sup>3</sup>/day at a water temperature of 104 °f (40 °c) according to DIN 4726.
    - .2 XLPE hoses shall be manufactured in accordance with ASTM F876.
    - .3 XLPE pipes shall have a hydrostatic design and standard pressure capacities of 200 °F (82 ° C) at 100 psi (689 kpa) and 73.4 °F (23 °C) to 160 psi (1 102 kPa). The pressure and temperature capabilities will be established by the Plastic Pipe Institute (PPI), a division of the Society of the Plastic Industry (SPI).
    - .4 The minimum bend radius for cold bending of XLPE pipes shall not be less than 6 times the outer diameter. A bending medium provided by the pipe manufacturer shall be used in the case of any bending with a radius lower than that indicated.
  - .2 Manifold Materials: Manifold will be completely assembled and mounted on a durable bracket with an end cap on manifold and an end cap with vent and drain on return leader. The manifold will have an inside diameter of 1 1/4 in. For unrestricted flow characteristics. The manifold will have union R32 fittings on the inlet side to allow the use of various adapters connection. Temperature indicators to the admission, with Pommelle and shutoff valve, will ensure complete insulation of manifold:
    - .1 Manifold Type: with built-in balancing valve on each loop.
    - .2 Manifold will be supplied by the pipe manufacturer.
    - .3 Manifold will have manual air bleeders part of the return.
    - .4 Manifold shall be made of brass.
    - .5 Manifolds will be supplied with the manufacturer's mounting brackets.

- .6 Manifold will be supplied with ball valves with temperature indicator on supply and return;
- .7 Manifold will be supplied with flow indicator for each loop.
- .3 Fittings Materials: Fittings will be made of dezincification-resistant brass or poly sulfonated:
  - .1 The fittings will be supplied by the pipe manufacturer.

## 2.2 BOILERS

- .1 Review site conditions to ensure equipment meets accessibility requirements specified, and for maintenance requirements as identified by manufacturer.
- .2 Accessories: piping, valves and accessories to achieve a complete heating system, with connections to energy supply piping and heat distribution piping.
- .3 Insulate to maintain maximum equipment skin temperature of 57 degrees C at ambient room temperature of 32 degrees C.
- .4 Measuring devices: manometers and thermometers mounted on intake fittings and outlet fittings of fluid and to all critical locations.

## 2.3 FABRICATION

- .1 Pipe and Fittings: Size piping to handle maximum required flow and meet maximum designed pressure losses of system. ASHRAE pipe sizing guidelines.
- .2 Boiler Circulating Pumps:
  - .1 Provide pumps to circulate water from hot water return pipe through boilers and into hot water supply pipe.
  - .2 Provide two (2) motor pump 100% duty pumping units to maintain manufacturer's recommended boiler flow conditions rated at 3.5 L/s at a differential head of 299 kPa].
  - .3 Run pumps continuously to provide constant flow of water to boiler it serves.
  - .4 Select pump so that first critical speed is minimum 125% greater than design operating speed.
- .3 Breeching and Chimneys:
  - .1 Self-stable chimneys made of stainless steel or with stainless steel lining, of a height complying with the requirements of the most recent code for the technical recommendations for the protection of the environment, and of internal diameter established in depending on the dispersion speed defined in the code, must be installed; refers to the workshop drawing mentioned in section 01 11 00.
  - .2 The steel wall of the chimneys shall be of sufficient thickness to protect the workpiece for its entire useful life against against galvanic action.
  - .3 Chimneys shall be equipped with watertight inspection doors, flashing, refractory interior coatings and ladders as required.
  - .4 Fabricate breeching gas tight.
  - .5 Accessories: expansion joints, hangers to support entire weight of breeching and not on expansion joints, hinged gasket bolted inspection doors as needed.

- .4 Condenser:
  - .1 Propylene Glycol 50%/air cooler, fully autonomous unit, with integrated control to maintain the Glycol output temperature:
    - .1 Heat-release cooling capacity 75 KW.
    - .2 Temperature at Liquid inlet 71 °C.
    - .3 Temperature at liquid outlet 40 °C.
    - .4 Air temperature input 32 °C.
    - .5 Flow rate 0662 L/S.
    - .6 Maximum pressure loss 137 kPa.
    - .7 Fan minimum 3, 0.5 HP each, one fan must have variable speed.
    - .8 600/3/60.
    - .9 Control Panel.
    - .10 Section without fuse.
    - .11 Fault Alarm.
    - .12 Maximum floor projected dimensions: 3300 mm x 1300 mm.

### **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 INSTALLATION**

- .1 Install material and equipment to manufacturers instructions.
- .2 Install equipment on pads which extend beyond equipment base minimum 100 mm.
- .3 Operate equipment at best efficiency points.
- .4 Install insulation to NFPA 90A.
- .5 Provide insulation to boiler, heat exchangers, flash tanks, expansion tank, deaerator, and condensate receivers to manufacturer recommendations.
- .6 Provide gas, oil, atomizing steam, blowdown, economizer, and feed water piping, control valves, isolation valves, from point of service connection to generator.
- .7 Provide lightning protection on chimney stack.
- .8 Connect breeching from boiler outlet to chimney.
- .9 Weld piping rated over 104 kPa. Welded piping is subject to radiographic inspection.

**3.3 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product[s]and submit written reports, in acceptable format, to verify compliance of Work with Contract.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, at stages listed:
    - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
    - .2 Upon completion of the Work, after cleaning is carried out.
  - .4 Obtain reports, within 3 days of review, and submit, immediately, to the Departmental Representative.
- .2 Performance Verification:
  - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
  - .2 Perform periodic site inspection visits by manufacturer's representative to verify installation complies with manufacturer's instructions:
    - .1 After delivery and storage of products.
    - .2 When preparatory Work upon which product installation depends is complete.
    - .3 Twice during installation progress at 25% and 60% complete.
    - .4 After installation and cleaning is complete.

**3.4 DEMONSTRATION**

- .1 Demonstrate functioning of equipment and devices in accordance with Section 01 79 00 - Demonstration and Training.
- .2 After heating appliances have been in operation for two weeks, provide experienced and qualified boiler, burner and combustion control system manufacturer representatives to demonstrate boiler operating capability.
- .3 Provide training and instructions to boiler operators, including burner control and safety systems.

**3.5 COMMISSIONING**

- .1 Commission equipment to 01 91 13 - General Commissioning (Cx) Requirements.
- .2 Test and adjust boiler for capacity and efficiency to ASME standard short form:
  - .1 Prove guaranteed efficiencies at 100% load.
  - .2 Operate boiler with automatic combustion controls in manual mode.
  - .3 Fuel, water, chemicals, power and steam load will be supplied by Owner.

**3.6 CLEANING**

- .1 Perform cleaning operations.
- .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                SUMMARY**

- .1 Section Includes:
  - .1 Materials and installation for:
    - .1 Air distribution systems.
    - .2 Hydronic distribution systems.
    - .3 Other HVAC distribution systems.

**1.2                RELATED REQUIREMENTS**

- .1 Division 01, 23 and D

**1.3                REFERENCE STANDARDS**

- .1 Air Moving and Control Association International, Inc. (AMCA)
- .2 Air Conditioning and Refrigeration Institute (ARI)
- .3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - .1 ASHRAE 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .4 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A53/A53M-18, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 National Fire Protection Association (NFPA)
  - .1 NFPA 90A (R2018), Standard for the Installation of Air Conditioning and Ventilating Systems.
  - .2 NFPA 96 (R2018), Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .7 National Electrical Manufacturers Association (NEMA)
  - .1 NEMA MG 1 (R2016), Motors and Generators.
- .8 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
  - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 3<sup>rd</sup> edition 2006.
- .9 Underwriters Laboratories Inc. (UL)

**1.4 DESIGN REQUIREMENTS**

- .1 Provide complete and operational HVAC and water system, designed to achieve desired space environment criteria.
- .2 Pumps and Fans: select fans for optimum efficiency over the design operating pressure range.
- .3 Pipe Sizing: calculate sizes to ASHRAE guidelines.
- .4 Duct Sizing: perform duct sizing calculations in accordance with SMACNA guidelines.

**1.5 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet for heating, ventilation and air conditioning distribution piping and ductwork (HVAC).
- .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials and equipment comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturer's Field Services: submit reports within [three]days of receipt from manufacturer.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include data as follows:
  - .1 Indicate: brief description of heating, ventilation and air conditioning distribution piping and ductwork (HVAC).
  - .2 Provide for equipment, manufacturer's name, type, year, number of units, and capacity.
  - .3 Submit complete start-up report indicating start-up and system verification sequences.

**1.6 QUALITY ASSURANCE**

- .1 Meet requirements of Section 01 45 00 - Quality Control.
- .2 Provide AMCA or ARI certified equipment where possible.
- .3 Test air distribution ductwork to SMACNA Duct Leakage Test Manual. Departmental Representative to witness tests.
- .4 Equipment: similar functioning equipment from same manufacturer.

**Part 2 Products****2.1 MATERIALS**

- .1 Air Distribution System:
  - .1 Duct: SMACNA HVAC Duct Construction Standards, Metal and Flexible.
  - .2 Balancing Dampers: splitter dampers or balancing dampers where possible on larger main branches; duct balancing dampers on small branches. Use outlet balancing devices only where branch balancing is not possible.
  - .3 Dampers - Operating:
    - .1 Select size and type, based on AMCA certified performance ratings.
    - .2 Blade profile to suit service.
    - .3 Seals: blade and side seals to achieve maximum 1% air volume leakage at design system pressure, and to withstand and maximum design velocity.
    - .4 Bearings: self-lubricating.
    - .5 Linkage: sufficient strength and locations, allow motors to operate damper without causing structural damage or warping.
    - .6 Motors: sufficient strength to operate dampers at greatest design load, of type compatible with air control system and damper design.
  - .4 Dampers - Fire: ULC labelled, fusible link temperature rating to ULC listing and fire compartment rating.
- .2 Fluid Distribution System: to ASTM A53/A53M.-18:
  - .1 Underground Distribution System:
    - .1 Steam or hot water piping: Schedule 40.
    - .2 Glycol Distribution Piping: Schedule 40.
  - .3 Terminal Devices:
    - .1 Convectors:
      - .1 Convectors: coil unit with items inside a baked enamel, sheet metal cabinet.
      - .2 Equip units with sheet metal enclosures.
    - .2 Fan Coil Units:
      - .1 Fan Coil Units: galvanized steel, centrifugal forward curved, statically and dynamically balanced fan in a galvanized steel housing.
      - .2 Cabinet: steel, complete with baked enamel finish and hinged access door.
      - .3 Units: acoustically insulated.
      - .4 Unit: equip with an externally insulated galvanized steel drain pan complete with minimum 75 mm drain connection.
      - .5 Units: equip with a minimum 25 mm thick replaceable filter.

## 2.2 FLUID DISTRIBUTION SYSTEM

- .1 General:
  - .1 Piping: provide piping materials recommended by ASHRAE for associated medium.
  - .2 Insulation: size and type required to maintain design temperature at every outlet.
  - .3 Allow for system thermal expansion, to prevent structural failure or fluid leakage.
  - .4 Install various HVAC distribution piping along similar routing where possible, to share pipe support structures. Locate pipe labels in similar locations.
- .2 Glycol Distribution System:
  - .1 Provide distribution piping from mechanical room to terminal units as required.
  - .2 Insulation: as required to maintain design temperature at every outlet.
  - .3 Provide glycol and water mixing and treatment system, and equip system with means to fill and maintain design glycol system fluid levels.

## 2.3 PUMPS

- .1 System Distribution Pumps:
  - .1 Provide system distribution pumps to pump hot water from hot water supply pipe through hot water distribution system and back to hot water return pipe.
  - .2 Specification refer to Section D3020.

## 2.4 TERMINAL DEVICES

- .1 General:
  - .1 Provide air and water terminal devices, sized and located to achieve desired design environment.
  - .2 Provide similar equipment from one manufacturer.
- .2 Duct Accessories:
  - .1 Dampers - Balancing:
    - .1 Splitter dampers: material and hardware of thickness and structural strength to withstand design duct velocity and pressures without failure.
    - .2 Balancing dampers: capable of maintaining maximum air leakage of 5% design flow in fully closed position at design operating duct pressure.
  - .2 Dampers - Fire: type B or C, for horizontal or vertical operation as applicable, ULC listed. All the walls of the building are fire stop.
  - .3 Registers, Grilles and Diffusers: use equipment from manufacturers with published data tested to AMCA standards. Do not use terminal dampers unless volume control can not be achieved with duct devices.

