



ARCHITECTURE | DESIGN URBAIN



Correctional Service  
Canada

Service correctionnel  
Canada

**UIS Port-Cartier**  
**Tower UIS and ground floor redesign**  
**Secteur S**

Project no: 368-10083B

**CIVIL / STRUCTURE**  
**ARCHITECTURE**  
**ELECTROMECHANIC**

**Specification for Tender**  
**September 21, 2021**



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END OF SECTION



## STRUCTURAL & CIVIL ENGINEERING SPECIFICATIONS

### FOR TENDER CALL

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300-1145, boulevard Lebourgneuf  
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Révision n°	Émission	Date
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1	For submission	2021-09-21

**ARCHITECTURE SPECIFICATION****FOR TENDER CALL**

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1	Pour soumission	2021-09-21

## **ELECTROMECHANIC SPECIFICATION**

### **FOR TENDER CALL**

Prepared by :  
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Revision n°	Emission	Date
0	Review 90 %	2021-08-27
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**Partie 1      General****1.1      MAINTENANCE OF OPERATIONS**

- .1      The work must in no way interfere with the operations of the establishment.

**1.2      SCOPE OF WORK**

- .1      The following list describes the scope of the work, without being restrictive. Complete the work down to the smallest detail and deliver a complete, functional and efficient installation. Unless otherwise indicated, the work includes the supply, installation, connection of equipment and testing.
- .2      The work covered by this contract includes, among other things:
  - .1      All work necessary for the construction of one (1) new observation turret and an exit to the yard:
    - .1      Demolition work on the exterior precast concrete wall
    - .2      Demolition work of exterior mesh fences, their infrastructure and paving
    - .3      Modification to an exterior blowing in metallic coating
    - .4      Installation of the new steel structure of the turret
    - .5      Insulation and finishing of turret walls
    - .6      Construction of the elastomeric membrane roof
    - .7      Installation of doors and windows
    - .8      Construction of a new interior mesh airlock.
  - .2      All the work necessary for the construction of new interview rooms:
    - .1      Demolition of existing interview rooms: partitions, door, frames, floor and ceiling coverings
    - .2      Partial demolition of a concrete wall
    - .3      Demolition and partial reconstruction of the existing concrete slab
    - .4      Construction of new partitions and installation of door and frame
    - .5      Installation of new liquid floor covering
    - .6      Installation of new ceilings
  - .3      The work includes the restoration of the premises and the site at the end of the work.
  - .4      All other work indicated in the plans and specifications and also work not explicitly described, but required for the full performance of the contract.

**1.3      SECURITY REQUIREMENTS**

- .1      Carry out construction work on the new turret and demolition work on fences inside the safety enclosure in accordance with the prescriptions of section 01 35 13 - Safety Requirements. The machinery used cannot remain inside the security perimeter when the site is not in operation.

**1.4 WORK CARRIED OUT BY THIRD PARTIES**

- .1 Work in collaboration with other contractors and carry out instructions from Departmental Representative.
- .2 Coordinate work with that of other contractors. If the execution or the result of any part of the work covered by this contract depends on the work of another contractor, report without delay, in writing to the Departmental Representative, any anomaly or any defect likely to adversely affect the good execution of the work.

**1.5 FUTURE WORK**

- .1 Ensure that the works do not encroach on the areas targeted by the work to come.

**1.6 WORK EXECUTION ORDER**

- .1 Execute the work in stages, so that the Departmental Representative can use the premises continuously during the work.
- .2 Coordinate the work progress schedule according to the occupancy of the premises by the Departmental Representative.
- .3 Carry out work in stages so as to allow continuous use of the premises by the public. Maintain public access to the premises as long as the progress of the work prevents an alternative solution from being offered.
- .4 Maintain access for fire fighting purposes; also provide the means of fire fighting.

**1.7 USE OF PREMISES BY THE CONTRACTOR**

- .1 The site can be used without restriction until substantial completion of the work.
- .2 The use of the premises is restricted to the areas necessary for the execution of the storage and access work in order to allow:
  - .1 Occupancy of the premises by the Departmental Representative
  - .2 Partial occupancy of the premises by the Departmental Representative
  - .3 Execution of work by other contractors
  - .4 Use of premises by the public
- .3 Coordinate the use of the premises according to the instructions of the Departmental Representative.
- .4 Find additional work or storage areas required to perform work under this contract and pay the cost.

- .5 Remove or modify the existing work to avoid damaging the parts that must remain in place.
- .6 Repair or replace as directed by the Departmental Representative, for the purposes of connection to the existing work or to adjacent work, or for the purposes of harmonization with them, the parts of the existing work which have been modified during construction work.
- .7 Once work is completed, the existing structures must be in a state equivalent or superior to the state before the start of the work.

**1.8 OCCUPATION OF PREMISES BY THE DEPARTMENTAL REPRESENTATIVE**

- .1 The Departmental Representative will occupy the premises for the duration of construction work and continue normal activities during this period.
- .2 Collaborate with the Departmental Representative in establishing the work schedule, so as to reduce conflicts and facilitate the latter's use of the premises.

**1.9 PARTIAL OCCUPANCY OF THE PREMISES BY THE CONTRACTOR**

- .1 Establish a schedule for the substantial completion of the work in the designated sectors, so as to allow the occupancy of these by the Departmental Representative before the substantial completion of all work subject to of the contract.
- .2 Departmental Representative will occupy designated areas for storage of supplies and equipment installation of material.
- .3 Execute the obligations related to the issuance of the certificate of substantial completion of the work for each designated area, before the Departmental Representative occupies the premises.
- .4 The Contractor must allow:
  - .1 Access to the premises for the personnel of the Departmental Representative
  - .2 Use of parking areas
  - .3 Operation of HVAC systems and electrical installations

**1.10 ELEMENTS PROVIDED BY THE DEPARTMENTAL REPRESENTATIVE**

- .1 Responsibilities of the Departmental Representative

- .1 Make the necessary arrangements to forward shop drawings, technical data sheets, samples, manufacturers' instructions and certificates to the Contractor.
  - .2 Submit the list of materials and equipment ordered to the Contractor.
  - .3 Arrange for these materials and equipment to be delivered to the site in accordance with the work progress schedule, and pay the costs thereof.
  - .4 Check materials and equipment in collaboration with the Contractor at the time of their delivery.
  - .5 Submit, if applicable, claims for damage caused during transport.
  - .6 Take the necessary steps to replace damaged, defective or missing elements.
  - .7 Make the necessary arrangements for the services provided on site by the manufacturer. Also make the necessary arrangements to obtain the guarantees and warranties from the manufacturer and to ensure their delivery to the Contractor.
- .2 Responsibilities of the Contractor
    - .1 Designate, for the purposes of the work progress schedule, the documents and samples to be submitted as well as the delivery date of each product.
    - .2 Review shop drawings, technical data sheets, samples and other documents to be submitted. Report to the Departmental Representative all observed deviations or problems foreseen due to the non-compliance of the products with the requirements of the contractual documents.
    - .3 Receive and unload products on site.
    - .4 Inspect products upon delivery, in collaboration with Departmental Representative, and take note of missing, damaged or defective items.
    - .5 Handle products on site, in particular to unpack and store them.
    - .6 Protect products against damage and bad weather.
    - .7 Assemble, install, connect, adjust and finish products.
    - .8 Ensure, after installation, the inspections required by the competent authorities.
    - .9 Repair or replace items damaged on site by the Contractor or by a subcontractor in the service of the latter.
  - .3 List of items provided by the Departmental Representative
    - .1 Manual and electric prison type locks

## **1.11 MODIFICATIONS, ADDITIONS OR REPAIRS TO THE EXISTING BUILDING**

- .1 Execute the work with the least possible interference with the operation of the building, the occupants, the public and the normal use of the premises. Make the necessary arrangements with the Departmental Representative to facilitate execution of the work.
- .2 For the transport of workers, materials and equipment, use only elevators, dumbwaiters, carriers, or existing escalators in the building.

- .1 Protect the walls of the elevators to the satisfaction of the Departmental Representative before using them.
- .2 Assume equipment safety as well as responsibility for damage caused by work and overloads imposed on existing equipment.

### **1.12 EXISTING UTILITIES**

- .1 Before interrupting utility services, inform the Departmental Representative as well as the utility companies concerned, and obtain the necessary authorizations.
- .2 If it is necessary to make taps on existing utility pipes or connections to these pipes, give the Departmental Representative a prior notice 48 hours before the scheduled time of interruption of the corresponding electrical or mechanical services. Make sure that the duration of the interruptions is as short as possible. Carry out the work at the times fixed by the competent local authorities, with minimal interference with pedestrian and vehicle traffic, and the activities of occupants.
- .3 Provide alternate routes for the movement of personnel, pedestrians and vehicles.
- .4 Before starting work, define the extent and location of utility pipes in the work area and inform the Departmental Representative.
- .5 Submit to the Departmental Representative for approval a schedule relating to the shutdown or closure of active facilities or works, including the interruption of communications services or power supply. Respect the approved schedule and inform the parties affected by these inconveniences.
- .6 Provide temporary utility services as directed by the Departmental Representative to maintain critical building and tenant systems.
- .7 Install site walkways for crossing trenches, in order to maintain normal pedestrian and automobile traffic.
- .8 When unlisted utility pipes are discovered, immediately inform the Departmental Representative and record them in writing.
- .9 Protect, relocate or maintain existing active services. If non-functional pipes are discovered during the work, seal them in a manner authorized by the competent authorities.
- .10 Record location of utility lines that are maintained, relocated or abandoned.
- .11 Build barriers in accordance with section 01 56 00 - Temporary Barriers and Enclosures.

**1.13 REQUIRED DOCUMENTS**

- .1 Keep one copy of each of the following documents on site
  - .1 Contract drawings
  - .2 Specifications
  - .3 Addendum
  - .4 Reviewed shop drawings
  - .5 List of unrevised shop drawings
  - .6 Order of changes
  - .7 Other modifications of the contract
  - .8 Field test reports
  - .9 Copy of approved work schedule
  - 10 Health and safety plan and other safety related documents
  - .11 Other documents indicated

**1.14 BUILDING PERMIT**

- .1 The Contractor is responsible for requesting a building permit from the City of Port-Cartier and paying the fees relating to this request.

**Partie 2 PRODUCTS****2.1 NOT APPLICABLE**

- .1 Not applicable

**Partie 3 EXECUTION****3.1 NOT APPLICABLE**

- .1 Not applicable

**END OF SECTION**

**PART 1 GENERAL****1.1 PRIORITY**

- .1 In the case of work performed for the federal government, Division 1 sections take priority over the technical specifications of the other divisions.

**1.2 RELATED SECTIONS**

- .1 Section 01 78 00 – Closeout Submittals.

**1.3 ADMINISTRATIVE**

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

**1.4 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which

- adjacent items will be supplied and installed. Indicate cross-references to design drawings and specifications.
- .3 Allow 15 work days for Ministry Representative's review of each submission.
  - .4 Adjustments made on shop drawings by Ministry Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Ministry Representative prior to proceeding with Work.
  - .5 Make changes in shop drawings as Ministry Representative may require, consistent with Contract Documents. When resubmitting, notify Ministry Representative in writing of revisions other than those requested.
  - .6 Accompany submissions with transmittal letter, in duplicate, containing:
    - .1 Date.
    - .2 Project title and number.
    - .3 Contractor's name and address.
    - .4 Identification and quantity of each shop drawing, product data and sample.
    - .5 Other pertinent data.
  - .7 Submissions include:
    - .1 Date and revision dates.
    - .2 Project title and number.
    - .3 Name and address of:
      - .1 Subcontractor.
      - .2 Supplier.
      - .3 Manufacturer.
    - .4 Details of appropriate portions of Work as applicable:
      - .1 Materials and Fabrication.
      - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
      - .3 Setting or erection details.
      - .4 Capacities.
      - .5 Performance characteristics.
      - .6 Standards.
      - .7 Operating weight.
      - .8 Wiring diagrams.
      - .9 Single line and schematic diagrams.
      - .10 Relationship to adjacent work.
  - .8 Submit 2 printed copies or one PDF version of shop drawings requested in specification Sections.
  - .9 Ministry Representative will return 1 copy to Contractor. Contractor will make 7 printed copies and distribute them to the appropriate persons.

- .10 Distribute shop drawing and product data copies only after Ministry Representative has finished review.
- .11 Delete information not applicable to project.
- .12 Supplement standard information to provide details applicable to project.
- .13 If upon review by Ministry Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

## **1.5 SAMPLES**

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

END OF SECTION



## 1. GENERAL INFORMATION

### 1.1. PURPOSE

- .1 To ensure that the work and institutional activities are carried out smoothly with no undue delays, and that institutional security is maintained at all times.