- .3 Hydronic System:
  - .1 Select pipe size and material for fluid medium, and design conditions.
  - .2 Select pipe and equipment to ASHRAE 90.1-2016.
  - .3 Provide reverse return piping on heating systems.
  - .4 Provide drain capability at low points, auto vents for high points.
  - .5 Locate isolation valves at branches, at connection to equipment, and at flow control balancing valves as required.
  - .6 Provide flexible connections and vibration isolation supports and hangers at connection to equipment. Do not support piping from equipment.
  - .7 Protect equipment and components against freezing.
  - .8 Provide dielectric unions at connections between different materials.
  - .9 Provide stand by-pumps for primary systems.
  - .10 Provide means to add chemicals and glycol to systems in operation.
  - .11 Insulate as per table in ASHRAE 90.1.
- .4 Vibration Isolation: vibration isolation equipment manufacturer's recommendations.

### **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 INSTALLATION**

- .1 Install equipment to manufacturer's written instructions.
- .2 Air Distribution System:
  - .1 Ducts:
    - .1 To SMACNA HVAC Duct Construction, Standards, Metal and Flexible.
    - .2 Insulate fresh air intakes and exhaust ducts [\_\_\_\_\_]
    - .3 Insulate supply air ducts.
  - .2 Ventilation and Exhaust System:
    - .1 To SMACNA HVAC Duct Construction Standards, Metal and Flexible.
    - .2 During testing and balancing, be prepared to change sheaves if required to provide required airflow as per Room Data Sheets.
    - .3 Insulate fresh air intake and exhaust ducts sufficiently to prevent sweating at coldest design exterior conditions.
- .3 Fluid Distribution Systems: to manufacturer's recommendations.
- .4 Duct Accessories: install fire dampers to local code requirements.

- .5 Piping:
  - .1 Install to conserve space in buildings and to keep furring to a minimum.
  - .2 Slope piping in direction of flow. Provide drain spouts at low points in system.
- .6 General:
  - .1 Install equipment as per manufacturer's written direction.
  - .2 Vibration Isolation:
    - .1 Install vibration isolation at connections between piping and pumps
    - .2 Install vibration isolation devices as recommended by equipment manufacturer.
  - .3 Install insulation as required.

### 3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
  - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product(s) and submit written reports, in acceptable format, to verify compliance of Work with Contract.
  - .2 Manufacturer's Field Services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, at stages listed:
    - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the 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 the Work, after cleaning is carried out.
  - .4 Obtain reports, within 3 days of review, and submit, immediately, to the Departmental Representative.
- .2 Performance Verification:
  - .1 Operate equipment and verify that performance criteria specified in this section has been achieved.
  - .2 Perform periodic site inspection visits by manufacturer's representative to verify that installation complies with manufacturer's instructions:
    - .1 After delivery and storage of products.
    - .2 After installation and cleaning is complete.

**3.4 COMMISSIONING**

- .1 Commission equipment to Section 01 91 13 - General Commissioning (Cx) Requirements].
- .2 Test and adjust pumps, air handling units. Prove that equipment operates in manufacturer's published operating range for selected model.

**3.5 CLEANING**

- .1 Perform cleaning operations.
- .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 SUMMARY**

- .1 Section Includes:
  - .1 Materials and installation for balancing and certification of HVAC air and liquid systems.
  - .2 Sustainable requirements for construction and verification.

**1.2 RELATED REQUIREMENTS**

- .1 Division 01, 23 and D

**1.3 REFERENCE STANDARDS**

- .1 Associated Air Balance Council (AABC).
  - .1 National Standards for Total System Balance 2002.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).

**1.4 DESIGN REQUIREMENTS**

- .1 Perform air and water balancing, to minimum requirements specified in AABC, National Standards manual.

**1.5 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Reports:
  - .1 Once the work complete, submit 1 balancing and certification report.
  - .2 Report Format: AABC Test and Balance Procedures manual. Include recommendations where additional balancing devices should be installed. Include actual test procedure details, initial and final balanced performance figures.

**1.6 QUALITY ASSURANCE**

- .1 Engage balancing agency accredited by the Associated Air Balance Council (AABC).
- .2 Measurement Instruments: calibrated to AABC recommendations.
- .3 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**Part 2            Products**

**2.1                NOT USED**

- .1            Not Used.

**Part 3            Execution**

**3.1                ADJUSTING**

- .1            Perform system balancing to AABC - Test and Balance Procedures.
- .2            Permanently mark valve, damper and other adjustment device settings in their balanced position.
- .3            Set and lock memory stop balancing devices.
- .4            Balance liquid systems only after successful balancing of air systems.

**3.2                FIELD QUALITY CONTROL**

- .1            Performance Verification:
  - .1            Perform random flow readings in Departmental Representative presence after completion of balancing report. If inconsistencies are noted between balancing report and random readings, re-balance entire system and re-submit balancing report until random readings coincide with report at no additional cost.

**END OF SECTION**

**Part 1           General****1.1               RELATED REQUIREMENTS**

- .1       Division 01

**1.2               REFERENCE STANDARDS**

- .1       Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1       Material Safety Data Sheets (MSDS).
- .2       National Fire Protection Association (NFPA)
  - .1       NFPA 10-2017, Standard for Portable Fire Extinguishers.
- .3       Underwriter's Laboratories Canada (ULC)
  - .1       CAN/ULC S503-, Standard for Carbon Dioxide Fire Extinguishers.
  - .2       CAN/ULC S508, Rating and Testing of Fire Extinguishers Extinguishing Agents.
  - .3       CAN/ULC S512, Standard for Halogenated Agent Hand and Wheeled Fire Extinguishers.
  - .4       CAN/ULC S522, Standard for Fire Extinguisher and Booster Hose.

**1.3               DESIGN PERFORMANCE REQUIREMENTS**

- .1       Provide fire extinguishers to local codes.
- .2       Type and location of extinguishers must provide complete fire protection coverage in accordance with NFPA reference standard.
- .3       Provide extinguisher type and capacity most suitable to extinguish fire in area served.

**1.4               DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1       Submit according to Section 01 33 00 - Submittal Procedures.
- .2       Submit product data: in accordance with Section 01 33 00- Submittal Procedures.
- .3       Submit - Material Safety Data Sheets under WHMIS (Workplace Hazardous Materials Information System).
- .4       Submit shop drawings: for extinguisher locations in accordance with Section 01 33 00 - Submittal Procedures.

**1.5               QUALITY ASSURANCE**

- .1       Equipment: ULC listed, to NFPA.
- .2       Extinguisher Ratings: CAN/ULC S508.
- .3       Health and Safety:
  - .1       Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**Part 2 Products**

**2.1 FIRE EXTINGUISHERS**

- .1 Manual Fire Extinguishers:
  - .1 Type: multi-purpose dry chemical, stored pressure rechargeable type, with hose and shut-off nozzle.
  - .2 ULC labelled for Type C protection.
  - .3 Capacity: minimum 4kg.
- .2 Wheeled Fire Extinguishers:
  - .1 Material: multi-purpose cylinder, suitable for passage through standard doorway, large diameter rubber tread wheels, non- kinking hose, ball type shut off nozzle and wheel valve.
  - .2 Type: CAN/ULC S512, S503. S522, C rated, pressurized with nitrogen.
  - .3 Capacity: minimum 20 kg.
  - .4 Discharge time: 70 sec.
  - .5 Discharge range: 5 – 10 m.

**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 INSTALLATION**

- .1 Install to NFPA 10 and local regulatory requirements.

**END OF SECTION**

**Part 1            General****1.1                RELATED REQUIREMENTS**

- .1            Section 01 and 40.

**1.2                REFERENCE STANDARDS**

- .1            The purpose of this division is to present the technical requirements for electrical work as well as the performance objectives for the construction of a bioreactor at the Sherbrooke Research and Development Center - Lennoxville sector operated by Agriculture and Agri-Food Canada (AAFC).
- .2            The bioreactor must be designed initially to treat organic waste from cattle and hog farms in order to reduce the impact of organic residues and reduce the energy consumption of its buildings. To achieve this objective, the Contractor has the current and projected design parameters. Refer to the other divisions of this specification and especially to the division dealing with the mechanics of the process and the controls of this specification. The plans and specifications of the other divisions must be considered as part of this estimate. The Contractor must take note of these documents in order to prepare his bid properly. Note that as for electrical work, control work and HVAC will be designed by the contractors responsible for this work and therefore the plans and specifications of these divisions have performance objectives but do not include plans and detailed specifications.
- .3            For performance objectives to be achieved, the design, construction, commissioning of all electrical systems, including interior and exterior systems, will be required to achieve the objectives set by AAFC in terms of reliability, flexibility, expansion, operation, economy, maintenance and repair. Refer to all sections of this specification for more details (not just sections of this discipline).
- .4            Work must be performed in accordance with the technical and performance requirements of this specification while complying with applicable laws, regulations and standards. In case of contradiction between the sections of this specification and the applicable standards, the most stringent specifications and requirements apply. The work must be carried out according to the rules of the art and the schedule established in order not to delay the execution of all the works.
- .5            The Contractor shall be required, except as explicitly stated in this specification to be provided by others, to provide all that is necessary directly or indirectly for such work as: design, documentation, training, accessories, parts spare parts, equipment, materials, tools and equipment, labor, disposals of rubbish, fuel and all other elements of the same nature, inherent to what must be done to complete the work to be done.
- .6            If materials or products are prescribed by their trade-mark, refer to the instructions to bidders for information on how to apply for approval of materials or substitutes.

**1.3                PERFORMANCE OBJECTIVES**

- .1            The facilities shall be designed to provide, with normal operation and maintenance activities, a service life of 50 years.

- .2 The Contractor is responsible for the design, selection, supply (unless provided by another contractor), delivery and installation of electrical materials and equipment, cabling, connections, testing, commissioning, and installation in service, documentation and training for all electrical systems throughout the bioreactor facility.
- .3 More specifically, the Contractor shall perform the activities listed above in connection with the requirements of the plans and the following needs:
  - .1 Temporary Feeding:
    - .1 Make a temporary electrical installation as required during the construction period for all contractors on site (all disciplines);
    - .2 All wiring and temporary electrical connections and installations required by all contractors working on site.

#### 1.4 **ELECTRICAL DISTRIBUTION AND ELECTRICITY OF THE BUILDING**

- .1 Two 600 volt three-phase power supplies will be required for project requirements, normal power for non-critical loads and emergency power from an existing generator for critical loads. Note that the power supplies required for personal safety systems will have to come from stand-alone battery systems that will be connected to the normal power supply. Critical loads include only process loads that must be maintained in operation in the event of a power failure and are therefore not subject to the requirements of Section 46 of the Electrical Code. The Contractor will be responsible for the design, supply and installation of the following:
  - .1 Non critical loads:
    - .1 A 600 volt three-phase power supply with a maximum capacity of 150 amps available from transformers on an existing pole. The post is identified with the HPXL5V barcode and is located near the existing generator set. These transformers are currently feeding the hog farming complex, building F;
    - .2 The Contractor shall validate the current load of Building F to confirm that existing transformers have the capacity required to meet the requirements of the new facility. Note that WSP has done a preliminary validation which tends to show that the excess capacity will be sufficient. However, at the time of writing the estimate, the measurement data over a period of one year was not yet available to confirm the scenario. Although the Contractor must validate it, for its submission, it will be able to assume that the capacity is sufficient and include only the costs required to do the validation.
  - .2 Critical loads (emergency power):
    - .1 The emergency line consists of a 600 volts three-phase emergency power supply that will be connected to the PDU distribution panel of the generator set. The latter is located near the generator and the HPXL5V pole. The new emergency power feeder should be able to supply a load of approximately 10 amps, but should be designed for a minimum load of 20A. A circuit breaker must be added to the PDU to create an emergency feeder that is independent of the existing feeder used for the people safety systems. Information on the loads that will be connected to

- the emergency is available in the plans and specifications of the other disciplines.
- .2 The new feeder will terminate in a new transfer switch (provided by the Contractor) to be located in the electrical room of the new bioreactor building. A short feeder, of the same capacity from the normal power supply network, must be installed in the electrical room and connected to the new transfer switch. (See the plan).
  - .3 In order to allow automatic start of the generator set in the event of voltage loss detection by the transfer switch, a control cable shall be installed between the generator set and the transfer switch. The latter will have to follow the same path as the emergency line.
- .2 The Contractor will design a new aerial line that will follow approximately the route shown on the plan. He will also have to validate the capacity of the HPXL5V pole and replace or brace it if necessary.
  - .3 The Contractor shall take into account the location of existing conductors on the post in its design. No changes can be made to the level of existing conductors and their current heights. See, for reference, the photo included in the plan showing the HPXL5V pole.
  - .4 The validation required to ensure that there will be no interference with underground infrastructure is also the responsibility of the contractor. WSP have not done any validation with Info-Excavation.
  - .5 The new poles shall be designed to support the cables for the supply of non-critical loads, but also for the supply of critical loads and the control cable for the start of the generator set.
  - .6 The design of the new line shall meet the requirements of the latest version of CSA C22.3 Number 1. Under no circumstances may a cable descend to a height of less than 4.6 meters. The Contractor shall provide the calculations related to the design of the power line at the same time as the shop drawings. In addition to documenting the complete design of the new power line, the calculations will have to show the minimum height of the aerial cables in the worst conditions. Whenever possible, the Contractor must propose a solution that will avoid tree cutting. Should tree cuts be required, the Contractor must submit a scenario to the Ministry Representative for approval, with the latter reserving the right to request changes at no additional cost. The cut of the tree, if necessary, will be under the responsibility of the Contractor.
  - .7 The electrical infrastructure and layout of an electrical room including the design and sizing of the systems and equipment provided to meet the needs of the project.
  - .8 The design of the entire electrical distribution of the project. Note that electrical distribution equipment and starters should be located in the electrical room.
  - .9 Unless specifically indicated, the electrical distribution wiring of the project shall be installed in rigid PVC conduit.
  - .10 A system for electrically measuring power consumption on a continuous basis and transferring measurement data to the central site historization system. This system shall, at least, provide phase current data, phase voltage, kW, kVA, KVAR, power factor, etc. The data should be provided as integrated instantaneous (RMS) and averaged (RMS) values over 15 minutes periods in addition to providing daily, monthly, annual meters as well as perpetual meters.