### 1.2. DEFINITIONS

- .1 « CSC » Correctional Service Canada.
- .2 « Warden » Warden of the institution.
- .3 « Departmental representative » Any employee who is mandated to intervene, carry out supervision, ensure coordination and/or supervision of the work.
- .4 « Work enclosure » Area where, as indicated on the project plans, the contractor is authorized to work. This can be isolated from the perimeter of the institution.
- .5 « Perimeter » Area of the establishment surrounded by fences or walls preventing the movement of inmates.
- .6 « Prohibited items » :
  - .1 Intoxicants, including alcohol, drugs and narcotics;
  - .2 A weapon or a component thereof, ammunition, or anything that is designed to kill, injure or disable a person or that can be assembled or modified for such purposes, possessed without prior authorization;
  - .3 An explosive or a bomb, or a component thereof;
  - .4 An amount of money exceeding the regulatory limit;  
**NOTE:** Consult the *Corrections and Conditional Release Regulations* (SOR/92-620): \$50 limit in a minimum-security institution, \$25 limit in a medium-security institution, maximum-security institution, or multi-level security institution.
  - .5 Any other item possessed without prior authorization that could jeopardize the security of the penitentiary or the safety of persons;
  - .6 Electronic or telecommunication devices;
  - .7 Tobacco products and associated products (including, but not limited to, cigarettes, electronic cigarettes, cigars, tobacco, chewing tobacco, cigarette-making machines, matches and lighters) are considered unauthorized items.
- .7 « Commercial vehicle » Vehicle intended for the transportation of material, equipment or tools necessary for the work.

### 1.3. PRELIMINARY MEASURES

- .1 Prior to starting the work, the Contractor must communicate with the Departmental representative to:
  - .1 Discuss the nature and the scope of the work associated with the project;
  - .2 Establish mutually-acceptable security measures, in accordance with this directive and the specific needs of the institution.
- .2 The Contractor must:
  - .1 Be sure to inform their employees of the security requirements;
  - .2 Work with institutional staff to ensure that their employees comply with the security

requirements.

#### **1.4. CONTRACTOR'S EMPLOYEES**

- .1 According to the Warden's preference, the Contractor must be aware that no employee will be admitted access to the institution without valid security clearance and have a recent photo identification card, such as a provincial driver's licence.
- .2 The Contractor must submit to the Departmental representative a list of the names and birth dates of all his employees scheduled to work in the institution or all other CSC site, as well as their completed security clearance forms (*Federal Institution Access Request* form). Allow two (2) weeks for the security clearance forms to be processed.
- .3 The Warden may require that headshots be taken of the Contractor's Employees so that their pictures can be posted in appropriate areas throughout the institution or entered into a database for identification purposes. The Warden may also require that the Contractor's Employees prominently display photo identification on their clothing when they are within the institutional perimeter.
- .4 An individual will be refused entry to institutional premises if there is reason to believe that they pose a security risk.
- .5 Individuals will be immediately removed from institutional premises if:
  - .1 They appear to be under the influence of alcohol, drugs or narcotics;
  - .2 They behave in an abnormal or disorderly manner;
  - .3 They are in possession of prohibited items.
- .6 Before accessing the institution any individual may be required to fill out a form or to answer questions concerning their immediate health state. When requested by the Warden, the individual's body temperature may be checked. Following these verifications, CSC might chose to refuse access to any individual.

#### **1.5. VEHICLES**

- .1 The personal vehicles of the Contractor's Employees are not allowed within the perimeter of medium- or maximum-security institutions without the express permission of the Warden.
- .2 All individuals who leave a vehicle unattended on CSC premises must close the windows and lock the doors and trunk. The owner of the vehicle or the employee from the company that owns the vehicle must ensure that the keys are kept safely in their personal possession.

**NOTE:** The institution may require that all vehicles and motorized equipment be equipped with a device that allows for locking the fuel cap.
- .3 The Warden can limit the number and type of vehicles permitted within the perimeter at any time.
- .4 Those delivering materials needed for the work may be required to have security clearance.
- .5 Should the Warden allow trailers to be left within the institution's perimeter, the doors and windows must remain closed and locked when left unattended. Windows must be equipped with expanded metal grates.

#### **1.6. PARKING**

- .1 The Departmental representative designates authorized parking areas for vehicles. If the Contractor's Employees park elsewhere, their vehicle may be towed.

#### **1.7. SHIPMENTS**

- .1 All shipments of material, equipment or tools for the work must be addressed to the Contractor

to clearly distinguish them from shipments for the institution. The Contractor must ensure that his employees are on site to receive deliveries, as CSC staff will not accept deliveries of materials, equipment or tools intended for the Contractor.

### 1.8. COMMUNICATION DEVICES

- .1 Cellular or digital cordless phones (including, but not limited to, text messaging devices, pagers, BlackBerry, and telephones used as two-way radios), laptop computers and tablets are prohibited in the institution without the express authorization of the Warden. Even when permitted, they are not to be used by inmates.
- .2 The Warden may approve but limit the use of two-way radios.

**NOTE:** In some institutions, cellular or digital phones and two-way radios are permitted; however, conditions may apply. For example, their use may not be permitted in areas accessible to inmates.

### 1.9. TOOLS AND EQUIPMENT

- .1 The Contractor must keep a comprehensive list of the tools and equipment used during the work. This list must be kept up-to-date throughout the work and be submitted for inspection when necessary.

**NOTE:** A list of unauthorized or restricted tools and equipment may be provided to the Contractor if necessary.

- .2 The Contractor's Employees must never leave tools unattended, particularly mechanical tools, files, saw blades, hacksaws, wire, rope, ladders and any item used for lifting (jacks, cylinders, etc.).
- .3 The Contractor's Employees must store tools and equipment in a secure, authorized location.
- .4 The Contractor's Employees must lock all toolboxes after use and keep the keys with them at all times. They must also lock scaffolding that is not being used; once erected, scaffolding must be secured to the satisfaction of the Departmental representative.
- .5 The Contractor's Employees must notify the Departmental representative immediately if any tools or equipment have been lost or are unaccounted for.
- .6 The Warden will ensure that security staff verifies the Contractor's tools and equipment based on the list provided by the Contractor, at the following times:
  - .1 at the beginning and end of each project;
  - .2 each week, if the work lasts more than one (1) week.

**NOTE:** Some institutions require that tools and equipment be removed from the work site on a daily basis (e.g., in a busy area).

- .7 Some tools and equipment - such as cartridges and metal saw blades - are closely controlled. At the beginning of the day, the Contractor will be given a sufficient number of these items for one (1) day's work. Used blades/cartridges must be returned to the security personnel at the end of each day.
  - .8 The use of fastening tools or other tools with cartridges is strictly prohibited.
- NOTE:** Controlled items are managed differently from one institution to another and must be verified with the specific institution.
- .9 If propane or natural gas is used as a heat source for the work, the institution requires that a member of its personnel supervise the work site outside of regular working hours.

**NOTE:** This is a concern if the work site is located near inmates' living units. A fire could put

human lives in danger. Check the institution's policy.

#### **1.10. KEYS**

- .1 During the work, the Contractor must use regular cylinders in regular locks.
- .2 Once the security locks are installed, the Departmental representative who escorts the Contractor's Employees must obtain the keys in order to open doors according to the Contractor's needs. The Contractor must inform his employees that only the Departmental representatives escorting them are authorized to use the keys.

#### **1.11. PRESCRIPTION MEDICATION**

- .1 If the Contractor employs individuals who must take prescription medication during the work day, these employees must obtain authorization from the Warden to bring one (1) day's dosage into the institution.

#### **1.12. RESTRICTIONS ON TOBACCO USE**

- .1 Neither Contractors nor the Contractor's Employees are permitted to smoke inside correctional institutions, nor outside while within the perimeter of a correctional institution. They must not have unauthorized tobacco products in their possession within the institutional perimeter.
- .2 All individuals who violate this policy will be asked to stop smoking or to throw out all unauthorized tobacco products immediately. Individuals who continue to violate this policy will be asked to leave the institution.
- .3 Smoking will only be permitted outside the correctional institution's perimeter, in a location designated by the Departmental representative.

#### **1.13. PROHIBITED ITEMS**

- .1 Firearms, ammunition, explosives, alcohol, drugs and narcotics are prohibited on institutional premises.
- .2 The Warden must be notified immediately if anyone is found in possession of prohibited items on the work site.
- .3 The Contractor must be vigilant in monitoring their employees as well as the employees of their Subcontractors. Individuals found in possession of prohibited items may have their security clearance revoked. If the violation is serious, the company in question may be expelled from the institution for the duration of the work.
- .4 If firearms or ammunition are found in the vehicle of a Contractor, Subcontractor, supplier, or their personnel, the security clearance of the vehicle's driver will be revoked immediately.

#### **1.14. SEARCHES**

- .1 All individuals and vehicles arriving on the institution's premises may be searched.
- .2 If the Warden has reason to believe that one of the Contractor's Employees is in possession of a prohibited item, the Warden may order a search of that individual.
- .3 The personal belongings of all the Contractor's Employees arriving at the institution may be checked to search for the residue of contraband drugs.

#### **1.15. CONTACT WITH INMATES**

- .1 It is prohibited to enter into contact with inmates, speak to them, give them anything or accept anything from them without specific authorization. Anyone who violates this order will be expelled from the site and have their security clearance revoked.

- .2 It is prohibited to photograph inmates or CSC employees. It is also prohibited to photograph sectors of the institution when such photography is not required for the execution of the present contract.

## **2. PRODUCTS**

### **2.1. NO OBJECT**

## **3. EXECUTION**

### **3.1. ACCESS TO THE INSTITUTION**

- .1 Neither the Contractor's Employees nor commercial vehicles may be admitted to the institution's premises outside normal working hours without the express authorization of the Departmental representative.
- .2 The work week at the facility is Monday to Friday, generally 7:30 a.m. to 4 p.m. Hours of work vary from institution to institution. They should be checked with the institution concerned.

### **3.2. DAILY WORK PROGRAM**

- .1 The contractor must send a daily work program to the departmental representative in the form of an email one day in advance and before noon, so that he can coordinate the work with the operations and security of the institution as well as with other work in progress and schedule the security escorts required for surveillance. The contractor must notify the departmental representative as soon as possible if there are any changes to the day's schedule, eg: interruption or need for extension of work, etc.

### **3.3. VEHICLE TRAFFIC**

- .1 Vehicles may enter and leave the facility escorted through the vehicle access barrier, at the times specified by the Departmental representative for each site. Note that service barriers will be inaccessible during the lunch hour.  
**NOTE:** Hours vary from one institution to the next. They should be verified with the institution concerned.
- .2 The Contractor must provide the Departmental representative forty-eight (48) hours' notice of the arrival of heavy equipment.
- .3 Vehicles carrying detritus or other material deemed impossible to search must constantly be monitored by CSC employees or security personnel who report to the Warden or must wait for an official head-count of the inmates to be conducted.
- .4 Before a commercial vehicle may be admitted onto the institution's perimeter, the Contractor or its representative must certify that the vehicle's content is essential to the execution of the work.
- .5 Entry will be refused to all vehicles carrying materials that the Warden believes pose a risk to institutional security.

### **3.4. CIRCULATION OF THE CONTRACTOR'S EMPLOYEES ON INSTITUTIONAL PREMISES**

- .1 Subject to proper institutional security, the Warden will give the Contractor and the Contractor's Employees as much freedom of movement and autonomy as possible.
- .2 The previous paragraph notwithstanding, the Warden may:
  - .1 Prohibit access to sections of the institution;
  - .2 Require that the Contractor's Employees be accompanied by CSC security personnel in

designated sections;

- .3 Require that the Contractor's Employees remain on-site during coffee/health and lunch breaks, depending on the institution and the situation. The Contractor's Employees are not authorized to eat in the break room of CSC employees, but they may use another area designated by the Departmental representative.

### **3.5. UNINSTALLED EQUIPMENTS AND ACCESSORIES**

- .1 Return all uninstalled devices, devices, equipment, accessories or hardware to the Departmental Representative to ensure that they are disposed of or kept in a safe place for later reuse. If authorized by the departmental representative, dispose of it responsibly.

### **3.6. MONITORING AND INSPECTION**

- .1 CSC security personnel will monitor and inspect the Contractor's Employees activities as well as related movement and vehicle traffic to ensure that established security standards are being followed.
- .2 At the start and throughout the duration of the work, CSC staff will convey to the Contractor's Employees the necessity of monitoring and inspections.

### **3.7. WORK STOPPAGE**

- .1 At any time, the Warden may ask the Contractor, the Contractor's Employees, or Subcontractors not to enter the work site or to leave immediately if a security incident is in progress in the institution. The Contractor's Employees must note the name of the CSC employee issuing the request as well as the time and comply with the order as soon as possible.
- .2 Once notified, the Contractor must inform the Departmental representative of work stoppage without delay.

### **3.8. WORK COMPLETION**

- .1 Unless otherwise indicated in the contract, once the project is completed or the facilities handed back to the CSC, the Contractor must remove all materials, tools and equipment from the institution, as well as perform a final clean-up of the site.

**END OF SECTION**

**Partie 1      General**

**GENERAL NOTE:** in this section, the term “worksite” extends to all the installations located on the site where work takes place (the worksite itself, buildings, accesses, infrastructures, parking lots, docks, etc.).

**1.1      RELATED REQUIREMENTS**

- .1 Sections of Division 1.

**1.2      REFERENCES**

- .1 Province of Quebec
  - .1 Act respecting occupational health and safety, RSQ, c S-2.1
  - .2 Safety code for the construction industry, LRQ, c. S-2.1, r.4

**1.3      SUBMITTALS PROCEDURES**

- .1 Submit the required documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Send the prevention program specific to the worksite, as described in the “GENERAL REQUIREMENTS” section, to the Departmental Representative and to the CNESST, at least 10 days before the start of the work.
- .3 The Departmental Representative will examine the prevention program prepared by the Contractor for the worksite and will provide them with their observations within 10 working days of receipt of this document. If necessary, the Contractor will revise their prevention program and resubmit it to the Departmental Representative no later than 5 days after receiving the Departmental Representative's observations. The Departmental Representative reserves the right not to authorize the start of work on the site until the content of the prevention program is satisfactory. The Contractor must then update their prevention program and submit it to the Departmental Representative if the scope of the work changes, if the Contractor's working methods differ from their initial forecasts or for any other new applicable condition.
- .4 The review by the Departmental Representative of the prevention program prepared by the Contractor for the worksite should not be interpreted as an approval of this program and in no way limits the Contractor's overall responsibility for health and safety during construction work.
- .5 Submit to the Department Representative once a week the reports of health and safety inspections carried out on the worksite by the Contractor's authorized representative.
- .6 Submit to the Departmental Representative, within 24 hours, a copy of any inspection report, correction notice or recommendation issued by federal, provincial and territorial government health and safety inspectors.

- .7 Submit to the Departmental Representative, within 24 hours, an investigation report for any accident resulting in injury and for any incident that highlights a potential risk.
- The investigation report must contain at least the following elements:
1. Date, time and place of the accident
  2. Name of the subcontractor involved in the accident
  3. Number of people involved and condition of injured
  4. Identification of witnesses
  5. Detailed description of the tasks performed at the time of the accident
  6. Equipment used to perform the tasks performed at the time of the accident
  7. Corrective actions taken immediately after the accident
  8. Causes of the accident
  9. Preventive measures put in place to avoid a similar accident
- .8 Submit the WHMIS Material Safety Data Sheets to the Departmental Representative in accordance with Section 01 33 00. The Contractor must also keep a copy of these sheets on the site.
- .9 Medical surveillance: Where required by law, regulation or safety program, submit, before starting work, certification of the medical surveillance of personnel working on the site. Provide the Departmental Representative with additional certification for any new employee working on the site.
- .10 Submit an emergency response plan to the Departmental Representative at the same time as the prevention program. This emergency response plan must contain the elements listed in the "GENERAL REQUIREMENTS" section.
- .11 Submit a copy of the worksite worker training certificates to the Departmental Representative, in particular for the following training (when applicable):
- .1 First aid in the workplace and cardiopulmonary resuscitation
  - .2 Work likely to emit asbestos dust (compulsory for all work in the presence of asbestos)
  - .3 Work in confined spaces (compulsory for all work in confined spaces)
  - .4 Lockout (compulsory for any work requiring lockout)
  - .5 Safe operation of forklifts (compulsory for all use of forklifts)
  - .6 Safe operation of elevated work platforms (mandatory for all use of elevating platforms)
  - .7 Any other training required by regulation or by the prevention program
- In addition, certificates for the *General Health and Safety Course for construction sites* must be available on request on site.
- .12 Engineer's plans and certificates of compliance: the Contractor must send a copy signed and sealed by an engineer to the Departmental Representative and to the *Commission des normes, de l'énergie, de la santé et de la sécurité du travail* (CNESST) of all plans required under the *Safety Code for the construction industry* (S-2.1, r.4), and any other

law or regulation, or any clause of the specifications or contract. The Contractor must also send a certificate of conformity signed by an engineer once the installation for which these plans were designed has been completed and before a person uses this installation. A copy of these documents must be available at all times on the work site.

#### **1.4 PRODUCTION OF WORKSITE OPENING NOTICE**

- .1 Before the start of work, send the worksite opening notice to the CNESST. Send a copy of the notice of opening and the acknowledgment of receipt sent by the CNESST to the Departmental Representative.  
  
Upon completion of all work, the closure notice must be sent to the CNESST, with a copy to the Departmental Representative.
- .2 The Contractor must assume the role of the Principal Contractor at all times within the limits of the worksite and anywhere else where he must carry out work within the framework of this project. The Contractor must recognize the responsibility of the Principal Contractor and identify himself in the notice of opening of the worksite that he sends to the CNESST.
- .3 The Contractor must agree to divide and identify the worksite adequately, in order to define the time and space at all times during the duration of the project.

#### **1.5 RISK / HAZARD ASSESSMENT**

- .1 Make an assessment of the safety risks / dangers present on this worksite with regard to the execution of the work.

#### **1.6 MEETINGS**

- .1 Organize a health and safety meeting with the Departmental Representative before the start of the work, and assure the direction of it.
- .2 A decision-making representative of the contractor must attend all meetings concerning health and safety on the site.
- .3 If it is expected that there will be 25 or more workers on the site, at any time during the work, the contractor must set up a worksite committee and hold meetings as required by the *Safety Code for construction work* (S-2.1, r. 4). A copy of the minutes of the worksite committee meetings must be sent to the Department Representative within 5 days of the date of the committee meeting.

#### **1.7 REGULATORY REQUIREMENTS**

- .1 Comply with all laws, regulations and standards that are applicable to the performance of the work.
- .2 Observe the prescribed standards and regulations in order to guarantee the normal progress of work on sites contaminated by dangerous or toxic materials.

- .3 Always use the most recent version of the standards cited in the *Safety Code for the construction industry* (S-2.1, r.4), notwithstanding the date indicated in this *Code*.

## **1.8 COMPLIANCE REQUIREMENTS**

- .1 Comply with the *Act respecting occupational health and safety* (RSQ, c. S-2.1) and the *Safety Code for the construction industry* (S-2.1, r. 4.) in addition to respecting all the requirements of the this quote.

## **1.9 RESPONSIBILITIES**

- .1 The Contractor must accept and assume all the tasks and obligations normally devolved on the Principal Contractor under the Act respecting occupational health and safety (LRQ, chapter S-2.1) and the *Safety Code for construction work. construction* (S-2.1, r.4).
- .2 The Contractor must assume responsibility for the health and safety of people on the site, as well as the protection of property located on the site, and assume also, in areas adjacent to the site, the protection of people and the environment insofar as they are affected by the work.
- .3 Regardless of the size and location of the site, the Contractor must clearly delimit the boundaries of the site by physical means; it must also comply with the specific requirements of the regulations on this subject. The means chosen to delimit the site must be submitted to the Departmental Representative.
- .4 Comply with, and enforce by employees, the safety requirements set out in contract documents, ordinances, applicable local, territorial, provincial and federal laws and regulations, as well as in the prevention program prepared for the worksite.

## **1.10 WORK CARRIED OUT BY EXTERNAL CONTRACTORS**

- .1 On this worksite, it is expected that the following work will be carried out by an external contractor not hired by the Contractor:
- .2 The Contractor must take the necessary measures to protect the health and safety of external contractors who are not in contractual relation with them but who are mandated by the Departmental Representative to carry out certain work. In return, these external contractors have the obligation to submit to the authority of the Contractor (Principal Contractor). A subordination agreement must be signed by the Contractor and by each external contractor for this purpose and submitted to the Departmental Representative before the start of the work of each external contractor (see the wording in the article OHS SUBORDINATION AGREEMENT).

**1.11 GENERAL REQUIREMENTS**

- .1 Before starting the work, draw up a prevention program specific to the site, based on the prior assessment of risks / dangers in accordance with the article "RISK / DANGER ASSESSMENT" and with the article "RISKS INHERENT AT WORKSITE" of this section. Apply this program and ensure it is respected at all points until the demobilization of all site personnel. The prevention program must take into account the specifics of the project and must cover all the work carried out on the worksite.

The prevention program must include at least the following elements:

- .1 Company health and safety policy
- .2 Description of the stages of the work
- .3 Total cost of the work, schedule and expected staffing curve
- .4 Organizational chart of health and safety responsibilities
- .5 Physical and material organization of the site
- .6 Identification of risks for each stage of the work, corresponding preventive measures and methods of implementation
- .7 Identification of preventive measures related to the specific risks inherent in the workplace indicated in the article "RISKS INHERENT AT THE WORKSITE"
- .8 Identification of preventive measures for the health and safety of employees and / or the public of the work site as indicated in the article "SPECIFIC REQUIREMENTS FOR THE HEALTH AND SAFETY OF OCCUPANTS AND THE PUBLIC"
- .9 Training required
- .10 Accident / injury procedure
- .11 Written commitment from all stakeholders to respect this prevention program
- .12 Worksite inspection grid based on preventive measures
- .13 Emergency response plan, which must contain at least the following elements:
  - .1 Site evacuation procedure
  - .2 Identification of resources (police, firefighters, ambulances, etc.);
  - .3 Identification of the responsible persons on the site
  - .4 Identification of first aid workers
  - .5 Communication organization chart (including site manager and Departmental Representative)
  - .6 Training required for those responsible for its application
  - .7 Any other necessary information, taking into account the characteristics of the site

The Departmental Representative will give the Contractor the site evacuation procedure, if applicable; the latter will then have to align the site procedure with that of the site and forward it to the Departmental Representative.

- .2 The Departmental Representative may provide written comments if the prevention program contains anomalies or raises concerns, and may require the submission of a revised program that will correct or eliminate those concerns.

- .3 In addition to the prevention program, during the work the Contractor must develop and send to the Departmental Representative a specific written procedure for any work presenting a high risk of accidents (example: demolition procedure, special installation procedure, plan lifting, procedure for entering confined spaces, electrical cut-off procedures, etc.) or at the request of the Departmental Representative.
- .4 The Contractor must plan and organize the work in such a way as to promote the elimination at the source of the dangers or collective protection and thus reduce to a minimum the use of personal protective equipment.
- .5 Equipment, tools or means of protection which cannot be installed or used without compromising the health and safety of workers or the public is deemed to be inadequate for the work to be performed.
- .6 All mechanical equipment (examples: devices for lifting people or materials, mechanical shovels, concrete pumps, concrete saws, but not limited to) must be inspected before delivery to the worksite. The Contractor must obtain an inspection certificate signed by a mechanic and dated less than a week before the arrival of each equipment on the site, and keep it on the site. The certificate is to be presented upon request to the Departmental Representative.
- .7 Ensure that all inspections (daily, periodic, annual, etc.) of equipment for lifting people or materials required by the standards in force are carried out and be able to provide a copy of the inspection certificates upon request of the Departmental Representative.
- .8 The Departmental Representative may at any time, if he suspects a defect or a risk of accident, order the immediate shutdown of any equipment and require an inspection by a specialist of their choice.
- .9 The Departmental Representative must be consulted on the location of gas cylinders and tanks on the worksite.

## **1.12 RISKS INHERENT AT THE WORKSITE**

- .1 In addition to the risks related to the tasks to be performed, the personnel responsible for the work on the site will be exposed to the following risks, inherent in the place where the work will be carried out.

In the place where the work will take place, there is in particular the presence of:

- .1 Materials containing asbestos
- .2 Lead-containing materials
- .3 Mold
- .4 Other hazardous materials (specify)
- .5 Enclosed spaces
- .6 Overhead power lines
- .7 Underground services (electricity, gas, steam, aqueduct, etc.);
- .8 Laboratories
- .9 Trees and landscaping to conserve and protect
- .10 Potentially unstable soils
- .11 Barbed wire fences

.12 Nearby body of water

The Contractor must carry out a site risk assessment to validate this information and see if other risks are present on the worksite. It must include in its prevention program all the risks that have been identified

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

- .1 The site where the work will take place is occupied by employees and / or the public at all times, although these people will not have access to the Contractor's site.
- .2 The Contractor must protect the health and safety of employees and / or the public present on the site.

**1.14 UNINTENDED RISKS / DANGERS**

- .1 When a source of danger not specified in the contract documents and not identifiable during the preliminary inspection of the site appears by the fact or during the execution of the work, the Contractor must immediately stop the work, notify the person responsible for the site health and safety, put in place temporary protective measures for workers and the public and notify the Departmental Representative verbally and in writing. The Contractor must then make the necessary modifications to the prevention program and put in place the necessary safety measures so that work can resume.

**1.15 PERSON RESPONSIBLE FOR HEALTH AND SAFETY**

- .1 If the site meets the criteria of article 2.5.3 of the *Safety Code for the construction industry* (S-2.1, r.4), the Contractor must hire a competent and authorized person as a security guard, and assign them full-time from the start of the work. The tasks of this person must be dedicated exclusively to the management of health and safety on the site. The security guard must meet the following criteria:
  - .1 Hold a security guard certificate issued by the CNESST
  - .2 Have practical experience of at least 5 years on a site where associated activities similar to those of the project are carried out
  - .3 Have a working knowledge of workplace health and safety regulations
  - .4 Assume responsibility for the Contractor's training sessions in occupational health and safety, and verify that only people who have successfully completed the required training have access to the site to perform the work
  - .5 Take responsibility for the implementation, respect in minute detail and monitoring of the health and safety plan prepared for the site by the Contractor
  - .6 Be present at all times on the site during the execution of the work

- .7 Inspect the work and ensure compliance with all regulatory requirements and those indicated in the contractual documents or the prevention program
- .8 Keep a daily log of their interventions and send a copy to the Departmental Representative at least once a week.

The security guard's certificate must be sent to the Departmental Representative before the start of the work.