- .11 Installation of a new automatic power transfer switch in open transition. Note that according to the information provided, the current emergency installation meets the requirements of CSA C282. Changes to the facilities will be required to maintain this certification. In addition, the Contractor must update the required documentation in order to maintain this certification.
- .12 A complete system of bonding and grounding respecting the requirements of the most recent version of the Electrical Code of Quebec (CSA C22.10).

## **1.5 CONNECTING THE PROCESS**

- .1 Starters, variable frequency drives, distribution centers, etc. required for the treatment equipment shall be provided by the Contractor. The Contractor must consult the other disciplines bidders documents and coordinate with them to clearly define the scope of its supply and work.
- .2 All wiring and connections for the supply of process loads whether for the motor loads, the control panels, the heating loads or other shall be provided by the Contractor. Each load must be equipped with a lockable local disconnect switch provided by the Contractor (unless equipment is already provided). Local disconnects should be suitable for the locations where they will be installed in accordance with regulatory requirements.
- .3 Unless specifically indicated, all wiring provided in this section shall be installed under rigid PVC conduit.
- .4 All wiring, conduits, poles, hardware and electrical indoor, outdoor and underground cable trays including connections to equipment, control systems, motors, generator set, etc.
- .5 Seismic fixtures, when required, shall comply with applicable regulations (Building Code, Quebec Electrical Code, Fire Code ...).

## **1.6 BUILDING**

- .1 All luminaires inside and outside the building, emergency lighting and services required.
- .2 All interior, exterior and underground electrical wiring, conduits, hardware including connections to building equipment, etc.
- .3 The connection of all building loads including the supply of local disconnect switches if they are not included in the supply of another discipline.
- .4 Unless specifically indicated, all wiring provided in this section shall be rigid PVC conduit.
- .5 The electrical heating apparatus of the building, when not provided by those responsible for the building's mechanical work.
- .6 Self-regulating freeze-up heating cable for 1-inch diameter domestic water line between control building and mixing pit over a distance of approximately 4 meters. This will need to be equipped with a controller that will be able to provide a process confirmation to the process controller and will automatically disable power to the heating cable when the outdoor temperature is above an adjustable threshold.

**1.7 PROTECTION AGAINST LIGHTNING**

- .1 A lightning protection system, if required as a result of the study findings (see 1.11.1.8), meets the requirements of the latest version of CSA B72.

**1.8 FUTURE NEEDS**

- .1 The supply and installation of an empty rigid PVC conduit with pull rope between the new building and the future stationary mill for organic material as shown in drawing R082975.001-G02-PN sheet 01.
- .2 1 mat and 2 "diameter underground PVC conduit with pull rope, for future installation of aerial underground network cable as shown in drawing R082975.001-E01-PN sheet 01.

**1.9 DOCUMENTATION AND TRAINING**

- .1 Provide all plans and documents for approval prior to purchase equipment and start of construction.
- .2 Documentation of all equipment provided (data sheet, service manual, user manual, shop drawings).
- .3 Training of personnel identified by the AAFC (starters, VFDs, measurement and presentation of the main elements of electrical distribution). Schedule a training session lasting 8 hours (see requirement 3.3).
- .4 Preparation of project design documentation (plans, calculations, instructions, studies, etc.). All the documentation must be provided for approval before the start of the works, in the "For construction" version at the beginning of the works and in the "Final plan" version at the end of the works. Where applicable (for construction and final plans), the documents must be signed and sealed by an engineer, a member in good standing of the Ordre des Ingénieurs du Québec. Plans for seismic fixings must be signed and sealed by an engineer specialized in this type of design.
- .5 Documentation of tests and commissioning of the entire electrical installation. Test and commissioning forms should be prepared prior to these for approval by the Ministry Representative prior to testing. All tests must be signed by a qualified technician or engineer of the Contractor.
- .6 Final plans in certified electronic format (PDF / A-1b) and signed, sealed by a member engineer in good standing of the Ordre des ingénieurs du Québec and in native editable format recognized by Autocad software. Plans for seismic fasteners must be signed and sealed by an engineer in good standing specialized in this discipline, whether for cable trays, panels and other components related to the mandate of the contractor who requires it.

**1.10 TESTING AND COMMISSIONING**

- .1 The Contractor shall, minimally execute the testing and prepare the test reports for the following elements:
  - the electrical network;
  - the balancing of loads;
  - transfer switch;

- The grounding network;
  - Lightning protection installation;
  - Lighting level;
  - Of all the installations of the site.
- .2 Rebalancing of charges between phases.
  - .3 Commissioning and production of a report.
  - .4 Training of maintenance and operations team.

### **1.11 STUDIES AND LICENSES**

- .1 Detailed study reports must be provided with each study. These reports should include an introduction, list the applicable regulatory norms and standards, detail the scope of the study, include a section presenting the results, an analysis section and a conclusion section. Where applicable, the studies should also provide summary results and include all results as an appendix to the report:
  - .1 Obtaining all permits required for his discipline;
  - .2 Provide complete calculations for the new overhead power system including poles, distances, cable heights, tension;
  - .3 All certificates necessary for completion of work and commissioning in accordance with applicable regulations;
  - .4 Short circuit study and coordination of protections;
  - .5 Arc flash exposure study in accordance with CSA Z462-2018. The Contractor must also print and provide the security labels in accordance with the requirements of this same standard, must be bilingual (English and French) and comply with the Official Languages Act. The design should be done to avoid the requirement of category 2 protection in all cases;
  - .6 Study of harmonic emissions if required by the distributor or documentation proving that it is not required in accordance with the requirements of the latter;
  - .7 Power factor calculations (the installation must be designed to maintain a power factor between 0.9 and 1 at all times);
  - .8 Risk assessment to determine the need, if any, for a lightning protection system to CSA B72;
  - .9 Study of the lighting level of each room to ensure that the minimum lighting levels required by the applicable normative and regulatory requirements are met. Lighting levels shall, at a minimum, meet the requirements of the Canadian and Quebec Occupational Health and Safety Regulations, whichever is more stringent (refer to Section D5020 for details of technical requirements);
  - .10 Any other study that may be required by the regulation, the customer or by the electricity distributor.

### **1.12 OTHERS**

- .1 Coordination including the preparation of documentation required for the overall management of the project, obtaining permits and obtaining written confirmations of the connections from utilities distributors prior to the beginning of the work.

- .2 The installation of all electrical equipment, appliances and infrastructure of the station under this division and not included in the previous subsections.
- .3 Consider applicable standards for the treatment of organic bovine and swine organism, particularly with respect to hazardous locations and wet or corrosive environments. The contractor is responsible for determining the electrical classification of the premises according to the nature of the equipment that will be installed, in accordance with the requirements of the electrical code.

### **1.13 OTHER SECTIONS AND DRAWINGS**

- .1 In addition to this section presenting the general requirements, the following sections and drawings present the specific requirements for the work:
  - .1 Section D5010 - Food and Distribution;
  - .2 Section D5020 - Lighting and Power and Bypass Cabling;
  - .3 Drawings R082975.001-E01-PN sheet 01 - Distribution of the new building.
- .2 In addition, all plans and specifications of other disciplines related to this project as presented in the overall table of contents of the specifications must be considered as an integral part of this section. These documents contain many details for the administration and the design of the project that will be necessary for the Contractor to complete its design as well as for the preparation of its bid. The general contractor must be consulted in order to obtain the details required for the Contractor's submission in relation to the other disciplines submitted for performance.

### **1.14 CODES, REFERENCE STANDARDS**

- .1 However, unless otherwise stated by law, the latest versions of the following codes, standards and standards must be strictly adhered to in the context of this mandate:
  - .1 The National Building Code (NBC) edition in force, its revisions, additions and related documents;
  - .2 Quebec Construction Code, Chapter V - Electricity (Canadian Electrical Code, Part I and Amendments of Quebec C22.10-18 or the most recent version if available at the time of signing the contract);
  - .3 Provincial codes and regulations of the Ministry of Labor;
  - .4 Canada Occupational Health and Safety Regulations SOR / 86-304;
  - .5 Regulation respecting occupational health and safety, Québec, chapter S-2-1, r. 13;
  - .6 Construction, zoning and provincial codes;
  - .7 The applicable regulations of the Department of Municipal Affairs and Environment from the Ministry of Municipal Affairs and Housing (MMAH);
  - .8 Any other law, regulation or standard applicable to the project.
  - .9 CSA Group:
    - CSA B651, Accessible Design for the Built Environment;
    - CSA B72-M87, Installation Code for Lightning Protection Systems;
    - CAN3-C13-M83, Measuring Transformers;
    - CAN / CSA-C22.2 Number 0, General Requirements, Canadian Electrical Code.

- .10 Second part:
  - CSA C22.3 Number 1, Overhead Systems;
  - CSA C22.3 number 7, Underground systems;
  - CAN / CSA-C22.3 Number 3, Electrical Coordination;
  - CAN3 C235, preferred voltages for AC Systems from 0 to 50,000 V;
  - CAN / CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware;
  - CSA C22.2 No. 31, Switchgear assemblies;
  - CSA C22.2 No. 45, Rigid Metal Conduit;
  - CSA C22.2 No. 56, Flexible Metal Conduit and association Liquid-Tight Flexible Metal conduit;
  - CSA C22.2 No. 83, Electrical Metallic Tubing;
  - CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit;
  - CAN / CSA C22.2 No. 227.3, Flexible Nonmetallic Tubing;
  - CSA C282 Emergency Electrical Power Supply for Buildings;
  - CSA Z431-12 Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators;
  - CSA Z462-2018 Electrical Safety in the Workplace;
- .11 Electro-Federation Canada:
  - Y1-2 EEMAC, Performance Specifications for Finishing Systems for Outdoor Electrical Equipment.
- .12 Health Canada's Workplace Hazardous Materials Information System (WHMIS):
  - Material Safety Data Sheets (MSDS).
- .13 National Research Council Canada (NRC):
  - National Energy Code for Buildings - Canada (NECB).
- .14 Underwriters Laboratories of Canada (ULC);
- .15 The Lennoxville Municipality Fire Department;
- .16 In each particular case, the most severe order, law, standard, code or regulation prevails over the others;
- .17 The special requirements of the manufacturers;
- .18 The Canadian Standards Association (CSA) bulletins relating to the electricity in effect at the time of the performance of the work, although not designated by their number in this division, shall be considered an integral part of Part II of CSA standards and must be respected as such.