- .2 When the hiring of a security guard is not required or that this guard is hired by the Departmental Representative, the Contractor must appoint a competent person as supervisor and responsible for health and safety regardless of the size of the site or the number of workers present. This person must be present at all times on the worksite and must be able to take all necessary measures to ensure the health and safety of people and property on the job and in the immediate environment of the site that could be affected by the progress of the work. The Contractor must send the name of this person to the Departmental Representative before the start of the work.

#### **1.16 DISPLAY OF DOCUMENTS**

- .1 Ensure that relevant documents, articles, ordinances and notices are posted in a conspicuous place on the job site in accordance with provincial laws and regulations and in consultation with the Departmental Representative.
- .2 As a minimum, the following information and documents should be posted in a location easily accessible to workers:
  - .1 Notice of opening of the site
  - .2 Identification of the Principal Contractor
  - .3 Company policy on OSH
  - .4 Prevention program specific to the worksite
  - .5 Emergency plan
  - .6 Minutes of worksite committee meetings
  - .7 Names of representatives on the worksite committee
  - .8 Name of first responders
  - .9 Intervention and correction reports issued by the CNESST.

#### **1.17 INSPECTIONS AND CORRECTIONS FOR NON-COMPLIANCE**

- .1 Inspect the workplaces, complete the worksite inspection grid and submit it to the Departmental Representative in accordance with the article "SUBMITTAL PROCEDURES" in this section.
- .2 Immediately take the necessary measures to correct the situations deemed non-compliant observed during the inspections mentioned in the previous paragraph or noted by the competent authority or by the Departmental Representative or their agent.
- .3 Provide the Departmental Representative with a written report of the action taken to correct the situation in the event of a health and safety non-compliance.

- .4 The Contractor must grant the security guard or, when there is no security guard, the person mandated to take care of health and safety, all the authority necessary to order stopping and resuming work when it deems it necessary or desirable for health and safety reasons. He must ensure that the health and safety of the public and site personnel as well as the protection of the environment always take precedence over issues related to the cost and schedule of the work.
- .5 The Departmental Representative or their agent may order the work to be stopped if the Contractor does not take the necessary corrective measures regarding the conditions deemed non-compliant in terms of health and safety. Without limiting the scope of the preceding articles, he may also at any time order the work to be stopped if, according to their perception, there is a danger or risk to the health or safety of site personnel, the public, or the environment.

### **1.18 PREVENTION OF VIOLENCE**

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

### **1.19 BLASTING**

- .1 Blasting or any other use of explosives is permitted only if the Departmental Representative has given written instructions to do so.
- .2 Perform blasting operations in accordance with section [31 23 16.26 - Excavation in rock].
- .3 Any operation involving explosives must be carried out under the immediate supervision of a qualified blaster.
- .4 The purchase, transport, storage and use of explosives must comply with the provisions of applicable federal and provincial laws:
  - .1 Canada: *Explosives Act (E-17), Explosives Regulations (CRC CH. 599), Standard for Detonator Blasting Explosives Magazine, Transportation of Dangerous Goods Regulations.*
  - .2 Quebec: *Act respecting explosives (E-22), Regulation respecting the application of explosives (E-22, r.1), Safety code for the construction industry (S-2.1, r.4), Regulation respecting transport of hazardous materials.*
- .5 The Contractor must obtain all permits required under the aforementioned laws and regulations and keep a copy easily accessible on the worksite.
- .6 The Contractor must facilitate the visit of the site and the explosives depots as well as the inspection of the vehicles used for their transport to all government representatives and police officers who have jurisdiction over explosives.

**1.20 CARTRIDGE DEVICES**

- .1 Use cartridge devices only with written permission from the Departmental Representative.
- .2 Anyone who uses a nail gun must hold a training certificate and meet all the requirements of section 7 of the *Safety Code for the construction industry* (S-2.1, r. 4).
- .3 Any other cartridge device must be used according to the manufacturer's instructions and according to the applicable standards and regulations.

**1.21 USE OF PUBLIC ROADS**

- .1 When it is necessary to encroach on the public highway for operational reasons or to ensure the safety of workers, occupants or the public (e.g. use of scaffolding, cranes, excavation work, etc.), the Contractor must obtain at its own expense all authorizations and permits required by the competent authority.
- .2 The Contractor must install at their own expense all signage, barricades and other devices required by regulations to ensure the safety of the public and their own installations.

**1.22 LOCKOUT**

- .1 For any work on equipment powered by electricity or any other energy source, the Contractor must send a general lockout procedure to the Departmental representative and implement it.
- .2 Supervisory staff and all workers involved in work requiring lockout must have completed lockout training given by a recognized organization; The Contractor must send the training certificates to the Departmental Representative.
- .3 Before undertaking the lockout of an equipment in an occupied site, the Contractor must coordinate their work with the Site Representative if the shutdown of the energy sources could have an impact on the operations of the site or on the occupants.
- .4 The Contractor must identify a qualified person as being responsible for the lockout and must ensure that this person draws up a lockout sheet for each item of equipment to be locked out. The lockout sheet must be sent to the Departmental Representative at least 48 hours before the start of the work; the latter will have it checked by a representative of the site if the work is taking place in an existing building. The lockout sheet must include at least the following information:
  - .1 Description of the work to be performed
  - .2 Identification, description and location of the circuit and / or the equipment to be locked out
  - .3 Identification of the energy sources that power the equipment
  - .4 Identification of each cut-off point

- .5 Sequence of lockout and release of residual energy as well as sequence of unlocking
- .6 List of necessary lockout equipment
- .7 Method of checking zero energy
- .8 Name and signature of the person who wrote the file

At the request of the Departmental Representative, the Contractor must record all this information on the workSite Representative form.

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

### **1.23 ELECTRICAL WORK**

- .1 The Contractor must ensure that all electrical work is performed by qualified employees in accordance with provincial regulations on qualification and vocational training.
- .2 The Contractor must comply with the requirements of the *CSA Z462 Workplace Electrical Safety Standard*.
- .3 All work on electrical equipment must be done with the power off, unless it is not possible to completely disconnect this equipment.
- .4 The Contractor must comply with all the requirements of the "Lockout" paragraph of this section.
- .5 The Contractor must notify the Departmental representative in writing of any work that cannot be done with the power off and obtain his authorization. They must demonstrate to the Departmental Representative that it is impossible to do the work with the power off and provide all information necessary to complete and obtain an Energized Electrical Work Permit (work method, evaluation of the level of electric arc, protection perimeter, protective equipment, etc.) before the start of work, except in cases provided for in *CSA Z462 Workplace Electrical Safety Standard*.
- .6 The Energized Electrical Work Permit must contain at least the following elements:
  - a. Description of circuit and equipment and location
  - b. Justification of the need to perform energized electrical work
  - c. Description of the safe work practices to be adopted
  - d. Conclusions of the electric shock hazard analysis
  - e. Delimitation of the perimeter of protection against electric shocks
  - f. Conclusions of the arc flash hazard analysis
  - g. Description of the protection perimeter against electric arc flashes
  - h. Description of the personal protective equipment required

- i. Description of the means to restrict access to unqualified persons
  - j. Proof that an information session has taken place
  - k. Energized electrical work approbation signature (by a person in authority or by the Owner)
- .7 If, for the operational needs of the occupants of the site, the Site Representative requires the Contractor to carry out energized work, the Contractor must obtain all information necessary to obtain an Energized Electrical Work Permit (work method, assessment of the level of arc, protection perimeter, protective equipment, etc.) and have it signed by the Site Representative designated by the Departmental Representative before the start of work.

#### **1.24 EXPOSURE TO ASBESTOS**

The work covered by this specification is not expected to involve the handling of materials containing asbestos; however, if the Contractor or the Departmental Representative or his agent discover materials that are likely to contain asbestos, the Contractor must immediately stop the work and notify the Departmental Representative. If it is subsequently demonstrated that these materials contain asbestos, the Contractor must comply with the following requirements.

Before starting any work likely to emit asbestos dust, the Contractor must:

1. Provide a written work procedure identifying the risk level of the work (low, moderate, high), as defined in section 3.23 of the *Safety Code for the construction industry* S-2.1, r-4, and which takes into account all the requirements of
  - a. this same section.
2. Submit certificates showing that all workers involved in the work have received training on the risks associated with asbestos and on the procedure required in the previous paragraph.
3. Demonstrate that they have on hand all the material and equipment necessary for the respect of the procedure and the safe execution of the work.

#### **1.25 FUNGAL CONTAMINATION**

The work covered by this specification is not expected to involve the handling of materials contaminated with mold; however, if the Contractor or if the Departmental Representative or his agent discover materials which are likely to be contaminated by mold, the Contractor must immediately stop the work and notify the Departmental Representative. If it is subsequently demonstrated that these materials contain mold, the Contractor must comply with the following requirements.

Before the start of any work for which workers are likely to come into contact with materials contaminated by mold, the Contractor must:

1. Provide a written work procedure that meets the requirements of the *Safety Code for the construction industry, S-2.1, r.4* as well as the requirements indicated in the document " *Mold guidelines for the Canadian construction industry* published by the Canadian Construction Association (<http://www.cca-acc.com/documents/electronic/cca82/acc82.pdf>).
2. Demonstrate that they have on hand all the material and equipment necessary for the respect of the procedure and the safe execution of the work.

### **1.26 EXPOSURE TO SILICA**

For any interior or exterior work generating silica dust, the Contractor must comply with the requirements below, in addition to respecting those of the Safety Code for the construction industry S-2.1, r.4.

1. Work in a humid environment or use tools with water supply in order to reduce dust accumulation, otherwise capture the dust at the source and retain it in a high-efficiency filter so as not to propagate it in the environment.
2. Clean surfaces and tools with water, never with compressed air.
3. Sand and etch surfaces using an abrasive containing less than 1% silica (also called amorphous silica).
4. Install screens or partitions to prevent the migration of dust outside the work area and thus protect other workers and the public.
5. Wear respiratory protection and eye protection equipment during all operations likely to produce silica dust in accordance with the requirements of the *Safety Code for the construction industry, S-2.1, r.4*.
6. Wear protective suit to prevent contamination off site.
7. Do not eat, drink or smoke in a dusty area.
8. Wash hands and face before drinking, eating or smoking

### **1.27 ABRASIVE WATER BLASTING**

Before the start of any abrasive blasting work, the Contractor must:

1. Provide a written work procedure that meets the requirements of section 3.20 of the *Safety Code for the construction industry, S-2.1, r.4* .

2. Demonstrate that they have on hand all the material and equipment necessary for the respect of the procedure and the safe execution of the work.
3. All sandblasting and stripping work must be carried out with an abrasive containing less than 1% silica.

### **1.28 LEAD-BASED PAINT REMOVAL**

Before the start of any work for which workers are likely to handle materials containing lead paint or other lead-containing substances, the Contractor must:

1. Provide a written procedure that meets the requirements of the *Safety Code for the construction industry, S-2.1, r.4* as well as the requirements indicated in the document "*Guidelines for lead exposure on construction sites*" published by the Ontario Ministry of Labor ([http://www.labour.gov.on.ca/english/hs/pdf/gl\\_lead.pdf](http://www.labour.gov.on.ca/english/hs/pdf/gl_lead.pdf)). In the event of differences between the Quebec regulations and the Ontario document, the more severe requirements apply.
2. Demonstrate that they have on hand all the material and equipment necessary for the respect of the procedure and the safe execution of the work.

### **1.29 EXPOSURE TO ANIMAL DROPPINGS**

Before the start of any work for which workers are likely to come into contact with materials contaminated by animal droppings, the Contractor must:

1. Provide a written procedure that meets the requirements of the *Safety Code for the construction industry, S-2.1, r.4* as well as the requirements indicated in the document "*Pigeon droppings in your workplace: beware*" published by the CNESST ([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 they have on hand all the material and equipment necessary for the respect of the procedure and the safe execution of the work.

### **1.30 RESPIRATORY PROTECTION**

1. The Contractor must ensure that all workers who must wear a respiratory protection device as part of their tasks have received training for this purpose as well as the adjustment tests of their breathing apparatus, in accordance with the *CSA Z94.4 Selection, Use, and Care of Respirators*. The fit test certificates must be given to the Departmental Representative upon request.

### **1.31 PREVENTION OF FALL RISKS**

1. The Contractor must plan and organize the work in such a way as to promote the elimination at the source of the dangers or collective protection and thus reduce to a minimum the use of personal protective equipment. When personal fall protection is required, workers must use a safety harness in accordance with CAN/CSA- Z-259.10 - M90. Seat belts should not be used for fall protection.
2. All persons using a lifting platform (scissors, telescopic mast, articulated mast, rotating mast, etc.) must have received training for this purpose.
3. Wearing a safety harness is compulsory in all lifting platforms with telescopic, articulated or rotating mast.
4. Mark out a danger zone around each lifting platform.
5. Any opening in a floor or in a roof must be surrounded by a guardrail or covered with a cover fixed to the floor and resistant to the loads to which it may be subjected, regardless of the dimensions of this opening and the height of the fall it represents.
6. Anyone who works within two meters of a place presenting a risk of falling of 3 meters or more must use a safety harness in accordance with the requirements of the regulations, unless there is a guardrail or other element offering equivalent security.
7. Despite the requirements of the regulations, the Departmental Representative may require the installation of guardrails or the use of safety harnesses for certain specific situations presenting a risk of fall of less than 3 meters.