### **1.15 SUBMITTALS / SUBMITTALS FOR APPROVAL / INFORMATION**

- .1 Submit required documents and samples in accordance with the general administrative clauses - Submittal Procedures - before proceeding with fabrication or construction.
- .2 Data sheets:
  - .1 Submit data sheets and manufacturer's documentation for electrical installations. The data sheets must indicate product characteristics, performance criteria, dimensions, limits and finish;

- .2 Submit MSDS required under WHMIS, which must be in accordance with Labor Canada and Health Canada. MSDSs must cover electrical materials and equipment and must indicate the VOC content.
- .3 Shop Drawings:
  - .1 The submitted shop drawings must bear the seal and signature of a competent engineer member in good standing of the Ordre des Ingénieurs du Québec;
  - .2 Shop drawings shall indicate the layout of the equipment, including details such as wiring diagrams and schematic diagrams, dimensions, electrical characteristics, weight and performance of the component parts of the installation;
  - .3 Drawings must indicate technical details of electrical and electronic products.
- .4 Certificates:
  - .1 Upon completion of the work, submit to the Ministry Representative and the Engineer inspection reports and certificates issued by the appropriate authorities, if applicable;
  - .2 Obtain the required permits and inspection certificates, and pay for them;
  - .3 Certificates: submit certificates signed by the manufacturers of the products and components, certifying that they comply with the performance characteristics and physical properties requirements.
- .5 Test Reports:
  - .1 Submit to the Ministry Representative and Engineer test reports and certificates issued by recognized independent laboratories:
    - .1 These documents must certify that the products, materials and equipment meet the requirements for physical characteristics and performance criteria;
    - .2 On-site Manufacturer's Services: Submit the number of copies required of manufacturers' on-site inspection reports.
- .6 Submittals / Documents for Sustainable Design:
  - .1 Construction Waste Management:
    - .1 Submit the construction waste management plan for the project, which must specify the recycling and recovery requirements;
    - .2 Submit calculations for end-of-project recycling rates, recovery rates and landfill rates, which must demonstrate that 75% of construction waste has actually been diverted from landfills.

#### **1.16 DOCUMENTS / COMPLEMENTS TO COMPLETE THE WORK**

- .1 Submit the required documents / elements in accordance with the section of the General Administrative Clauses - Documents / Deliverables upon Completion.
- .2 Attach accurate drawings of structures constructed.
- .3 Submit electronic versions and two (2) hard copies of drawings and specifications.
- .4 Manufacturer's Installation Instructions: Submit manufacturer's instructions for installation and operation of products, components and assemblies.

- .5 Provide operation and maintenance manuals for component parts, indicating construction features, function of various components and requirements for effective maintenance and repair work.
- .6 Provide product data sheets, product data, component illustrations, technical descriptions, part lists, wiring diagrams and non-patented block diagrams, as well as test and inspection reports.

### **1.17 TRANSPORTATION, STORAGE AND HANDLING**

- .1 Transport, store and handle materials and equipment in accordance with general product clauses and manufacturer's written instructions.
- .2 Delivery and Acceptance: Deliver materials and materials to site in their original packaging, which must be labeled with the name and address of the manufacturer.
- .3 Storage and Handling:
  - .1 Store materials and equipment in a clean, dry, well-ventilated area as recommended by the manufacturer;
  - .2 Store prescribed materials and equipment to protect them from marks, scratches and scuffs;
  - .3 Replace damaged materials and equipment with new materials and equipment.
- .4 Packaging Waste Management: recover packaging waste for re-use / re-use of pallets, quilts, crates, other packaging material by manufacturer and rework, as directed by the waste reduction and the construction waste management plan, in accordance with the general administrative clauses and the Construction / Demolition Waste Management and Disposal clauses.

### **1.18 WARRANTY**

- .1 Duration of the guarantee: Refer to the administrative section of the call for tenders.
- .2 Coverage: The work must be guaranteed against any performance defect as required and must cover both the replacement of material or materials and the labor required. Replace damaged materials and equipment with new materials and equipment.
- .3 Manufacturer's Warranty: Submit Manufacturer's Warranty Certificates to the Ministry Representative and Engineer.

### **1.19 COMMISSIONING**

- .1 Submit a commissioning plan, as well as copies of test and commissioning documentation, in accordance with general administrative requirements (MS) - General requirements and start-up, verification and commissioning.

### **1.20 MATERIALS / EQUIPMENT**

- .1 Provide materials, equipment and equipment required for completion of work in accordance with general administrative clauses.
- .2 Unless otherwise specified:
  - .1 Use new materials and equipment;

- .2 Use products of one manufacturer for materials and equipment of the same type or class;
- .3 Comply with latest manufacturer's written instructions for installation methods.
- .3 Supply and install prescribed quality materials and design equipment with performance in accordance with established standards and for which spares are readily available.
- .4 Notify the Engineer in writing of any discrepancies between this specification and the manufacturer's instructions; the Engineer will then determine which document to use.
- .5 Material:
  - .1 As applicable, material to be CSA approved and ULC certified;
  - .2 In cases where there is no CSA or ULC designation, obtain approval from the local authority having jurisdiction.
- .6 Ensure labels are visible and legible once equipment is installed.
- .7 All conductors and cables must be copper with minimal protection against the propagation of FT4 flames. However, aerial power cables may be aluminum.
- .8 Provide metal fasteners and accessories of the same texture, color and finish as the metal support to which they are attached. Avoid different metals being exposed to electrolytic action.
- .9 Use stainless steel fasteners, anchors and wedges to secure exterior structures.
- .10 Check seals made at the factory and tighten as necessary to ensure continuity of installation.
- .11 Determine and comply with manufacturers' recommendations for storage and installation of equipment.

#### **1.21 ACCESSORIES**

- .1 Terminals, lugs and screw connections shall be suitable for conductor materials.
- .2 Supports: Provide anchors and supports for electrical equipment and components. Provide independent supports, including fasteners, devices and hangers that can withstand the load of equipment and components, plus 100 kg. Anchors made of fiber, wood or plastic are not accepted.

#### **1.22 FINISH**

- .1 Finish in workshop the surfaces of metal envelopes; apply rust remover, both indoors and outdoors, and at least two (2) coats of enamel finish.
  - .1 All exterior material must have a brushed stainless steel finish;
  - .2 Paint indoor switchgear and distribution cabinets in light gray in accordance with EEMAC 2Y-1;
  - .3 Clean and retouch the surface of finished shop equipment that has been scratched or damaged during shipment or installation; use a color paint that matches the original color;
  - .4 Clean, prime and paint exposed fasteners such as stirrups, brackets, fasteners, to protect them against rust.

**1.23 IDENTIFICATION OF EQUIPMENT**

- .1 For identification of electrical equipment, identify as follows.
- .2 Indicator plates.
- .3 3 mm thick, white-faced, black-core laminate plastic engraving plates mechanically fastened with self-tapping screws.

Format of Indicator Plates

Format 1	10 mm x 50 mm	1 line	Letters 3 mm high
Format 2	12 mm x 70 mm	1 line	Letters 5 mm high
Format 3	12 mm x 70 mm	2 lines	Letters 3 mm high
Format 4	20 mm x 90 mm	1 line	Letters 8 mm high
Format 5	20 mm x 90 mm	2 lines	Letters 5 mm high
Format 6	25 mm x 100 mm	1 line	Letters 12 mm high
Format 7	25 mm x 100 mm	2 lines	Letters 6 mm high

- .4 Entries on nameplates must be approved by the Ministry Representative prior to manufacture.
- .5 Expect an average of twenty-five (25) letters per plate.
- .6 Registrations must be in English and French.
- .7 Nameplates for terminal boxes and junction boxes shall indicate network and / or voltage characteristics.
- .8 Indicator plates of disconnect switch, starters and contactors must indicate the controlled device and voltage.
- .9 The nameplates of the terminal boxes and pull boxes must indicate the network and the voltage.
- .10 Transformer nameplates shall indicate power, primary and secondary voltages.
- .11 For secondary distribution panels, complete and insert in the panel an updated circuit breaker identification sheet. It is recommended to prepare this sheet using the "Excel" software for ease of later review. An electronic copy of this document must be provided to the Ministry Representative. Use placards indicating, in addition to the alphanumeric identification of the sign, the capacity (A) as well as the voltage, the number of phases and the power source.
- .12 For engine control panels, affix lamicoïd plates to indicate the equipment or branches it controls. Also identify the entire panel using a sign indicating, in addition to the alphanumeric identification of the panel, the capacity as well as the voltage, the number of phases and the power source.
- .13 For burglar alarm equipment, if applicable, all enclosures, junction boxes and pull boxes for the intrusion alarm system shall bear a white laminated red lamicoïdal identification plate.
- .14 For each engine, provide marking on the basis of the identifying engine, in addition to its alphanumeric identification, the disconnecting device and its location as well as on the starter or on the engine controller when they are not already integrated. at an engine control center.

- .15 For all junction and pull boxes used for branch circuits, identify: source electrical panel number and circuit numbers. The process junction boxes shall have a unique alphanumeric identification in addition to the identification of the source panel.
- .16 For the boxes of the different systems, the name of the system (eg telephone, computer, monitoring, call for guard, etc.) in addition to a unique alphanumeric identification.
- .17 For each receptacle and switch shall be marked with the following: panel number and circuit number. Identify using an identifier plate:
  - .1 The colors will be as follows:
    - .1 Normal: white letter black background;
    - .2 Emergency: white letter red background.
- .18 List of formats to use:
  - .1 Main service tables: 7;
  - .2 Junction boxes, pulling boxes: 2;
  - .3 Automatic reversers: 4 or 5;
  - .4 Counters, alarms: 2 or 3;
  - .5 Contactors: 4;
  - .6 Magnetic starters: 2 or 3;
  - .7 Manual Starter: 1;
  - .8 Main circuit breakers: 7;
  - .9 Generating sets: 4 or 5;
  - .10 Control lamps: 2 or 3;
  - .11 Control panels: 4 or 5;
  - .12 Motor Control Centers: 7;
  - .13 Disconnect switches: 4;
  - .14 Transformers: 7;
  - .15 Junction and alarm control cabinets: 6;
  - .16 Engines: 4;
  - .17 Systems: 4;
  - .18 Sockets and switches: 1;
  - .19 Main panel: 7;
  - .20 Secondary distribution panels: 7;
  - .21 Within each main panel and on the gutters, phase identification "A", "B", "C", "N" shall be affixed with letters of 50 mm (2 ") minimum height.

#### **1.24 WIRING IDENTIFICATION**

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 The colour code must comply with to CSA C22.1

- .4 Use communication and fire alarm cables made of color-coded conductors using the same colors for the entire network.

### 1.25 CONDUIT AND CABLE IDENTIFICATION

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

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red

- .4 Provide identification of equipment, components, and assemblies specified, using materials suitable to withstand anticipated operating environment.

### 1.26 COLOR CODING

- .1 Color coding for motor control to be in accordance with CAN / CSA Z431. The control and signaling equipment must comply with this same standard.

### 1.27 FIELD QUALITY CONTROL

- .1 Confirm other related work is complete to receive work of this and related electrical sections.
- .2 Commission electrical systems.
- .3 Qualifications:
- .1 Electricians: qualified, licensed electricians or apprentices in accordance with Provincial Act respecting manpower vocational training and qualifications.
  - .2 Apprentices: employees registered in provincial apprentice's program permitted, under direct supervision of qualified licensed electrician, to perform specific tasks. Permitted activities determined based on level of training attained and demonstration of ability to perform specific duties.
- .4 Contractor holding valid Master Electrical contractor licensed as issued by Province that work is being constructed.

**1.28 INSTALLATION**

- .1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, MSDS, and product datasheets.
- .2 Protect electrical equipment from dust and dirt. Plug or cap openings in conduit, fixtures and equipment during construction with the Ministry Representative approved materials.
- .3 Conceal conduit in finished areas, unless otherwise authorized. Run exposed conduit parallel to building lines and maintain maximum headroom.
- .4 Install lighting fixtures, outlets, plates and other visible items parallel to building lines. Exposed ducts must be aligned, parallel and at right angles to building walls, partitions and ceilings.
- .5 Set equipment and components plumb and level, accurate to position intended, and position hanger rods plumb.

**1.29 LOCATION OF OUTLETS**

- .1 Do not install outlets back to back in same wall or partition.
  - .1 Provide minimum 150 mm horizontal separation between boxes.
  - .2 Relocate outlets at no change in Contract cost.
  - .3 Locate light switches on latch side of doors.
  - .4 Locate disconnect devices on latch side of door.
- .2 Equipment mounting height, from finished floor to centerline of equipment item:
  - .1 Local switches: 1400 mm.
  - .2 Wall receptacles, general: 300 mm.
  - .3 Receptacles above top of counters or splashback: 175mm.
  - .4 Receptacle above top of electric baseboard: 200mm.
  - .5 Receptacles in mechanical rooms: 1400mm.
  - .6 Panelboards: as required by Code or as indicated.
    - .1 1800 mm from the top of panel to floor.
    - .2 Bottom of panel, minimum 150mm above floor.
    - .3 Where multiple panelboards are mounted together, align tops or trims of panelboards, with highest panelboard determining height.
  - .7 General telephone, interphone and cable TV outlets: 300mm.
  - .8 Wall mounted telephone and interphone: 1400mm.
  - .9 Fire alarm stations: 1400mm.
  - .10 Wall mounted fire alarm bells, horns, wall mounted speakers and clocks: 2100mm.
  - .11 Emergency lighting battery units: 2400mm.
  - .12 Wall mounted dry type transformers: 2400mm from bottom.
  - .13 Time switches: 1400mm.

- .14 Individual starters: 1500mm from top. Where multiple starters are mounted together, align starter tops with highest starter determining height.
- .3 Attach electrical equipment, components and devices directly to structure and structural supporting elements.

### **1.30 VERIFICATION**

- .1 Measure phase current to panelboards with normal loads 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 Submit report, at completion of measurements, listing phase and neutral currents on panelboards, dry-type transformers and motor control centres, operating under normal load. Include hour and date on which load was measured, and voltage at time of test.

### **1.31 FIELD TESTS**

- .1 Provide advance notice to the Ministry Representative of proposed testing schedule.
- .2 Perform tests at time of acceptance of work.
- .3 Conduct and pay for field tests:
  - .1 Power distribution, including phase voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and lighting control.
  - .4 Motors, heaters and associated control equipment, including sequenced operation.
- .4 Perform tests in presence of the Ministry Representative.
  - .1 Provide instruments, meters, equipment and personnel required to conduct required tests.
  - .2 Test systems to verify operation as specified.
- .5 Conduct di-electric tests, hi-pot tests, insulation resistance tests and ground continuity tests as required by nature of various systems and equipment.
- .6 Perform following tests on completed power systems:
  - .1 Control and switching: test circuits for correct operation of devices, switches and controls.
  - .2 Polarity tests: test circuits for correct operation of devices, switches and controls.
  - .3 Voltage tests: test voltage at last outlet of each circuit; maximum potential drop 2% on 120 V, and 208 V branch circuits, 2% on 208 V feeder circuits, and 5% on 600 V feeder circuits. Correct deficiencies.
  - .4 Phase balance: measure load on each phase at switchboards, splitter, distribution panel board and lighting and power panel board.
    - .1 Submit results to the Ministry Representative in writing.

- .2 Re-arrange phase connections as necessary to balance load on each phase as instructed by the Ministry Representative.
- .3 After marking such changes, submit revised drawings showing modified connections to the Ministry Representative.
- .5 Supply voltage: measure line voltage of each phase at load terminals of main breakers and report results in writing to the Ministry Representative. Perform test with majority of electrical equipment in use.
- .6 Motor loading: measure line current of each phase of motors with motor operating under load, and report results in writing to the Ministry Representative.
  - .1 Upon indications of imbalances or overloads, thoroughly examine electrical connections and rectify defective parts or wiring.
  - .2 If electrical connections are correct, report overloads due to defects in driven machines in writing to the Ministry Representative.
- .7 Insulation resistance tests:
  - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
  - .3 Check resistance to ground before energizing.
- .8 Co-ordinate and carry out motor testing at same time as driven equipment is being tested. In addition to motor loading tests, provide labour and instruments to read and record motor load readings required to supplement tests on driven equipment through various load sequences, as required by driven equipment tests.
- .7 General operations: energize and operate electrical circuit and item. Repair, alter, replace, test and adjust as necessary for a complete and operating electrical system.
- .8 Test systems and obtain written confirmation from manufacturers that components have been installed correctly and system functioning as intended. Submit certification for fire alarm, power distribution, communications systems to the Ministry Representative.
- .9 Provide labour, instruments, apparatus and pay expenses required for testing. The Ministry Representative reserves right to demand proof of accuracy of instruments used.
- .10 Immediately prior to occupancy, test entire electrical system by performing loss and return of utility power test. Demonstrate operation of:
  - .1 High and low voltage service equipment and metering.
  - .2 Exit and emergency lighting.
  - .3 Fire and intrusion alarm operation during power outage, including remote monitoring system.
  - .4 EMCS system shut down and auto restart, including restabilization of systems after power return. Attach report printouts as evidence of expected operation on systems.
  - .5 User equipment shut-down and auto-restart.

**1.32 TEST RESULTS**

- .1 Submit test results to the Ministry Representative for review.
- .2 Testing methods and test results to comply with the requirements of CSA, CEC and authorities having jurisdiction.
- .3 Remove and replace conductors found damaged, with new materials.
- .4 Provide required labour and tools, if during testing the Ministry Representative requests equipment be opened and removed from their housings to examine equipment, terminations and connections.

**Part 2 Products****2.1 DESIGN AND PERFORMANCE REQUIREMENTS**

- .1 Overhead and Underground Electrical Service: CSA C22.3 No.1 and CAN/CSA-C22.3 No.3.
- .2 Design equipment, components, and assemblies to operate satisfactorily at 60 Hz, within normal operating limits established within CAN3 C235.
- .3 Provide equipment designed to operate in normal interior operating limits specified in CAN3 C235, without damage to equipment or failure of service.
- .4 Barrier-Free access: design equipment and components in accordance with CSA B651.
- .5 Comply with the NECB.

**2.2 COMPONENT/ASSEMBLY PERFORMANCE**

- .1 Space requirements: provide dedicated rooms to house electrical and communication equipment. Do not locate electrical equipment in mechanical equipment rooms unless required to service mechanical equipment.

**2.3 DESIGN DATA**

- .1 Submit design data in accordance with general administrative clauses - Submittal Procedures.
- .2 Submit design calculations for the following electrical service.
  - .1 Lighting;
  - .2 Electrical energy demand;
  - .3 Building F actual power consumption;
  - .4 Voltage drop;
  - .5 Reactive Power (KVAR);
  - .6 Energy budget;
  - .7 Maximum connected lighting load (W/m<sup>2</sup>);
  - .8 Short circuit current;
  - .9 All studies and calculations requested in section 1.2.7;

**Part 3 Execution****3.1 EXAMINATION**

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

**3.2 CLEANING**

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

**3.3 TRAINING**

- .1 Meet the requirements of the "Demonstration and Training" section 01 79 00 as well as those in this section, whichever is more stringent.
- .2 Train operating personnel in operation, care and maintenance of electrical equipment.
- .3 Arrange and pay for manufacturer's factory service engineer to provide training. Ensure operating personnel are conversant with its care and operation.
- .4 Obtain and submit written confirmation from operating personnel that satisfactory training has been received.
- .5 Provide one-day training session for the following systems.
  - .1 Transfer switch;
  - .2 Variable frequency drive;
  - .3 Measurement system;
  - .4 Main elements of electrical distribution.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 01 and 40 and other sections of the of the specifications.
- .2            See Section D5000 - 1.2 "PERFORMANCE OBJECTIVES".

**1.2                REFERENCE STANDARDS**

- .1            See Section D5000 - 1.4 "CODES, STANDARDS AND REFERENCES".
- .2            See Section D5000 - 2.1 "DESIGN AND PERFORMANCE REQUIREMENTS".

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            See Section D5000 - 1.5 "SUBMITTALS / SUBMITTALS FOR APPROVAL / INFORMATION".

**1.4                DOCUMENTS / COMPLEMENTS FOR COMPLETION OF WORK**

- .1            See Section D5000 - 1.6 "CLOSEOUT SUBMITTALS / COMPLETING MATERIALS".

**1.5                QUALITY ASSURANCE**

- .1            Each type of material must come from one and the same manufacturer.

**1.6                TRANSPORTATION, STORAGE AND HANDLING**

- .1            See Section D5000 - 1.7 "TRANSPORT, STORAGE AND HANDLING".

**1.7                WARRANTY**

- .1            See section D5000 - 1.8 "WARRANTY".

**Part 2        Products****2.1        DESIGN PERFORMANCE REQUIREMENTS**

- .1        The Contractor is responsible for the complete design of the installation and the selection of equipment according to the requirements of this specification. He will have to prepare and provide detailed plans of the installations. These must be signed and sealed by an engineer in good standing with the Ordre des Ingénieurs du Québec.
- .2        Make an aerial connection to the owner's transformers cluster located on the existing HPXL5V pole. The transformers are currently used exclusively for supplying the building F with a three-phase voltage of 600 volts. The installation must include the required set of poles, the cables, the masts, the disconnect switches, distribution panels and accessories needed to make a complete connection to the local distribution network.
- .3        Provide a dedicated room (electrical room) for the electrical distribution equipment in the new building. Four underground PVC conduits of the appropriate size shall be installed between the position of the service masts and their connection points in the electrical room. One of the four conduits is intended for future use.
- .4        A connection mast fixed to the building will connect the normal supply line to the new disconnect switch (with a minimum capacity of 200A) supplying itself the new 600-volt 60-circuits three-phases distribution panel, with a minimum capacity of 200 Amperes. However, the contractor must validate by calculation that the minimum capacity requested is sufficient.
- .5        Note that the F building operation activities require continuous power supply and allow very short power interruptions without significant inconvenience to site operations. The Contractor will therefore have to plan this work in order to minimize the power interruption period to less than 30 minutes to make the connection. Of course, this interruption will have to be planned at least 7 days in advance and will have to be suitable for the operation staff of the site. No interruption will be permitted without the written approval of an authorized representative of the Department.
- .6        Perform the following work for the normal / emergency connection of an emergency network:
  - .1        Make an aerial connection to the existing PDU panel near the generator set via the HPXL5V pole. The installation must include a 20-amp PDU circuit breaker, cables, piping, disconnect switches, distribution equipment and accessories needed to fully connect to the new local emergency distribution. It will also be necessary to provide a control cable between the generator and the transfer switch to enable the automatic start of the group when a loss of power on the switch and also allow the transfer of diagnostic signals;
  - .2        Make the connection of the emergency feeder, via a new mast attached to the building, in a new transfer switch (provided by the Contractor) to be located in the electrical room. The installation shall include a 30 amps fuse disconnect located near and connected to the new transfer switch, an automatic transfer switch, the cables, lines, distribution equipment and accessories required to complete the connection to the local emergency distribution. The 30 amp switch

will be connected to the new 600-volt 3-phase distribution panel in the electrical room;

- .3 Make the control cable connection, via a new mast attached to the building, in the new transfer switch. The installation must include the cables, piping and accessories needed to make a complete connection to the local emergency distribution.
- .4 In addition to the three masts described above, a fourth mat must be installed near the other 3 and be connected to the electrical room via a free 50mm conduit. A pull rope must be left in the conduit to allow future installation in this conduit. The anchor point on the wall must have a capacity equivalent to that of the anchor point of the power cable.
- .7 A new 600V / 120-208V transformer with a minimum capacity of 15 kVA (require capacity validation by the Contractor) to power a 60-circuits 120/208 volts and 100 amps. distribution panel with neutral will also need to be installed in the electrical room. The latter will be connected in the 600 V distribution panel.
- .8 The emergency transfer switch load side shall be connected to a new 600-volt three-phases distribution box with a minimum capacity of 100A which will allow critical loads to be connected via three-phase disconnect switches.
- .9 The cabinets of electrical equipment must be located in selected locations to allow a distribution with the maximum flexibility and easy access to equipment and circuits supplied on the floor while respecting regulatory requirements.
- .10 The power equipment must be designed to operate within the normal limits specified in CAN3-C235, without causing damage to equipment or causing power failure.
- .11 Transformers must have a spare capacity of at least 25% more than the calculated maximum demand.

## **2.2 CAPACITY OF SHORT CIRCUITS**

- .1 The short-circuit capability of electrical equipment, such as distribution panel, distribution boxes, disconnect switches, circuit breakers, protective circuits, bus bars and main conductors, shall be sized to meet short-circuit calculations in accordance with manufacturers recognized method.
- .2 These calculations shall be based on customer data for new electrical feeders based on the required capacity, the characteristics of the existing facilities and the electricity distributor.
- .3 Provide detailed calculations and results, all coordination curves, coordination detail drawings for the entire electrical distribution that must be considered to allow accurate calculations related to this project.

## **2.3 DESIGN DOCUMENTS**

- .1 Design and provide design documents as follows:
  - .1 Singleline diagrams representing electrical installations; for the entire electricity distribution network including the emergency network. Diagrams should include the size and type of conductors and cables, conduits design, grounding and grounding network, protections, measurement, etc. .;

- .2 Interconnection diagrams showing all connections and wiring of starters and junction boxes. The diagrams must indicate the markings, the identifiers of the cables, conductors and terminals;
- .3 Installation drawings locating electrical equipment, outdoor installations, conduit runs and cable shelves. These diagrams must be made to scale and precisely locate the material.
- .4 Installation diagrams locating the electrical equipment of the building: Lighting, plugs, other;
- .5 Installation Detail Drawings: underground work, elevation view of electrical entrance, supports, distributor network connections, fixtures and other details as required;
- .6 Panel Schedule: Must include circuit breaker type, identification, characteristics (A), associated load, total panel load, panel characteristics (voltage, current, short circuit current, model, brand, ...), its identification and a clear description for each of the circuits;
- .7 Diagram of the building earthing system, the network grounding and bounding of the equipment and switchgear;
- .8 Detailed installation drawings of the lightning protection system;
- .9 List of materials illustrating the identifier, quantity, make, model, system to which the material belongs and any other relevant information;
- .10 List produced overhead conduits and cables representing all information and specifications relevant to the wiring, including: conduit number or aerial cable, origin, destination, type of aerial conduit or cable, type of wire or cable under conduit, the number of drivers, the reference plane or any other relevant remark;
- .11 If deemed appropriate, at no additional cost, the Engineer may require a copy of the calculation notes including design criteria, load calculations, distances, selection of type and size of wiring. This does not relieve the Contractor of the responsibility to entrust the task of designing the systems to a qualified engineer who will take the responsibility.