### **1.32 SCAFFOLDING**

In addition to the requirements of the *Safety Code for the construction industry*, the Contractor who uses scaffolding must comply with the following requirements:

#### **Foundation**

1. Scaffolding must be installed on solid foundations so that it cannot slip or tip over.
2. If the Contractor wants to install scaffolding on a roof, a roof overhang, a canopy, or an attic, they must submit load calculations and plans signed and sealed by an engineer to the Departmental Representative and obtain their authorization before start of installation

#### **Assembly, bracing and anchoring**

1. All scaffolding must be assembled, braced and anchored in accordance with the manufacturer's instructions and *the provisions of the Safety Code for the construction industry*.
2. For any situation where it is necessary to remove certain elements of the scaffolding (eg: braces), the Contractor must submit to the Department representative, before assembling the scaffolding, a

signed and sealed assembly procedure by an engineer certifying that the scaffolding thus assembled will allow the work to be carried out in a safe manner, taking into account the loads that will be applied to it.

3. For any scaffolding whose span between two supports is greater than 3 meters, the Contractor must provide the Departmental Representative, before assembling the scaffolding, with an assembly plan signed and sealed by an engineer.

### **Fall protection during assembly**

1. At all times, during assembly, all workers must be protected against falls if they are exposed to a risk of falling more than 3 meters.

### **Floors**

1. Scaffolding floors must be designed and installed in accordance with the provisions of the *Safety Code for the construction industry*.
2. If planks are used, they must be approved and stamped, in accordance with the provisions of article 3.9.8 of the *Safety Code for the construction industry*.
3. Scaffolds of 4 sections and more (or 6 meters) in height must have a solid floor covering the entire surface at every 3 meters of height or fraction of 3 meters and the elements of these floors must not be moved at any time. to create intermediate landings.

### **Railing**

1. A guardrail must be installed at all working landings.
2. Bracings should not be considered as guardrails.
3. If the floors are not solid, the guardrails should be installed just above the edge of the floor, so that there is no empty horizontal space between the floor and the guardrail.
4. In the case of scaffolds of 4 sections (or 6 meters) and more in height where solid floors are required, the guardrails must be installed at each of these landings at the start of the work and remain in place until the end of the work.

### **Means of access**

1. The Contractor must ensure that the means of access to the scaffolding do not compromise the safety of workers.
2. When scaffolding floors are made of planks, ladders must be installed so that the protruding planks do not interfere with ascent or descent.
3. Notwithstanding the provisions of the *Safety Code for the construction industry*, stairs must be installed on all scaffolding with 6 rows or more of uprights and 6 sections or more (or 9 meters) in height.

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

1. When the scaffolding is installed in an area accessible to the public, the Contractor must take measures to prevent the public from accessing the scaffolding and, if applicable, the work or storage area located near the scaffolding.

2. The Contractor must install covered walkways, nets or other similar devices to protect workers, the public and occupants against falling objects. The chosen means of protection must be approved by the Departmental Representative.

**Engineer plans**

1. In addition to those required by the *Safety Code for the construction industry*, the Departmental Representative reserves the right to require engineer's plans for other types or configurations of scaffolding.
2. A plan signed and sealed by an engineer is required for any scaffolding to which canvases, tarpaulins or other items giving resistance to wind will be fixed.
3. A certificate of conformity signed by an engineer is required for all cases where an engineer plan is required and this, before a person uses the installation covered by this plan. A copy of these documents must be available at all times on the work site.

**1.33 EXCAVATION WORKS**

In addition to the requirements of the *Safety Code for the construction industry*, the Contractor must comply with the following requirements when carrying out trenching or excavation work:

1. Complete the form below and send it to the Departmental Representative before the start of the excavation work.
2. Send the following documents to the Departmental Representative, as the case may be:
  - a. Plans and specifications, signed and sealed by an engineer, of the shoring to be put in place for the excavation work; or
  - b. an engineer's opinion specifying the angle of the walls of the trench or excavation.



- a. Lifting of concrete panels
  - b. Lifting of mechanical / electrical equipment on a roof or on floors of a building
  - c. Lifting of loads that encroach on a public road
  - d. Lifting of large loads or heavy weights
  - e. Any other lifting operation, according to the Departmental Representative's requirements.
3. In addition to the above requirements, the Contractor must plan lifting operations to prevent loads from passing over occupied areas on a site. When it is impossible to do otherwise, the lifting plan must be signed and sealed by an engineer and must guarantee the safety of the occupants of this area; this plan must be approved by the Departmental Representative. The Departmental Representative may, if he deems it necessary, impose evening and weekend work.
  4. As soon as work on the site begins, the Contractor must send the Departmental Representative the list of the lifting plans planned for the entire duration of the site. This list should be updated as needed if changes are made during work.
  5. In addition to the mechanical inspection certificate, all cranes or crane trucks must have the annual inspection certificate and the crane logbook in the cabin.
  6. The entire lifting area must be demarcated in such a way as to prevent any unauthorized person from entering it.
  7. The Contractor must carefully inspect all slings and lifting accessories to ensure that those in poor condition are destroyed and discarded.
  8. The lifting of compressed gas cylinders must be done using a basket specially designed for this purpose.

#### **MINIMUM CONTENT OF A LIFTING PLAN**

- Sketch showing as a minimum the location of the crane, the surrounding installations, the area covered by lifting operations, the paths for pedestrian and vehicle traffic, the safety perimeter, etc.
- Weight of loads
- Load dimensions
- List of lifting accessories and weights of each
- Total weight lifted
- Maximum height of obstacles to overcome
- Lifting height of loads in relation to the roof surface (in the case of lifting loads to be placed on roofs)
- Use of guide cables
- Type of crane used

- Crane capacity
- Boom length
- Boom angle
- Crane working radius
- Deployment of stabilizers
- Percentage of crane capacity utilization
- Lifting equipment verification confirmation
- Identification of the crane operator and the lifting operations manager with signatures and date

### **1.35 HOT WORK**

Hot work means all work using open flames or capable of producing heat or sparks, such as the following: riveting, welding, cutting, brazing, grinding, burning, heating, etc.

1. At the start of each shift and for each sector, the Contractor must obtain a "Hot Work Permit" issued by the site manager.
2. A functional portable extinguisher, and adequate for the fire hazard, must be available and easily accessible within 5 m of any flame and source of sparks or intense heat.
3. The Contractor must designate a person to continuously monitor fire hazards for a minimum period of one (1) hour after the end of each hot work. This person must sign the section of the permit to this effect and return it to the site manager after the one hour deadline.
4. When hot work is carried out in areas where there are combustible materials or where the walls, ceilings or floors are made or lined with combustible materials, a final inspection of the work area must be scheduled four (4) hours after the end of work. Unless the Departmental Representative advises otherwise, the Contractor must designate a person to carry out this monitoring.

### **Welding and cutting**

In addition to the requirements set out in the previous paragraphs, the Contractor must comply with the following requirements:

1. Welding and cutting work must be carried out in accordance with the requirements of the *Safety Code for the construction industry, S-2.1, r.4* and of *CSAW117.2 Safety in Welding, Cutting and Allied Processes*.
2. Use an air extraction system equipped with filters for any welding or cutting work done indoors.

3. Stop any activity that produces flammable or combustible gases, vapors or dust near welding or cutting work.
4. Store compressed gas cylinders on a fireproof surface and make sure the room is well ventilated.
5. Store all oxygen cylinders at a minimum distance of 6 meters from cylinders of flammable gas (e.g. acetylene) or combustible material such as oil or grease, unless they are separated by a partition made of non-combustible material as specified in article 3.13.4. of the *Safety Code for the construction industry, S-2.1, r.4.*
6. Store the bottles away from all sources of heat.
7. Do not store bottles near stairs, exits, corridors and elevators.
8. Do not put acetylene in contact with metals with metals such as silver, mercury, copper and brass alloys with more than 65% copper, in order to avoid the risk of an explosive reaction.
9. Check that electric arc welding equipment has the required voltage and that it is earthed.
10. Make sure that the lead wires of the electric welding device are not damaged.
11. Place the welding equipment on flat ground sheltered from the elements
12. Install fireproof cloths when welding work is done on top of each other and where there is a risk of falling sparks.
13. Keep away or protect flammable or combustible materials within 15 meters of welding work.
14. Never weld or cut on a closed container.
15. Do not perform any cutting, welding or any work with an open flame on containers, tanks, pipes or other containers that have contained a substance or residues of flammable or explosive products unless:
  - a. They have been cleaned and that air samples have been taken indicating the absence of explosive vapors and
  - b. Arrangements have been made to ensure the safety of workers

## **1.36 ROOF WORK**

### **Protection against falls from a height**

1. The installation of guardrails is mandatory at all times; however, the installation of a warning line is permitted to delimit work zones provided that all the requirements of articles 2.9.4.0 and 2.9.4.1 of the *Safety Code for the construction industry* are met.
2. Guardrails must remain in place until the very end of the project. The Departmental Representative will authorize their dismantling upon confirmation that all work, inspections and required corrections have been carried out.
3. Wearing a safety harness is compulsory for the installation of guardrails.
4. Wearing a safety harness is compulsory for the installation and modification of parapets or flashings, if it is necessary to temporarily move the guardrails.
5. Wearing a safety harness is compulsory for receiving equipment and signals to the crane at the edge.
6. Wearing a safety harness is compulsory for all work on the edge of a void where collective protection does not provide adequate safety.
7. The Contractor must provide an attachment method and emergency cable system in accordance with section 2.10.12 of the *Safety Code for the construction industry (LRQ, S-2.1, r.4)* for each sector or workplace. different.

### **Lifting materials**

1. For any winch installation, the contractor must provide the Departmental representative with the installation procedure recommended by the manufacturer or, failing that, an installation procedure signed and sealed by an engineer. The installation process must take into account the maximum allowable loads, the number, weight and location of the counterweights and any other detail that may affect the capacity and stability of the device.
2. The Contractor must carefully inspect all slings and lifting accessories to ensure that those in poor condition are destroyed and discarded.
3. The lifting of compressed gas cylinders must be done using a basket specially designed for this purpose.
4. For any use of a crane or truck crane, the Contractor must comply with the requirements of the paragraph "Lifting loads using a crane or crane truck" of this section.

### **Protection against burns**

1. Those assigned to hot water bottles must wear long sleeves and safety glasses and a face shield for loading the hot water bottle.
2. Those affected working with bitumen or other hot liquids should wear gloves, long sleeves and safety glasses.

### **Fire protection**

1. The storage and use of propane cylinders must comply with the *CAN/CSA-B149.2 Code on the storage and handling of propane*. Cylinders must be stored outdoors, in a secure place, away from any unauthorized handling, in a place where there is no movement of vehicles or equipment unless they are protected by barriers or equivalent means of protection.
2. The quantity of propane cylinders on the roof must not exceed that necessary for a working day and the cylinders must at all times be tied up upright or held vertically in a cart designed for this purpose.
3. All hot work (burning, heating, riveting, welding, cutting, grinding, etc.) must be carried out in accordance with the "Hot Work" paragraph of this section.

### **Materials and waste management**

1. On the roof, lightweight materials and sheet materials should be kept in containers or securely tied. In the event of an exemption, the Departmental Representative may prohibit the storage of materials on the roof.
2. The waste must be evacuated as it goes through a waste chute or in appropriate containers. The Contractor must put in place means to prevent the waste from blowing in the wind.
3. All waste must be removed from the roof at the end of each shift.
4. Unless specifically authorized by the Departmental Representative, any dumpster must be placed at least 3m from any structure or building.

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

1. The Contractor must install covered walkways, nets or other devices to protect workers, the public and occupants against falling objects near the building entrances and exits. The chosen means of protection must be approved by the Departmental Representative.
2. A ground safety perimeter must be set up under the work area to protect workers, the public and occupants.
3. The ground work area, the material handling area and the area where the hot water bottle is installed must be clearly barricaded, so that occupants and the public cannot access it.
4. Before installing any device likely to emit gases or vapours, the Contractor must obtain the authorization of the site manager. The latter will ensure that there is no risk of infiltration into the building's ventilation systems.