## 2.4 MATERIALS

- .1 Transformers:
  - .1 Dry type ANN transformers for indoor use; Class H insulation and standard outlets.
- .2 Distribution panels:
  - .1 Panels designed for bolt-on circuit breakers only, with copper busbars;
  - .2 Uninterrupted solid neutral busbar for panelboards and branch panels, bonded to panel with grounding conductors;
  - .3 Insulated earth bus for panels serving non-linear loads (electronic equipment and computer equipment);
  - .4 Each distribution panel must be dimensioned to allow a minimum of 25% additional free space and at least one (1) space for 100 A three-pole breaker. In addition, each branch circuit board must have at least 20% of 15 A, 120 V spare circuit breakers.

- .3 Automatic Transition Transfer Switch Open:
  - .1 Provide ASCO Series 7000 automatic transfer switchgear or approved equivalent;
  - .2 The type of automatic switchgear must be open transition designed to:
    - .1 Check the voltage of the normal supply on all phases;
    - .2 Initiate the launch of the emergency generator in case of failure of the normal power supply or in case of abnormal voltage below the adjustable limits, preset, on any phase, for an adjustable duration;
    - .3 Switch load circuit from normal power supply to back-up power when generator set operation reaches pre-set adjustable limits corresponding to rated frequency and voltage;
    - .4 Then cause the emergency generator to stop after it has run idle, to cool, for a period determined by an adjustable timer relay;
    - .5 Have a minimum capacity of 30 Ampere at 600 volts three phases, without neutral.
- .4 Measurement system:
  - .1 Electronic microprocessor type unit;
  - .2 Plug-in type;
  - .3 Digital display with a minimum of 2 lines of 20 characters. All available measurements can be viewed on this display;
  - .4 Front LED indication for alarms and other indications;
  - .5 Programming of the possible unit on the front panel using a keypad, communication via a port installed on the front and by network (Ethernet IP) using dedicated software running under Windows;
  - .6 Real time reading of all three phases. The required measures are:
    - .1 Voltage (line-line and line-neutral, per phase);
    - .2 Current (per phase);
    - .3 Actual power (kW);
    - .4 Apparent power (kVA);
    - .5 Reactive power (kVAR);
    - .6 Energy (kWh);
    - .7 Power factor;
    - .8 Frequency (Hz);
    - .9 Harmonic distortion rate.
  - .7 Equipped with auxiliary relays: 4 inputs and 4 programmable outputs;
  - .8 Event records and alarms:
    - .1 Drop in voltage (Sag);
    - .2 Overvoltage (Swell).
  - .9 All alarms must be recorded;
  - .10 Records are kept in non-volatile memory with an associated date and time;

- .11 Each event must be recorded by capturing the signal with a minimum duration of 30 cycles (current, voltage, frequency);
- .12 TCP / IP communication protocol over Ethernet network. Must be able to provide this data to the existing system;
- .13 Voltage inputs 120 Vac;
- .14 Current inputs 5A;
- .15 High precision model (full range):
  - .1 Voltage:  $\pm 0.2\%$ ;
  - .2 Current:  $\pm 0.2\%$ ;
  - .3 Power factor:  $\pm 1\%$ ;
  - .4 Frequency:  $\pm 0.02$  Hz;
  - .5 Actual power:  $\pm 0.4\%$ ;
  - .6 Reactive power:  $\pm 0.4\%$ ;
  - .7 Apparent power:  $\pm 0.4\%$ .
- .5 Power Capacitors:
  - .1 Apparatus: dry, dustproof envelope;
  - .2 Discharge device: voltage reduced to 50 V in 1 minute;
  - .3 Conductors to CSA C155;
  - .4 Installation consisting of a common switching capacitor bank.
- .6 Starters and motor controls:
  - .1 Full voltage magnetic starters: Magnetic starters and magnetic starters combined; quick acting contactor and motor overload protection device on each phase. Magnetic starters must be equipped with circuit breakers with operating lever on the outside;
  - .2 Variable Speed Starters: solid state starter with rectifier bridge, electronic controller, for robust, configurable application, communication module (Ethernet TCT / IP), harmonic filters at source;
  - .3 Soft starters: solid state starters with rectifier bridge, electronic controller, for robust, configurable application, communication module (Ethernet TCP / IP), harmonic filters at the source and bypass starter;
  - .4 Accessories: pushbuttons, selectors, LEDs for intense service;
  - .5 Contactors maintained electrically, controlled by auxiliary devices: heavy-duty contactors, 22 mm push-buttons with "Manual - Off - Auto" positions, red, green, white LEDs; "ON-OFF" indication. Field-controllable control relays
  - .6 Dedicated terminal block for on-site connection of grouped motor control conductors;
  - .7 Solid state timer relay.
- .7 Ground busbar:
  - .1 Material: copper;
  - .2 Size: bar at least 32 mm x 4 mm, located on the inner periphery of the main room of electrical installations;

- .3 Ground bus must be connected to ground electrodes consisting of copper rods 3 m long;
  - .4 The connections of the earth rods and the underground connections must be made by aluminothermie and using clamps;
  - .5 Ground in accordance with CSA C22.1 all exposed non-current metal parts of the pipes, earth conductors laid in non-metallic raceways. Install ground connections on the main power switch and on the outer ground rods. Install ground connections to the metal structure or other metal equipment near sources, loads, distributions and electrical equipment.
- .8 Conduits and accessories:
- .1 General areas: conduits, fittings and accessories in waterproof PVC;
  - .2 Underground installation from the distribution system: conduits, fittings and accessories in waterproof PVC;
  - .3 Secondary distribution panel feeders and motor control centers: PVC conduit, fittings and accessories;
  - .4 Underground conduit not penetrating hazardous location: PVC conduit, fittings and accessories;
  - .5 Hazardous environment: rigid threaded conduit;
  - .6 Underground conduit entering a hazardous location: threaded rigid conduits, fittings and accessories with steel or aluminum threaded connections coated with epoxy resin.
- .9 Cables and Conductors: XLPE designation, type R90 - RWU90, depending on the application.

### **Part 3 Execution**

#### **3.1 APPLICATION**

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

#### **3.2 INSTALLATION**

- .1 Install electrical equipment in cabinets of electrical equipment rooms.
- .2 The conduits must be installed in such a way as to maintain the maximum possible free height in the rooms where they are visible. Pass conduits over or between the wings of steel framing members, if applicable.
- .3 Where possible, group conduits inside C-sections.
- .4 Install cables in conduits depending on the environment respecting the requirements of CSA C22.1.
- .5 Install dry transformers on a concrete base; provide sufficient free space for ventilation.
- .6 Transformers must be installed leveled and plumb. Loosen the isolation buffers until they show no signs of compression.

- .7 Use K-13 type transformers for installations where at least 50% of the connected load is non-linear.
- .8 Position and secure switchgear and service equipment on a plinth base so that they are rigid and plumb.
- .9 Install circuit breaker panels and circuit breakers.
- .10 Check factory-made switchgear connections for mechanical safety and electrical continuity.
- .11 Check tripping devices, setting thermal protections and fuse rating. Submit the installation to the required tests, put it into service and then make the necessary adjustments to bring it to the operating conditions.
- .12 Where necessary, install support panels on walls and behind safety lighting fixtures. Install at least one non-dedicated general double socket in each cabinet and two dual sockets in the main electrical room.
- .13 Provide three-phase motors for applications requiring power of 1/2 hp or more.
- .14 Provide progressive or variable frequency starters for 10 HP, 208 V, and 30 hp, 600 V motors and more or as prescribed by the discipline responsible for the supply of the equipment.
- .15 Branch circuit distribution panels must have a capacity of 42 circuits. Provide locking devices for 5% of unipolar circuit breakers from 15 A to 30 A.
- .16 Provide a solid, uninterrupted neutral dedicated to non-linear load circuits.
- .17 Provide automatic correction equipment to obtain a power factor of at least 90% when the electrical installation of the building is in normal maximum load condition. Power factor should be kept between 0.9 and 1 at all time.
- .18 Provide engine control equipment and starters.
- .19 Use motor circuit switches (protections) for combination starters.
- .20 Power supply conductors shall have characteristics that are compatible with the nominal rating of the main switchgear.

### 3.3 CONDUITS

- .1 Install underground conduits using trenches provided by others (see underground infrastructure plans). The Contractor will be responsible for the installation of these conduits as well as for the preparation of the soil below these if necessary as well as the laps specific to its application. The Contractor must coordinate with other disciplines, because the trenches will not necessarily be dedicated to his needs.
- .2 Surface mounted conduits:
  - .1 Unless otherwise specified, use PVC conduit of appropriate diameter for both feeders, branch circuit and control wiring;
  - .2 Install conduits parallel or perpendicular to building layout lines; the elbows must have a large radius of curvature;
  - .3 Respect the spacing between the conduits and the wall required by the Quebec Electrical Code;

- .4 Installed to maintain maximum free height in rooms where they are visible. Pass conduits over or between the wings of steel framing members, if applicable;
  - .5 In the case of gas or infrared heaters, pass the conduits behind and leave a space of 1500 mm;
  - .6 Where possible, group conduits on U-channels;
  - .7 Unless otherwise specified, conduits may not pass through framing members;
  - .8 Where conduits are parallel to steam or hot water lines, provide at least 75 mm clearance from insulation; at crossings between conduit and pipes, the clearance must be at least 25 mm in relation to the thermal insulation;
  - .9 Always install a nylon pull rope in conduit, whether empty or not.
- .3 Flexible conduits:
- .1 Use flexible waterproof conduits with metal framing and FT4 flame propagation protection;
  - .2 Where a flexible conduit is required in humid or corrosive areas, use the following conduits:
    - .1 Fluid-tight, liquid-tight, environmentally-approved metal conduits with appropriate marking and approval recognized by local authorities.
  - .3 Flexible conduits must not be more than 500 mm in length.
- .4 Flooded conduits in ground slab in place:
- .1 Route conduits 25 mm or more below slab; coat them with a layer of concrete at least 75 mm thick;
  - .2 Cover the concrete cover with a layer of 50 mm sand extending to the underside of the slab;
  - .3 Apply an asphalt over the connections.
- .5 Install underground conduits on a slope to promote drainage. Apply a generous coat of bituminous paint or bitumen to the joints to make them watertight.
- .6 Conduits below ground level or embedded in concrete must be watertight.
- .7 Verify with the Engineer, the location of the conduits in the slab and follow the instructions of the latter.

### **3.4 CABLE TRAYS**

- .1 Not planned for this project.

### **3.5 WIRING METHODS**

- .1 Install separate insulated ground continuity wire in conduit.
- .2 The minimum wire sizes are based on the use of copper conductors:
  - .1 Power and lighting circuits: minimum 12 AWG;
  - .2 Control Cables: 14 AWG;
  - .3 Instrument Cables: 18 AWG;
  - .4 Conductors 10 AWG and over must be stranded.
- .3 In conduits:
  - .1 Use RW90 type cables inside and RWU90 type cables outside;

- .2 Size of conduits: at least 19 mm;
- .3 Route in rigid PVC conduit wiring installed in or under floor slabs;
- .4 Use approved termination fittings and accessories for the location where they will be installed;
- .5 Do not mix power circuits, class 1, 2 and telecommunication circuits in one conduit. Use separate conduits. Refer to section 16 of the Quebec Electrical Code.

**3.6 CLEANING**

- .1 Clean in accordance with Section D5000 – 3.2 Cleaning.

**3.7 COMMISSIONING**

- .1 Test, commission and set equipment into operation.
- .2 Provide coordination study and report on primary and secondary protection devices and transformers.

**END OF SECTION**

**Part 1            General****1.1                RELATED REQUIREMENTS**

- .1            Section 01 and 40 and other sections of the specification.
- .2            See Section D5000 - 1.2 "PERFORMANCE OBJECTIVES".

**1.2                REFERENCE STANDARDS**

- .1            Illuminating Engineering Society of North America (IESNA).
- .2            ANSI / ASHRAE 90.1.
- .3            Regulation respecting health and safety of work in Québec - chapter S-2.1, r. 13.
- .4            See Section D5000 - 1.4 "CODES, STANDARDS AND REFERENCES".

**1.3                SUBMITTALS / SUBMITTALS FOR APPROVAL / INFORMATION**

- .1            Data sheets:
  - .1            Submit data sheets and manufacturer's documentation for lighting fixtures and associated electrical wiring. The data sheets must indicate the characteristics of the products, the performance criteria, the dimensions, the limits and the finish.
- .2            Shop Drawings:
  - .1            Submit location diagrams for lighting equipment, service receptacles, motors and other equipment indicating location and type of equipment;
  - .2            Submit location diagrams for hazardous locations and category 1 or 2 as defined in the Quebec Construction Code - Chapter V sections 18 and 22;
  - .3            Submit a complete simulation showing the average lighting levels at each location (indoor and outdoor), indicating target levels, minimum and maximum values, as well as simulation parameters.
- .3            See Section D5000 - 1.5 "SUBMITTALS / SUBMITTALS FOR APPROVAL / INFORMATION".

**1.4                TRANSPORTATION, STORAGE AND HANDLING**

- .1            See Section D5000 - 1.7 "TRANSPORT, STORAGE AND HANDLING".

**Part 2        Products****2.1        GLOBAL PERFORMANCE REQUIREMENTS**

- .1 Lighting:
  - .1 The lighting system must be designed to meet the functional criteria for the lighting of each task and must be equipped with efficient controls that will reduce the energy requirements of the facility;
  - .2 The lighting methods used shall provide primarily directed illumination with the least possible direct glare and reflection glare;
  - .3 The general lighting shall produce a luminance equal to at least one third of the required luminance above the task;
  - .4 For densely occupied work spaces, provide similar ceiling mounted light fixtures;
  - .5 Provide adequate T5 or LED fluorescent lighting within the building with a service life of 30,000 hours or more;
  - .6 Energy Consumption by Lighting System: to ANSI / ASHRAE 90.1;
  - .7 Lighting Calculation: per IESNA Lighting Handbook for each specific area, and ANSI / ASHRAE 90.1 for building lighting. Unless otherwise indicated, the calculation of the lighting must be based on the median illuminance values of the IESNA, but must at least meet the requirements of the Regulation respecting occupational health and safety in Quebec and Canada;
  - .8 Calculate illumination levels and uniformity factors as indicated in IESNA Lighting for Exterior Environments (RP-33-99);
  - .9 Any luminaire whose distance from the property line is less than 2.5 times its mounting height must be equipped with a louver which prevents its light from crossing the boundary of the property;
  - .10 The maximum portion of the light intensity produced by the interior lighting shall illuminate the interior of the building; the maximum portion of the light intensity produced by the exterior lighting must illuminate within the limits of the property.
- .2 Emergency Lighting and Remote Lamps:
  - .1 Lamps and lighting fixtures must have the characteristics necessary to continuously provide the full installed lighting power when there is no electricity for a minimum of 30 minutes;
  - .2 The emergency lighting shall provide the minimum levels of security illumination required by the applicable code, regulations, laws and standards;
  - .3 The conductors of the circuits to the remote lamps shall be of such a size that the voltage drop will not exceed 3% of the output voltage indicated for the luminaires;
  - .4 Install safety lighting fixtures such that in the event of a lamp failure, the space normally lit by this lamp is still illuminated to the minimum requirements.

## 2.2 LIGHTING

- .1 CSA approved luminaires, for 120V voltage, in some cases light sources with dimmer, a different voltage may be authorized by the engineer.
- .2 Internal cables of the luminaires:
  - .1 TEW type;
  - .2 Designed for a temperature of 105 degrees Celsius;
  - .3 Conductors at least 18 AWG in size; use larger drivers if necessary.
- .3 Grounding: Green ground wire connected to ground screw of lighting fixtures.
- .4 Luminaires must be supplied with all necessary accessories for installation, including ceiling mounting, hardware, ceiling trim rings, peripheral frames and end plates to close fixtures, so that they are solid, installed outcrop and accurately.
- .5 LEDs (Light Emitting Diode, for indoor installation):
  - .1 Closed luminaires with gaskets (minimum NEMA 12, select an appropriate type in hazardous areas, if applicable); structured matrix of LEDs optimizing the photometric distribution of light using a reflector grid or directional focusing optics; color rendering index of 4000 K; nominal life of 50,000 hours at 85% of luminous flux;
  - .2 Rated ambient temperature range of -40 to 50 ° C;
  - .3 System power factor > 90% and DHT < 20%;
  - .4 Do not contain lead or mercury.
- .6 Fluorescent lights (for indoor installation):
  - .1 Lamps: T5, quick start, color rendering index between 2700 to 4100 K, minimum service life of 30 000 hours, minimum NEMA 12 enclosure (select appropriate type in hazardous areas).
  - .2 Diffusers:
    - .1 Aluminum louver screens.
  - .3 Electronic ballasts, quick start:
    - .1 CSA certified ballasts complying with IEEE C62.41 / C62.45 standard, with and without lamp mounted on their secondary circuit;
    - .2 Maximum total harmonic distortion of the input current: 10%;
    - .3 Nominal sound level: Class A;
    - .4 Low temperature start: starting capacity below 10 degrees Celsius;
    - .5 Power factor: at least 0.97;
    - .6 Lamp peak current factor: not more than 1.5, value measured during operation;
    - .7 Ballast factor: 0.85 or more for all configurations under normal operating conditions;
    - .8 Minimum frequency of 20 kHz. Ballasts must not modulate the waveform with any component operating at 60 Hz or with any harmonic of this component;
    - .9 Lamps must operate without visible flicker;

- .10 Ballast box temperature: when the ambient temperature is 40 degrees Celsius, the temperature of the ballast case shall not exceed this temperature by more than 25 degrees Celsius;
  - .11 Maximum variation in luminous efficiency of lamps: 10%, when a voltage variation of 10% is applied to the ballast;
  - .12 Electromagnetic / Radio Frequency Interference (RF) limits to be met: Class A according to Part 18 of CFR 47 established by the FCC for non-residential applications, without impairing the operation of electrical equipment.
- .7 Outdoor lights (at external exits):
- .1 Brand: Philips;
  - .2 Series: Gardco;
  - .3 Type of lighting: LED;
  - .4 Render Color: AM-G2 (Amber);
  - .5 Case finish: BZ (Bronze);
  - .6 Mounting: Wall;
  - .7 Supply voltage: UNV (120-277 volts);
  - .8 Option: Integrated photocell (PCB).

### **2.3 LIGHTING CONTROLS**

- .1 Not planned for this project.

### **2.4 OUTPUT LIGHTING**

- .1 LED Output Indicators:
  - .1 Expected service life of at least 25 years;
  - .2 Operating temperature range -20 degrees Celsius to 40 degrees Celsius;
  - .3 Symbol in accordance with ISO 3864-1 and dimension in accordance with ISO 7010 requirements.
- .2 Supply voltage: The output indicator lights must be wired for connection to the emergency lighting circuits.
- .3 Buildings and boxes:
  - .1 Extruded or molded castings of cold rolled steel, of a thickness of not less than 1.0;
  - .2 Finishing: fired enamel paint, color selected;
  - .3 Face and back plates: material and finish in harmony with those of the case.

### **2.5 SECURITY LIGHTING AND REMOTELY INSTALLED LAMPS**

- .1 Batteries:
  - .1 Sealed, maintenance free;
  - .2 Power sufficient to power all lighting loads and exit lights for 30 minutes during a power failure;

- .3 Expected service life: at least 10 years;
  - .4 Supply voltage: 120V, a.c.;
  - .5 Output voltage: 6, 12 or 24V, c.c.;
  - .6 Mounting shelves: metal, securely anchored to the wall.
- .2 Integrated LED projectors.
  - .3 Test button, cord and plug for connection to 120 V circuits; Output terminal blocks c.c. inside the cabinet and mounting shelf.
  - .4 Certification CSA C22.2 No. 141.

## 2.6 LIGHTING CONTROL DEVICES

- .1 Switching:
  - .1 Local switches for each area;
  - .2 Large area with multiple accesses: Provide a switch at each access.
- .2 Outdoor lighting control equipment: photocell, for wall or luminaire mounting, as required.
- .3 Incorporate required number of contactors, photocells, timers, occupancy detectors and pushbuttons.
- .4 Low voltage programmable lighting controls are not permitted.

## 2.7 WIRING DEVICES

- .1 Double sockets:
  - .1 CSA 5-15R, 125 V, 15 A, U-shaped earth pin, for rear and side connections of 10 AWG wire; eight (8) rear entrances and four (4) side entrances;
  - .2 High-impact nylon face; heavy-duty, T-type, triple-rub, or four-point double-friction contacts, of length corresponding to the length of the tabs;
  - .3 Contact earth system;
  - .4 Wall mounting plates and flanges: one-piece, steel;
  - .5 Color: white.
  - .6 Must be combined with a ground fault circuit interrupter for outdoor use or in bathrooms.
- .2 Switches:
  - .1 Complies with CSA C22.2 Number 111, 120-277 V, c.a., 15 A, for 10 AWG wire, with solid silver contacts; the parts on which carbon deposits may develop must be molded, based on urea resin or phenolic resin;
  - .2 Switches suitable for rear or side connection;
  - .3 Color: white.
- .3 Cover plates:
  - .1 In wet or outdoor environment - weather resistant installations: waterproof plates with cover for wet locations marked "Extreme Service".

**2.8 FIXINGS AND SUPPORTS**

- .1 Mounting brackets: materials must be placed on supports or surfaces that will provide a permanent and durable installation.
- .2 Fasteners and supports shall meet the seismic requirements of the National Building Code for the location of work.

**Part 3 Execution****3.1 APPLICATION**

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

**3.2 LIGHTING**

- .1 Security lighting: to be provided in all areas and according to architect's recommendations and legal and regulatory requirements.
- .2 Lighting:
  - .1 Install fluorescent or LED fixtures in the following locations:
    - .1 In the whole building.
  - .2 Vapor-tight luminaires:
    - .1 Install vapor-tight luminaires in wet areas;
    - .2 Install explosion-proof luminaires in areas of danger of explosion;
    - .3 Luminaire in NEMA 12 enclosures for all other locations.
  - .3 Mechanical installation rooms and places where there is a risk of damage: rectilinear lighting fixtures fitted with a protective grid.
  - .4 Use connection cables of sufficient length to permit movement of equipment within 3 000 mm radius.
  - .5 Provide luminaires to illuminate the exterior of buildings at each exit of the buildings.

**3.3 WIRING and CONDUITS**

- .1 Refer to section D5010.

**3.4 WIRING METHODS**

- .1 Refer to section D5010.

**3.5 LIGHTING CONTROL DEVICES**

- .1 Provide switches for peripherally installed lighting fixtures to allow the use of daylight and thereby promote energy savings.
- .2 Provide switches for lighting fixtures installed in operation and maintenance stations requiring special lighting to perform the task.
- .3 Provide switches for access to the hazardous area.
- .4 Coordinate and calculate lighting controls in collaboration with end users of lighting system or lighted area.

- .5 Output light indicators:
  - .1 Mount LEDs in multiple circuits so that failure of a circuit or LED does not reduce the illumination of the faceplate;
  - .2 Provide, for output light signal circuits, circuit breakers locked in "ON" position.

### 3.6 WIRING DEVICES

- .1 Do not connect more than five (5) dual outlets per circuit.
- .2 The ratings of the circuits must correspond to the load of the equipment. Observe voltage drops and other requirements of CSA C22.10-18.
- .3 Install a dedicated neutral conductor for each circuit.
- .4 Provide a minimum of general purpose outlets so that the interval between shots is sufficiently close to allow equipment with a 5000 mm power cord to be placed anywhere. to connect it. At a minimum, meet the requirements of CSA C22.10-18.
- .5 Install an external circuit breaker outlet connected to a separate circuit:
  - .1 At the main entrance;
  - .2 One on each side of the exterior walls of the building.
- .6 Connect a GFCI receptacle to a separate circuit:
  - .1 In the washroom, if any, near the sink.