### 1.37 ERECTION AND DISMANTLING OF METAL STRUCTURES

- .1 In addition to complying with section 3.24 of the *Safety Code for the construction industry* (S-2.1, r.4), the Contractor must comply with the requirements set out in the following paragraphs.
- .2 The Contractor must send the following documents to the Departmental Representative before the start of metal frame assembly work:
  - .1 Assembly procedure in accordance with article 3.24.10 of the *Safety Code for the construction industry* (S-2.1, r.4);
  - .2 Rescue procedure aimed at freeing a worker suspended in a safety harness within a maximum of 15 minutes, adapted to the site and in accordance with article 3.24.4 of the same code; this procedure must be accompanied by written confirmation to the effect that it has been tested
  - .3 Engineer certificate to the effect that the anchor rods were installed in accordance with the anchoring plan, as required in article 3.24.12 of this same code
  - .4 Lifting procedure, in the event that the lifting is done in one of the ways indicated in article 3.24.15 of this same code
  - .5 Name of the person identified as rescuer and certificate of rescue training of this person
  - .6 Name of the person identified as a first aid attendant and certificate of first aid training for this person;
- .3 The Contractor must ensure that the following documents are available at all times on the site for consultation:
  - .1 Assembly plan from the manufacturer of the metal framework in accordance with the requirements of article 3.24.9 of the *Safety Code for the construction industry* (S-2.1, r.4)
  - .2 Anchoring plan for the pole anchor rods in accordance with the requirements of article 3.24.11 of the *Safety Code for the construction industry* (S-2.1, r.4);

**1.38 USE OF INTERNAL COMBUSTION ENGINES INDOORS**

1. In addition to complying with article 3.10.17 of the *Safety Code for the construction industry* (S-2.1, r.4), the Contractor must comply with the requirements set out in the following paragraphs.
2. The use of gasoline-powered equipment inside a building is prohibited, even if the building has openings.
3. The use of other equipment equipped with internal combustion engines inside a building must be subject to the authorization of the Departmental Representative.
4. For any use of equipment with an internal combustion engine inside a building, even if the building has openings, the Contractor must install a ventilation system to keep concentrations of toxic gases below regulatory values. Stale air must be exhausted outside the building.
  - a. Before using equipment with an internal combustion engine, the Contractor must plan in writing the following elements:
  - b. Number of fans to be installed
  - c. Fan power
  - d. Location of fans
  - e. Dimensions of the openings that will be open during the work
5. During the operation of equipment with an internal combustion engine, the Contractor must measure the concentration of carbon monoxide and nitrogen oxides in the work area, in the workers' breathing zone; the measured concentration levels must be entered every 30 minutes in a register available for consultation.
6. If the work takes place in an occupied building, the Contractor must also measure the concentration of carbon monoxide and nitrogen oxides every 30 minutes in the premises adjacent to the work area and record these values in a register.
7. If the alarm on the carbon monoxide or nitrogen oxides detectors is triggered during the work, the Contractor must suspend the work and make the necessary corrective measures before resuming the work.
8. A portable fire extinguisher must be available at all times in the work area while using equipment with an internal combustion engine.
9. Equipment must be kept a safe distance from any combustible material.
10. No fuel storage for equipment equipped with an internal combustion engine is permitted inside a building.

**1.39 TEMPORARY HEATING**

1. In addition to complying with section 3.11 of the *Safety Code for the construction industry* (S-2.1, r.4), the Contractor must comply with the requirements set out in the following paragraphs.

2. A portable fire extinguisher must be available at all times near heating devices, regardless of the type of heating used.
3. The devices should always be used according to the manufacturer's specifications.
4. If applicable, the cloths and tarpaulins used near heating appliances must be securely fastened so that they cannot be thrown on these appliances, on piping connected to these appliances or on any other heat source.
5. Gas cylinders must be installed in such a way that they are protected from the traffic of vehicles and other equipment.
6. For any use of heating devices other than electric, the Contractor must install a carbon monoxide detector in the work area, near the devices and / or workers, throughout the heating period. The Contractor must immediately make the necessary corrections to the heating installations if the detector alarm sounds.
7. The Contractor must ensure minimal monitoring of heating devices outside of working hours (evenings and weekends). He must present a monitoring plan to the Departmental Representative before using the heaters.

#### **1.40 WORK NEAR OVERHEAD POWER LINES**

1. When there is an overhead power line in the work area and the Contractor chooses to apply paragraph b) of section 5.2.2 of the *Safety Code for the construction industry* (2.1, r .4), a copy of the agreement with the electrical operating company and a copy of the work process, required in article 5.2.2 b), must be sent to the Departmental Representative before the start of work related to these documents.

**1.41 OHS SUBORDINATION AGREEMENT**

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

**EXTERNAL CONTRACTOR**

I hereby agree to submit to the authority of (name of the Principal Contractor company) \_\_\_\_\_, who is the Principal Contractor for the project indicated above and this, for the entire duration of our work on the site. Therefore, I confirm that I have read the prevention program of the Principal Contractor and I agree to:

- Inform my employees of the content of the Principal Contractor's prevention program and ensure that its content is respected at all times
- Provide the prevention program specific to our activities carried out within the framework of this project
- Inform the Principal Contractor of my interventions on the site and obtain his agreement before proceeding with the work
- Follow the health and safety directives given by the representative of the Principal Contractor on the site and attend, as necessary, training activities and health and safety meetings that they organize

Representative's name: \_\_\_\_\_

Company Name: \_\_\_\_\_

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

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

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

**PRINCIPAL CONTRACTOR**

I hereby agree to allow the company (name of the external contractor) \_\_\_\_\_ to do work within the framework of the project indicated above and, as Principal Contractor, to take the measures necessary to protect the health and safety of workers on site. In the event that the contractor repeatedly refuses or fails to comply with my instructions, I agree to inform the PWGSC Departmental Representative and to provide documentary evidence of my interventions with the Contractor.

Representative's name: \_\_\_\_\_

Name of the Principal Contractor: \_\_\_\_\_

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

Submit the completed and signed copy to the PWGSC Departmental Representative

## **1 GENERAL**

### **1.01 REFERENCES**

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

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data
  - .1 Submit two (2) copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
- .3 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Protection Plan.
  - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
  - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
  - .3 Names and qualifications of persons responsible for training site personnel.
  - .4 Descriptions of environmental protection personnel training program.
  - .5 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
    - .1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
  - .6 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
  - .7 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
  - .8 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
  - .9 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into

air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

- .10 Waste Water Management Plan identifying methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

### **1.03 FIRES**

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

### **1.04 DRAINAGE**

- .1 Develop and submit erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .3 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

### **1.05 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.
- .3 Minimize stripping of topsoil and vegetation.

### **1.06 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
  - .1 Provide temporary enclosures where directed by Departmental Representative.

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

### **1.07 NOTIFICATION**

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

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

## **3 EXECUTION**

### **3.01 CLEANING**

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

END OF SECTION



**PART 1 GENERAL****1.1 INSPECTION**

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

**1.2 INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be retained by the Departmental Representative. Cost of such services will be borne by Departmental Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Use of external inspection/testing agencies does not relieve the Contractor from responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for re-testing and re-inspection.

**1.3 ACCESS TO WORK SITE**

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

**1.4 PROCEDURES**

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, so 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.

## **1.5 REJECTED WORK**

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

## **1.6 REPORTS**

- .1 Submit three (3) copies of inspection and test reports to [Departmental Representative.

## **1.7 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Requirements laid out in this subsection apply to all sections of the Specifications that call for the production of mock-ups.
- .2 Construct in locations acceptable to Departmental Representative as specified in specific Section.
- .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in due time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such delay will be allowed.
- .5 If requested, Departmental Representative will assist in preparing schedule of dates for preparation of mock-ups.
- .6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

## **1.8 MILL TESTS**

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

## **1.9 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

**PART 2 PRODUCTS**

**1.10 NOT USED**

.1 Not Used.

**PART 3 EXECUTION**

**1.11 NOT USED**

.1 Not used.

**END OF SECTION**



**PART 1 GENERAL****1.1 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
  - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA-O121-FM1978(C2003)], Douglas Fir Plywood.

**1.2 INSTALLATION AND REMOVAL**

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

**1.3 GUARD RAILS AND BARRICADES**

- .1 Provide and install secure, rigid guard rails and barricades where required.
- .2 Provide and install as required by governing authorities.

**1.4 WEATHER ENCLOSURES**

- .1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- .2 Design enclosures to withstand wind pressure and snow loads.

**1.5 DUST TIGHT SCREENS**

- .1 Provide dust tight screens partitions to localize dust-generating activities, and for protection of workers, finished areas of Work and the public.
- .2 Maintain and relocate as needed protection until such work is complete.

**1.6 ACCESS TO SITE**

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

**1.7 PUBLIC TRAFFIC FLOW**

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

**1.8 EMERGENCY ACCESS ROUTES**

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

**1.9 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

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

**1.10 PROTECTION OF BUILDING FINI**

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm location and installation schedule with Departmental Representative three (3) days prior to installation
- .4 Be responsible for damage incurred due to lack of or improper protection.

**1.11 WASTE MANAGEMENT AND DISPOSAL**

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

**PART2 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 PRIORITY**

- .1 In the case of Work performed for the federal government, Division 1 sections take priority over the technical specifications of the other divisions.

**1.2 RELATED SECTIONS**

- .1 Section 01 73 03 – Execution Requirements.

**1.3 REFERENCES**

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, the Ministry Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by the Ministry Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .5 If no specific date or edition is indicated, conform to most recent applicable norms.

**1.4 QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality (in accordance with the specification terms) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 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.
- .3 Should disputes arise as to quality or fitness of products, decision rests strictly with the Ministry Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 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.

**1.5 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

Ministry 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 Ministry Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Ministry Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

## **1.6 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Sand for mortar and grout shall remain dry and clean. Store on wood pallets and cover with waterproof tarps during inclement weather.
- .6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Replace damaged products at own expense and to satisfaction of Ministry Representative.
- .9 Touch-up damaged factory finished surfaces to Ministry Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

## **1.7 TRANSPORTATION**

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

## **1.8 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 Ministry Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Ministry Representative will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Ministry Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

**1.9 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 Ministry 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. Ministry Representative reserves right to require dismissal from site, workers deemed incompetent, negligent, insubordinate, careless or whose presence will not be permitted on the Work site.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Ministry Representative, whose decision is final.

**1.10 COORDINATION**

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

**1.11 CONCEALMENT**

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Prior to concealment inform Ministry Representative if there is interference. Install as directed by Ministry Representative.

**1.12 REMEDIAL WORK**

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

**1.13 LOCATION OF FIXTURES**

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

**1.14 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.

#### **1.15 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. 316 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 stainless steel washers for stainless steel sheet.

#### **1.16 PROTECTION OF WORK IN PROGRESS**

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Ministry Representative.

**END OF SECTION**

**Part 1 General****1.1 PRIORITY**

- .1 In the case of Work performed for the federal government, Division 1 sections take priority over the technical specifications of the other divisions.

**1.2 RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Technical sections of specifications, regarding cutting and patching necessary for this project. Advise sub-trades in advance.

**1.3 REQUEST FOR CUTTING AND PATCHING WORK**

- .1 Submit written request before cutting or patching if the following may be affected:
  - .1 Structural integrity of any element.
  - .2 Integrity of waterproofed elements or elements exposed to weather.
  - .3 Effectiveness, maintenance, or safety of any functional element.
  - .4 Aesthetic qualities of visible elements.
- .2 Request must include and specify following:
  - .1 Project name.
  - .2 Location and description of affected elements.
  - .3 Explanation of need to perform cutting and patching work being requested.
  - .4 Description of work to be performed and products to be used.
  - .5 Alternative solutions.
  - .6 Written permission of other contractor.
  - .7 Date and time that work will be performed.

**1.4 MATERIALS**

- .1 Materials required to perform work identical to existing adjacent work.
- .2 Change in Materials: submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

**1.5 PREPARATION**

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

- .5 Provide protection from elements for areas that are to be exposed by uncovering work; maintain excavations free of water.

## **1.6 EXECUTION**

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 At penetrations through fire-resistant walls, ceilings or floors, completely fill voids around with fireproof material over the entire thickness of the penetrated element.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Unless otherwise specified, cover all conduits, ducts, and cables in walls, ceilings or floors in finished rooms.

END OF SECTION

**PART 1 GENERAL****1.1 PRIORITY**

- .1 In the case of Work performed for the federal government, Division 1 sections take priority over the technical specifications of the other divisions.

**1.2 SECTIONS CONNEXES**

- .1 Section 01 77 00 - Closeout Procedures.

**1.3 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris. Dispose of waste and debris at designated off site facilities each day.
- .6 Provide and use marked separate bins for recycling.
- .7 Dispose of waste materials and debris off site in containers at the end of each work shift.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day. Sw
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

**1.4 FINAL CLEANING**

- .1 Remove waste products and debris other than that caused by others, and leave Work clean and ready for occupancy.
- .2 Prior to final review remove surplus products, tools, construction machinery and equipment.

- .3 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.
- .4 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.
- .5 Clean lighting reflectors, lenses, and other lighting surfaces.
- .6 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .7 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .9 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .10 Remove dirt and other disfiguration from exterior surfaces.
- .11 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .12 Sweep and wash clean paved areas.
- .13 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .14 Clean roofs, downspouts, and drainage systems.
- .15 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .16 Remove snow and ice from access to building.

END OF SECTION

**PART 1 GENERAL****1.1 WASTE MANAGEMENT GOALS**

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss Contractor's proposed Waste Reduction Work plan for Construction, Renovation and /or Demolition (CRD) waste to be project generated.
- .2 Departmental Representative waste management goal: to divert a minimum 25 percent of total Project Waste from landfill site.
- .3 Target percentage goals are achievable for waste diversion. Contractor to review and confirm Departmental Representative's Waste Audit acceptable values.
- .4 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.
- .5 Protect environment and prevent environmental pollution damage.