### 3.7 FIXINGS AND SUPPORTS

- .1 Fasten materials to cast-in-place concrete elements using Tapcon screws, Buildex or expansion screws.
- .2 Support material conduits with spring clips and bolts, and pipe clamps as basic profile accessories.
- .3 Fix exposed conduits to the building or support system using clamps:
  - .1 Use one (1) hole steel conduit ties to secure protruding conduits 50 mm or less in size;
  - .2 Use two (2) hole steel conduit ties for conduits larger than 50 mm;
  - .3 Use fasteners to secure conduits to exposed steel elements.
- .4 Suspend individual conduit sections with 6 mm diameter threaded rods and spring clips:
  - .1 When it is impossible to fix them directly to the building components of the building, support the conduits grouped in pairs by means of profiles held by lines to threaded rods at least 6 mm in diameter.
- .5 For surface mounting of two (2) or more conduits, use U-profiles 40 mm x 40 mm x 2.5 mm, spaced 1000 mm apart.
- .6 Provide adequate support for vertical descents of conduits when the mounting surfaces do not have a solid bottom.
- .7 Do not use metal ligation wire or perforated foil to support or secure conduits.

- .8 Do not use brackets or equipment installed for other purposes.
- .9 Install fasteners and brackets for each type of conduit and material in accordance with manufacturers' installation instructions.

**3.8 CLEANING**

- .1 See Section D5000 - 3.2 "Cleaning".

**END OF SECTION**

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Division 01 and 40

**1.2 WORK DESCRIPTION**

- .1 Security and communication work consists in: Providing access control to doors, fire detection system and a system for communicating fire alarms and alarms related to process. Alarms must be communicated to the central panel; no control signal must be sent from the central panel to the new building.
- .2 All signals must be connected to the existing departed panels in rooms F-105 and F-120. As shown on general drawings R082975.001-G01-PN and G02-PN, refer to these drawings for the length to be provided.
- .3 Programming and fire alarm connection, process and intrusion at panel of building #1.
- .4 Fire safety:
  - .1 Supply the required equipment for fire detection in control building.
  - .2 Supply sound alarm in case of fire detection.
  - .3 Provide transmission of fire alarm from detection equipment supplied and signals from at least three (3) independent equipment (bioreactor, flare).
- .5 Access control:
  - .1 Provide a card access control on main door of control building.
  - .2 Provide possible installation of two access controls on future buildings.
- .6 Alarm system:
  - .1 Provide a link to the central panel to communicate at least 3 alarms from the process.

**1.3 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA International):
  - .1 CSA C22.1-F06, Canadian Electrical Code, Part I (20th Edition), Safety Standard for Electrical Installations.
  - .2 CSA T568.1-05, Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements.
- .2 Industry Canada:
  - .1 CS-03-04, Compliance Specification for terminal equipment, terminal systems, network protection devices, connection arrangements and hearing aids compatibility.
- .3 Underwriters' Laboratories of Canada (ULC):
  - .1 CAN/ULC-S537-13, Verification of Fire Alarm Systems.

**1.4 DOCUMENTS/SAMPLES TO BE SUBMITTED FOR APPROVAL/INFORMATION**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data sheets:
  - .1 Provide manufacturer's printed product literature and, data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Test Reports:
  - .1 Submit test and verification reports from approved independent testing laboratories certifying compliance with specifications.

**1.5 EXTRA MATERIALS/EQUIPMENT**

- .1 Provide operations and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals. Include information as follows:
  - .1 Maintenance instructions.
  - .2 List of components.
  - .3 Operation and maintenance instructions.
  - .4 List of spare parts and supplies.
  - .5 List of devices address identification.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials and equipment to site in original factory packaging, labelled with manufacturer's name, address.

**Part 2 Products****2.1 DESIGN PERFORMANCE REQUIREMENTS**

- .1 Provide systems to ensure:
  - .1 Code requirements.
  - .2 Functional criteria for facility.
  - .3 To Departmental Representative's approval.
- .2 Fire Alarm System:
  - .1 Design and provide to requirements of applicable CSA and ULC standards.
  - .2 Provide modular design to permit minimum 25% future expansion.
  - .3 Circuit load: 80% maximum capacity per circuit.
  - .4 Ensure components are fully operational while system is operating in stand-by mode.

- .5 Ensure system can be operated by personnel who do not possess specialized computer training.
- .3 Public Address System:
  - .1 Design system for continuous duty cycle, modular system design.
- .4 Security Access Control (two doors):
  - .1 Provide personal computer driven card access control monitoring system, designed to selectively restrict access to specified areas. Include support for:
    - .1 Checkpoints must be connected to the existing system in building #7 (swine complex).
  - .2 Use distributed processing architecture, where each control unit can make access decisions without communication with other units.
  - .3 Provide for expand-ability, to enable addition of controlled doors or input/output points without disrupting system operation or changing existing architecture.

## 2.2 FIRE ALARM SYSTEM

- .1 Control Processing Unit:
  - .1 Alarms shall be connected to the existing central system installed in building #7 (pig complex).
- .2 Manual alarms near the mechanical room door and entrance of control building.
- .3 Smoke detector model Siemens OP121. Interface Modules: addressable, to interface non-addressable devices to address loop, serial time polling, monitor normally open contacts, without clip switch address programming, built in LED signal.
- .4 CO detector.
- .5 Thermal detector model CDT-135R sealed located in mechanical room.
- .6 Fire system alarms shall be communicated to the existing central system in building #7 (swine complex).
- .7 System Wiring:
  - .1 Connection to existing Siemens CA-100 panel: Extend the connection to new building with a paired #-18 twisted-armoured 2-pair cable.
  - .2 General Areas: cross-linked polyethylene, in electrical metallic conduit with set screw connectors.
  - .3 Mechanical room: MICC cable with explosion proof gland type fittings.
  - .4 All underground cables must be passed through the PVC conduit as required by section D5010.

## 2.3 DATA TRANSMISSION SYSTEM

- .1 Data transmission system consisting of the following elements:
  - .1 Provide new Siemens controller access, model CA-100 with 2 modules of 16-points supervision and 2 surge modules model DTK-2LVLP-D.
  - .2 Incoming service and equipment room for cable and racking installations.

- .3 Combined zone conduit and cable tray network connecting equipment to distribution closets and from each system outlet to closets.
- .2 Incoming communication service: two rigid 25 mm PVC conduit. Extend conduit to input panel.
- .3 Conduit Within Facility: by tubing, bushed at both ends.
- .4 Conduit Fittings:
  - .1 Wide sweep bends, 6 times diameter of conduit.
- .5 Outlet Boxes: minimum 100 x 100 x 65 mm deep.
- .6 Cable Tray: prefabricated, ventilated bottom with two side rails, minimum 75 mm wide.
- .7 Backboards:
  - .1 Material: softwood plywood, 20 mm thick x 2440 mm long.
  - .2 Paint backboards with 1 coat fire retardant paint.
- .8 Grounding:
  - .1 Service Entrance and Equipment Room: no. 1/0 min, insulated, stranded copper ground conductor.
  - .2 Equipment Closet: no. 6, min insulated, stranded copper conductor wire.

## **2.4 PUBLIC ADDRESS SYSTEM**

- .1 Fire alarm horn Model AH-R installed in mechanical and control room.

## **2.5 DOOR ACCESS CONTROL**

- .1 Computer-based electronic door access security system, of magnetic door holders, electric stickers, magnetic card readers, door monitoring contacts, emergency release devices.
- .2 Design to provide card access push button egress.
- .3 Required material as already used and recommended by Client:
  - .1 Recessed alarm contact, model 1076W-M.
  - .2 External access reader, model FP603.
  - .3 Model output query detector T-REX-XL.
  - .4 Local Alarm piezo model PZ1.
  - .5 Any other auxiliary equipment required.
- .4 Software Capability:
  - .1 Four (4) minimum security access levels, field programmable.
  - .2 Capable of deleting inputted access card, without need to re-programme subsequent access codes.
  - .3 Capable of inputting new card identification in vacated identifier.
  - .4 Log entries and exits.
  - .5 Lock or unlock designated doors from remote location using computer inputs.

**Part 3 Execution****3.1 APPLICATION**

- .1 Manufacturer's instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and data sheets.

**3.2 INSTALLATION**

- .1 Locate control equipment, panels, and communication terminations in closets as indicated and connect to 110 VAC power source.
- .2 Locate devices as indicated, make connections to system wiring.
- .3 Locate and install fire detectors in accordance with standard, do not mount detectors within 1 m of supply air outlets.
- .4 Install systems wiring in EMT conduit.
- .5 Make communication terminations in accordance with manufacturers' written recommendations.
- .6 Ensure adequate clearances are maintained between power and communication systems wiring.

**3.3 FIRE ALARM SYSTEM**

- .1 Logging: automatically log system events for future review. Log change of status, alarm and fault messages, with time of day and date.
- .2 Provide addressable, microprocessor based, zoned, non-coded, electrically supervised, single stage, general evacuation type fire alarm system with data communication link.
- .3 Sprinkler System: fully supervised by fire alarm system, and indicate sprinkler flow, tamper condition, pressure loss, as minimum requirement.
- .4 Wire circuits for alarm, trouble, and signals for proper alarm system operation from addressable components.
- .5 Connect system to central monitoring agency.
- .6 Label panels, control equipment and wiring.
- .7 Locate fire alarm panel at main entrance to facility:
  - .1 Verify that location corresponds to area of building where fire fighters will respond.
- .8 Manufacturer to conduct one inspections during first year operation. Submit written report to the Departmental Representative for each inspection.
- .9 Conceal conduit wherever possible.

**3.4 DATA SYSTEM**

- .1 Run incoming communication conduits parallel or perpendicular to walls and floor.
- .2 Provide cable tray to carry communications cables for distribution throughout facility.

- .3 Provide zoned conduit system.
- .4 Communication conduit:
  - .1 Run conduit maximum 30 metres with 2 maximum 90 degrees bends between pull points:
    - .1 Install pull cord in each conduit.
    - .2 Label pull boxes on exposed exterior.
  - .2 Bond metallic conduit and pull boxes together and connect to approved building ground.
  - .3 Originate conduit runs at telecommunications closet, wire way, pull box or splice box.
  - .4 Place pull boxes in readily accessible locations only.
  - .5 Install outlet boxes where identified. Mount at same level as adjacent duplex receptacles 300 mm above finished floor level, flush with finished walls wherever possible.
  - .6 Raceway fill: maximum 40%.
  - .7 Enclose cable in conduit or support on cable tray from outlet to termination point.
- .5 Cable Trays:
  - .1 Provide ventilated cable trays where required.
  - .2 Locate trays below or above the ceiling, as required to suit application.
  - .3 Support cable trays to suit loading and recommended support requirements in the CEC, Part 1, for applicable class. Place supports within 610 mm maximum on either side of any connection to fitting.
  - .4 Bond metal cable trays to ground.
  - .5 Provide minimum 300 mm access headroom provided above cable tray where practical. DO NOT permit other building components to restrict access to trays.
- .6 Backboards:
  - .1 Provide wall space within incoming service and equipment rooms for equipment and cable terminations.
  - .2 Anchor backboards to wall, capable of supporting attached equipment. Where separate incoming service room is provided, cover one wall minimum with plywood backboard.
  - .3 Cover two walls minimum in closets with plywood backboards.
- .7 Grounding:
  - .1 Service Entrance and Equipment Room:
    - .1 Install ground conductor in conduit, from main building grounding electrode to backboard in equipment room.
    - .2 Leave 2000 mm of coiled conductor at bottom left corner of plywood backboard.
  - .2 Equipment Closet: connect ground wire from each plywood backboard to main building ground electrode or equipment room backboard.

**3.5 COMMISSIONING**

- .1 Test, verify, and put into operation systems specified in this section.
- .2 Test and commission systems, provide test and verification reports, and put into operation.
- .3 Fire Alarm System:
  - .1 Operating System: commissioned by system manufacturer/supplier.
  - .2 Verify performance to CAN/ULC-S537.
- .4 Public Address System:
  - .1 Install system in accordance with manufacturer's written instructions.
  - .2 Install wiring within EMT conduit.
  - .3 After intelligibility test has been conducted satisfactorily, submit signed certificate stating system as installed is operating properly.
- .5 Door Access Control:
  - .1 Wire to manufacturers recommendations, in EMT conduit with screw fittings.
- .6 Training for all installed elements:
  - .1 Manufacturer to provide on-site training and demonstrations, to train operational personnel in use and maintenance of public address system, including operations and minor troubleshooting. Train for 4 hours.
  - .2 The training shall be mainly based on the installed system; General training will not be accepted.

**3.6 SEQUENCES OF OPERATION**

- .1 Fire Alarm System: upon receipt of alarm condition from any initiating device by control panel,
  - .1 Annunciate visual and audible trouble indicator at main control panel.
  - .2 Annunciate at remote annunciator, and remote monitoring stations.
  - .3 Increased ventilation from 6 to 12 air changes per hour.
  - .4 Release magnetically held doors.

**3.7 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Clean installed products in accordance to manufacturer's recommendation.

**END OF SECTION**