**1.2 REFERENCES**

- .1 Definitions
  - .1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative.
  - .2 Class III: non-hazardous waste - construction renovation and demolition waste.
  - .3 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities.
  - .4 Cost/Revenue Analysis Workplan (CRAW): based on information from Waste Reduction Workplan, and intended as financial tracking tool for determining economic status of waste management practices (Schedule E).
  - .5 Inert Fill: inert waste - exclusively asphalt and concrete.
  - .6 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.
  - .7 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
  - .8 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
  - .9 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
  - .10 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
    - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

- .2 Returning reusable items including pallets or unused products to vendors.
- .11 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .12 Separate Condition: refers to waste sorted into individual types.
- .13 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
- .14 Waste Audit (WA): detailed inventory of estimated quantities of waste materials that will be generated during construction, demolition, deconstruction and/or renovation. Involves quantifying by volume/weight amounts of materials and wastes that will be reused, recycled or landfilled.
- .15 Waste Diversion Report: detailed report of final results, quantifying cumulative weights and percentages of waste materials reused, recycled and landfilled over course of project. Measures success against Waste Reduction Workplan (WRW) goals and identifies lessons learned.
- .16 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.
- .17 Waste Reduction Workplan (WRW): written report that addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities. Waste Reduction Workplan information acquired from Waste Audit.

### 1.3 DOCUMENTS

- .1 Post and maintain in visible and accessible area at job site, one copy of following documents:
  - .1 Waste Audit.

### 1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following prior to project start-up.
  - .1 One (1) copy and one (1) electronic copy of completed Waste Audit (WA).
- .3 Prepare and submit on monthly basis, throughout project or at intervals agreed to by Departmental Representative the following:
  - .1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.
  - .2 Updated Waste Materials Tracking form.
  - .3 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.
- .4 Submit prior to final payment the following:
  - .1 Waste Diversion Report, indicating final quantities [in tones] by material types salvaged for reuse, recycling or disposal in landfill and recycling centres, re-use depots, landfills and other waste processors that received waste materials.
  - .2 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

**1.5 WASTE AUDIT (WA)**

- .1 Departmental Representative will prepare WA prior to project start-up. WA will be provided with bid documentation (Schedule A).
- .2 WA provides detailed inventory, estimated quantities and types of waste materials that will be generated as well as their potential to be reused and/or recycled and project's waste diversion goals and objectives.
- .3 After award of contract, contractor to review WA and confirm that anticipated quantities of waste generated are accurate and goals achievable.
- .4 If after review, contractor determines that indicated quantities or opportunities in WA are not accurate or achievable, contractor to provide written details of discrepancies and revised quantities for areas of concern. Contractor to meet with Departmental Representative to review and justify revisions.
- .5 Post on-site WA where contractor and sub-contractors are able to review content.

**1.6 WASTE REDUCTION WORKPLAN (WRW)**

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

**1.7 USE OF SITE AND FACILITIES**

- .1 Execute Work with minimal interference and disturbance to normal use of premises.
- .2 Maintain security measures established by facility provide temporary security measures approved by Departmental Representative.

**1.8 WASTE PROCESSING SITES**

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

**1.9 USE OF SITE AND FACILITIES**

- .1 After award of Contract, a mandatory site examination will be held for this Project for Contractor responsible for construction, renovation demolition/deconstruction waste management.
  - .1 Departmental Representative will arrange date, time and location.

**1.10 STORAGE, HANDLING AND PROTECTION**

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

colliding with an airplane or affecting air visibility.

- .11 Keep materials in closed containers, inaccessible to birds.

### **1.11 DISPOSAL OF WASTES**

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

### **1.12 SCHEDULING**

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

## **PRODUCTS**

### **NOT USED**

- .1 Not Used.

## **PART 2 EXECUTION**

### **2.1 GENERAL**

- .1 Do Work in compliance with WRW.
- .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

### **2.2. CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
  - .2 Source separate materials to be reused/recycled into specified sort areas.

### **2.3. MAIN ENVIRONMENTAL AUTHORITIES**

- .2 Ministère du Développement durable, Environnement et Lutttes contre les changements climatiques, 675, boulevard René-Lévesque Est, Québec (Québec) G1R 5V7 Tél. : 1 800 561-1616
- .3 Ministère du développement Ministère du développement durable, de l'environnement et des Parcs: *Québec Residual Materials Management Policy 1998-2008*
- .4 RECYC-QUÉBEC: Répertoire québécois des récupérateurs, recycleurs et valorisateurs  
<http://www.recyc-quebec.gouv.qc.ca/client/fr/repertoires/rep-recuperateurs.asp>
- .5 Public Services and Procurement Canada: Sustainable Development Strategy 2017-2020.
- .6 Conseil de la conservation et de l'environnement, 800, Place d'Youville, 19<sup>ème</sup> étage, Québec QC G1R 3P4 Tél. : (418) 643-3818.
- .7 Service de l'ingénierie et division de l'environnement, Ville de Sept-Îles, 601, boul. des Montagnais, Sept-Îles, QC, G4R 2R4 Tél. (418) 964-3225

**END OF SECTION**

**Part 1 General****1.1 PRIORITY**

- .1 In the case of Work performed for the federal government, Division 1 sections take priority over the technical specifications of the other divisions.

**1.2 RELATED SECTIONS**

- .1 Section 01 78 00 – Closeout Submittals.

**1.3 INSPECTION AND DECLARATION**

- .1 Contractor's Inspection: Contractor and sub-contractors must inspect their work, identify defects and make necessary repairs to ensure conformance to contract documents.
  - .1 Notify Ministry Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
  - .2 Request Ministry Representative's Inspection.
- .2 Ministry Representative's Inspection: the Ministry Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
  - .1 Work has been completed and inspected for compliance with Contract Documents;
  - .2 Defects have been corrected and deficiencies have been completed;
  - .3 Equipment and systems have been tested, set-up and calibrated, and are completely operational;
  - .4 Certificates required by utility companies have been submitted.
  - .5 SCC personnel have received the necessary training in the operation of devices and systems;
  - .6 The maintenance and operation manuals as well as the fully completed as-built plans were given to the departmental representative;
  - .7 Work is complete and ready for final inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative, and Contractor. If Work is deemed incomplete by Ministry Representative, complete outstanding items and request reinspection.

END OF SECTION



**PART 1 GENERAL****1.1 PRIORITY**

- .1 In the case of Work performed for the federal government, Division 1 sections take priority over the technical specifications of the other divisions.

**1.2 SUBMITTALS**

- .1 Instructions to be prepared by competent persons with necessary knowledge of operation and maintenance of products or systems described.
- .2 Copy will be returned after final inspection, with Ministry Representative's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two (2) weeks prior to Substantial Performance of the Work, submit to the Ministry Representative, two (2) final copies of operating and maintenance manuals in French.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 Furnish evidence, if requested, for type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.
- .9 When existing equipment is dismantled or replaced, the existing blue lamicooids on the equipment must be handed to the Ministry Representative.

**1.3 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. 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. Bind in with text; fold larger drawings to size of text pages.

**1.4 CONTENTS - EACH VOLUME**

- .1 Table of Contents: provide title of project

- .1 Addresses and telephone numbers of Ministry Representative and Contractor name of responsible parties.
- .2 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

## **1.5 AS-BUILTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, at site for Ministry Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. 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. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Ministry Representative.

## **1.6 RECORDING ACTUAL SITE CONDITIONS (AS BUILT)**

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Ministry Representative.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Field changes of dimension and detail.
  - .2 Changes made by change orders.
  - .3 Details not on original Contract Drawings.
  - .4 References to related shop drawings and modifications.

## **1.7 EQUIPMENT AND SYSTEMS**

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

## **1.8 MATERIALS AND FINISHES**

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and color and texture designations. Give the information necessary to order special products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

- .3 Additional requirements: as specified in individual specifications sections.
- .4 Collaborate with Ministry Representative in work scheduling to reduce conflicts and facilitate site use by CSC.

### **1.9 STORAGE, HANDLING AND PROTECTION**

- .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 to satisfaction of Ministry Representative.

### **1.10 WARRANTIES AND BONDS**

- .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 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.
- .4 Verify that documents are in proper form, contain full information, and are notarized.

**END OF SECTION**

**PART 1      General****1.1            SUBMITTAL PROCEDURES**

- .1      Upon request by competent authorities, submit shoring and bracing drawings for approval prior to demolition work. The drawings must be prepared by a qualified engineer licensed to practice in Canada, in the province, and must illustrate the proposed method of work.

**1.2            REFERENCES**

- .1      CNESST: work standards in force.
- .2      Canadian Standards Association (CSA) / CSA International.
  - .1      CSA S350-M1980 (R1998), Code of Practice for Safety in Demolition of Structures.

**1.3            DEFINITIONS**

- .1      Hazardous Materials: Dangerous substances, goods, items and products including, but not limited to, poisons, corrosives, flammable materials, ammunition, explosives, radioactive substances and any other materials that if misused can have negative impacts on the health or well-being of people, or on the environment.
- .2      Remove: Uninstall a component from a construction. In case of temporary removal, the removal work must be carried out with care in order to allow reinstallation at a later date.
- .3      Demolish: Dismantle or disassemble a construction or a component thereof regardless of the condition of the materials after work and remove waste from the site.
- .4      Dismantle: Dismantle or disassemble a construction or a component thereof with care for full or partial recovery.

**1.4            ENVIRONMENTAL PROTECTION**

- .1      Ensure that demolition work does not adversely affect wildlife, groundwater and adjacent watercourses and that they do not generate excessive levels of air or noise pollution.
- .2      Burning of trash and debris on site will not be permitted.
- .3      Do not dispose of waste or volatile materials, such as mineral spirits, oils, petroleum-based lubricants or toxic cleaning solutions into waterways or storm and sanitary sewers.
  - .1      Ensure that appropriate methods of disposal for this type of waste are used throughout the duration of the work.

- .4 Do not discharge water containing suspended solids into waterways, storm and sanitary sewers, or adjacent lands, by pumping or otherwise.

## **1.5 EXISTING CONDITIONS**

- .1 If material resembling spray or trowel applied asbestos or other materials designated and listed as hazardous is discovered during execution of the work (other than the materials already identified in the asbestos report), suspend work, take the appropriate precautions and immediately inform the Departmental Representative. Do not resume work until reception of written instructions from the Departmental Representative.
- .2 Notify the Departmental Representative before obstructing access to the building or interrupting services.

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Route excess material to a site approved by regulation.

## **1.7 SCHEDULING**

- .1 Take the necessary measures to ensure that the work schedule is respected, without compromising the prescribed minimum percentages of reused and recycled materials.

## **Partie 2 Products**

### **2.1 MATERIALS AND EQUIPMENT**

- .1 Stop equipment, tools and machinery when not in use unless extreme temperature conditions require continuous operation.
- .2 Demonstrate that tools, equipment and machinery are being used to recover materials in the best possible condition.
- .3 Plan all demolition conditions in relation to repair work that may interfere or affect the work schedule.
- .4 Plan all materials, equipment and tools required to perform demolition and reconstruction work.

## **Partie 3 Execution**

### **3.1 PROTECTION MEASURES**

- .1 Take the necessary measures to prevent the displacement or subsidence of structures, utility pipes, sidewalks, pavements, trees, landscaping, adjacent floors and parts of buildings to be preserved and to prevent them from being damaged.

- .1 Supply and install bracing and shoring parts and perform the necessary underpinning work.
- .2 If necessary, repair structures damaged during demolition work according to the Architect's instructions.
- .2 Properly support the structures or elements targeted. If the demolition work appears to be a hazard to the rest of the structure or element or to adjacent structures or elements, take appropriate precautionary measures, stop the work and notify the Departmental Representative.
- .3 Make sure that the demolitions do not obstruct the surface water evacuation system, the elevators as well as the electrical and mechanical systems that must remain in operation.

### **3.2 PREPARATORY WORK**

- .1 Protection
  - .1 Limit as much as possible the dust and noise produced by the work, as well as the inconvenience caused to the occupants of the premises.
  - .2 Protect appliances, building mechanical and electrical installations, as well as utility lines.
  - .3 Provide dust screens, tarpaulins, railings, support elements and other necessary protective devices.
  - .4 As the demolition progresses, the Contractor will coordinate the reconstruction in order to keep the building protected from the elements.
- .2 Disconnect and reroute the connection pipes of the electrical, telephone and telecommunications networks. Post warning signs on electrical lines and equipment which must remain energized to serve other structures during period of demolition.
- .3 Identify and protect utility lines. Do not disrupt active or energized utilities designated to remain undisturbed.
- .4 Disconnect and close designated lines of the mechanical installations.

### **3.3 SAFETY**

- .1 Carry out demolition work in accordance with CNESST standards.

### **3.4 HAZARDOUS WASTE DISPOSAL**

- .1 Remove materials defined as contaminated or hazardous by the competent authorities for environmental protection, and dispose of them with all necessary safety measures to minimize hazards during their removal and disposal.
- .2 Before starting demolition work, remove contaminated or hazardous materials designated by the competent authorities from the site according to the Department Representative's instructions and dispose of them by sending them to designated facilities, using safe methods and according to regulatory requirements.

**3.5 DEMOLITION**

- .1 Dismantle parts of the existing building where their removal is necessary for the construction of new work or installation of new finishes.
- .2 Re-cut the edges of partially demolished elements of the building to the tolerances specified by the Consultant to facilitate the installation of new elements.
- .3 Pulverize all concrete debris generated by foundation demolition work until materials of suitable dimensions for recycling is obtained.
- .4 Remove equipment, pipes and other items that interfere with the overhaul or repair of existing surfaces, and put them back in place as the work progresses.
- .5 At the end of each working day, make sure that the work is safe and stable.
  - .1 Protect from the elements the interior surfaces of parts that will not be demolished at all times.
- .6 Carry out demolition work in such a way as to raise as little dust as possible.
- .7 Contain fibrous materials (eg, insulation) so as to minimize the release of fibers into the air during transport within facilities.
- .8 Unless otherwise indicated, remove and evacuate demolition materials from the site, in accordance with the requirements of the competent authorities.
- .9 In places where the temporary removal of existing materials, equipment or devices is indicated on the drawings, carefully remove the items in question and store them in a safe place until reinstallation.

**3.6 STORAGE**

- .1 When storing items to be reinstalled, follow the instructions below:
  - .1 Clearly label all materials recovered, indicating their nature and quantity.
  - .2 Take appropriate security measures and allocate sufficient resources to prevent theft, vandalism and deterioration of materials.

**3.7 EVACUATION OF MATERIALS FROM THE SITE**

- .1 If they interfere with the progress of the work, the stored materials must be removed according to the instructions.
- .2 Dispose of materials of a similar nature deposited and to be disposed of using the same ecological method, once the collection of these materials is complete.
- .3 Transport materials for environmentally sound disposal using approved waste accepting organizations listed in and in accordance with relevant regulations.
- .4 Dispose of products and materials that are not intended for environmentally friendly disposal, in accordance with relevant regulations.

**3.8 SITE CLEANING**

- .1 Keep the work site clean and in good order for the duration of the demolition work.
- .2 Once the work is completed, restore to a state corresponding to that of the adjacent undisturbed surfaces, surfaces, parking areas, pedestrian walkways and lighting poles that have been affected by the work.

END OF SECTION



**PART 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

**1.2 REFERENCES**

- .1 American Concrete Institute (ACI).
  - .1 ACI 555R-01, Removal and Reuse of Hardened Concrete.
- .2 American Society of Safety Professionals (ASSP)
  - .1 ASSP A10.6-2006, Safety Requirements for Demolition Operations.
  - .2 ASSP A10.12-1998(R2016), Safety Requirements for Excavation.
  - .3 ASSP A10.34-2021, Protection of the Public on or Adjacent to Construction Sites.
  - .4 ASSP A10.43-2016, Confined Spaces in Construction and Demolition Operations.
- .3 American Society for Testing and Materials International (ASTM).
  - .1 ASTM E 1575-18, Standard Practice for Pressure Water Cleaning and Cutting.
  - .2 ASTM E 2625-19, Standard Practice for Controlling Occupational Exposure to Respirable Crystalline Silica for Construction and Demolition Activities.
  - .3 ASTM E 3073-17, Standard Guide for Development of Waste Management Plan for Construction, Deconstruction, or Demolition Projects.
- .4 Canadian Standard Association (CSA)/CSA International.
  - .1 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.
- .5 Canadian Council of Ministers of the Environment (CCME).
  - .1 PN1326-2003, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
- .6 Underwriters Laboratories of Canada (ULC).
  - .1 ULC/ORD-C107.19-1992, Secondary Containment of Underground Piping.
  - .2 ULC/ORD-C58.19-1992, Spill Containment Devices for Underground Tanks.
  - .3 CAN/ULC S661-10(R2016), Standard for Overfill Protection Devices for Flammable and Combustible Liquid Storage Tanks.
- .7 Department of Justice of Canada (Jus).
  - .1 Canadian Environmental Assessment Act (CEAA), 2012, c. 19, s. 52.
  - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
    - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
  - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

- .8 Government of Quebec.
  - .1 Environment Quality Act (EQA).
  - .2 Safety Code for the Construction Industry R.R.Q., c. S-2.1, r.4.
- .9 U.S. Environmental Protection Agency (EPA)/Code of Federal Regulations (CFR), Title 40 - Protection of Environment, Chapter 1, Subchapter C - *AIR, Part 86* - CONTROL OF EMISSIONS FROM NEW AND IN-USE HIGHWAY VEHICLES AND ENGINES.
  - .1 EPA CFR 86.098-10, Emission standards for 1998 and later model year Otto-cycle heavy-duty engines and vehicles.
  - .2 EPA CFR 86.098-11, Emission standards for 1998 and later model year diesel heavy-duty engines and vehicles.

### 1.3 DEFINITIONS

- .1 Hazardous Materials: dangerous substances and goods, hazardous commodities and products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.
- .2 Waste Management Co-ordinator (WMC): Contractor Representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.
- .3 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.
- .4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

### 1.4 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 WMC is responsible for fulfilment of reporting requirements.
- .3 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal and ASTM E 3073. Indicate:
  - .1 Descriptions of and anticipated quantities of materials to be salvaged, reused, recycled and landfilled.
  - .2 Schedule of selective demolition.
  - .3 Number and location of dumpsters.
  - .4 Anticipated frequency of tipping.
  - .5 Name and address of haulers, waste facilities and waste receiving organizations.

- .4 Submit copies of certified weigh bills, bills of lading and receipts from authorized disposal sites and reuse and recycling facilities for material removed from site upon request of Owner's Representative.
  - .1 Written authorization from Owner's Representative is required to deviate from haulers or facilities and receiving organizations listed in Waste Reduction Workplan.
- .5 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning. Drawings shall be stamped and signed by professional engineer registered and licensed by the Ordre des Ingénieurs du Québec (OIQ).

## 1.5 QUALITY CONTROL

- .1 Regulatory Requirements: Ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial/Territorial and Municipal regulations.
- .2 Pre-Installation Meetings:
  - .1 Convene pre-installation meeting prior to beginning work of this Section, with Owner's Representative to verify existing site conditions adjacent to demolition work.
  - .2 Hold project meetings at intervals defined by the general specifications.
  - .3 Ensure key personnel, site supervisor, project manager, subcontractor representatives and WMC attend.
  - .4 WMC must provide written report on status of waste diversion activity at each meeting.
  - .5 Owner's Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.
- .3 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.9.1	Inspection of existing conditions, items to salvage and items to dismantle	Prior to the start of demolition	Inspection report
1.5.5	Demolition drawings, diagrams or details showing sequence of demolition work	At least fourteen (14) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Transmission letter Inscription to the technical specification registry
3.8.2	Falseworks, supporting structures and underpinning drawing.	At least fourteen (14) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents	Drawings signed and sealed by an engineer
2.2.1	Technical datasheets of demolition equipment	At least seven (7) days prior to beginning work	Technical datasheets
3.8.4	Certificate of compliance of falseworks	Prior to applying loads on falseworks	Certificate of compliance signed by an engineer and visit report
	Notice to Owner's Representative	At least seven (7) days prior to beginning each phase of work	Notice to Owner's Representative

## 1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

- .2 Divert unused material from landfill to a material collection site as approved by the Owner's Representative.

## **1.7 ENVIRONMENTAL PROTECTION**

- .1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Fires and burning of waste or materials is not permitted on site.
- .4 Do not bury rubbish waste materials.
- .5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum-based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
  - .1 Ensure proper disposal procedures are maintained throughout project.
- .6 Do not dump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction and as directed by the Owner's Representative.
- .8 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .9 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .10 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.
- .11 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
  - .1 In event of unforeseen delay, notify Owner's Representative in writing.

## **1.8 EXISTING CONDITIONS**

- .1 Prior to the start of the demolition work, inspect and make an inventory of items to salvage and items to dismantle, and submit inspection reports including, but not limited to, the information and the following documents:
  - .1 the state of the elements to salvage;
  - .2 the state of the elements to dismantle and
    - .1 to recover for reuse in work:
    - .2 to recover for re-use in another work:
    - .3 to give back to the Owner.
  - .3 the location and condition of utility lines, mechanical and electrical systems;

- .4 congestion of the premises;
  - .5 photographs of the present situation.
- .2 If material resembling spray or trowel applied asbestos or other substance listed as hazardous is encountered in course of demolition, stop work, take preventative measures, and notify Owner's Representative immediately. Proceed only after receiving written instructions.
  - .3 The Contractor shall validate whether ducts (electrical or otherwise) are present within concrete before demolition even where no indications are given on drawings. A specialized contractor or specialized equipment such as georadar should be used. The Contractor is presumed liable for any problematic resulting from damage to ducts.
  - .4 Structures to be demolished are based on their condition on date that tender is accepted.
  - .5 Remove, protect and store salvaged items as directed by Owner's Representative. Salvage items as identified on drawings and specifications. Deliver to the Owner as directed.

## 1.9

### PART 2 PRODUCTS

#### 2.1 MATERIALS

- .1 Equipment and heavy machinery:
  - .1 On-road vehicles to CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
  - .2 Off-road vehicles to: EPA CFR 86.098-10 and EPA CFR 86.098-11.
- .2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.
- .3 Access to equipment and heavy machinery.
  - .1 The Contractor shall consider restrictions to access due to clearance of access way, particularly in underground parking, when planning works.
  - .2 Consult drawings to obtain maximum clearance in different areas of the building.
  - .3 The Contractor remains solely responsible for determining accessibility of equipment and heavy machinery when planning work.

#### 2.2 AUTHORIZED DEMOLITION EQUIPMENT

- .1 Choice of materials used for demolition is subject to approval of Owner's Representative. Submit technical datasheets for approval at least seven (7) days prior to beginning work.
- .2 The Owner's Representative may reject the use of hydrodemolition equipment. If the Contractor wishes to use hydrodemolition, he shall demonstrate to the Owner's Representative satisfaction that no ill effects shall occur to mechanical, electrical or any buried utilities. The Contractor shall be liable for any damage, even accidental, resulting from demolition itself or ensuing water infiltration. Hydrodemolition shall conform to ASTM E 1575 if authorized.

- .3 Follow these guidelines for the use of hand-held pneumatic hammers:
  - .1 30 kg hammer: use a 30 kg or less caliber hammer for complete demolition of concrete except where an hammer of inferior caliber is required. Use this hammer for selective demolition as well on horizontal members before attaining the first layer of reinforcement steel.
  - .2 15 kg hammer: use a 15 kg or less caliber hammer for demolition of concrete over a 100 mm thickness adjacent to existing concrete member to be protected. Use this hammer for selective demolition over the face of vertical members up to the first layer of reinforcement steel.
  - .3 7 kg hammer: use a 7 kg or less caliber hammer for selective demolition of vertical members after attaining the first layer of reinforcement steel, to clear concrete around reinforcement. Use this hammer to demolish concrete over the top of steel beams after attaining the bottom layer of reinforcement.
  - .4 For hollow slab, use a 15 kg hammer for selective demolition up to the first layer of reinforcement steel and a 7 kg hammer to clear concrete around reinforcement steel.
  - .5 As an example, for complete demolition of slab over beams when beams shall be protected, use a 30 kg hammer for demolition except for the last 100 mm over the top of the beams where a 15 kg hammer shall be used. For selective demolition of the top of a slab, demolish concrete up to the top layer of reinforcement with a 30 kg hammer than use a 15 kg hammer to clear concrete around reinforcement steel. For columns or walls, use a 15 kg hammer to demolish concrete up to reinforcement steel than use a 7 kg hammer.
- .4 Follow these guidelines for the use of hydraulic hammers:
  - .1 200 J or 350 J hydraulic hammers may only be used for complete demolition of concrete farther than 300 mm from existing concrete to protect.
  - .2 60 J hydraulic hammers may be used in place of 30 kg hand-held pneumatic hammer as indicated in article 2.2.3.1.
- .5 Follow these guidelines for the use of shear type concrete cutters:
  - .1 Shear type concrete cutters may only be used for complete demolition of concrete farther than 300 mm from existing concrete to protect.

### **PART 3 EXECUTION**

#### **3.1 PROTECTION OF IN-PLACE CONDITIONS**

- .1 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades, properties, and parts of existing building to remain.
  - .1 Provide bracing, shoring and underpinning as required.
  - .2 Repair damage caused by demolition as directed by Owner's Representative.
- .2 Support affected structures and, if safety of structure being demolished or adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify the Owner's Representative.
- .3 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.

### 3.2 DEMOLITION PROCEDURES

- .1 Methodology, technics and equipment used for demolition are determined by the Contractor.
  - .1 Submit detailed procedure for structure demolition to Owner's Representative at least one week prior to beginning work.
  - .2 Follow the indications of article 2.2 to determine methodology, technics and equipment for demolition.
- .2 If the Owner's Representative or representatives from regulators consider that the methodology for demolition submitted by the Contractor endangers people, propriety or environment, they may require that the Contractor submit alternative methodology.
- .3 Intervention or comments from the Owner's Representative does not relieve the Contractor from his responsibilities. Inversely, the absence of intervention by the Owner's Representative does not signify approval of means or methods used by the Contractor.
- .4 Means of demolition used by the Contractor must allow quality control. The Contractor shall be able to control all phase of work, be able to predict the consequences of his actions to the structure including parts that are not being demolished. In particular, the Contractor shall not overload existing part of the structure with debris from demolition.
- .5 Steel structure erection and dismantling work shall be done in accordance with Quebec's *Safety Code for the Construction Industry*, article 3.24 *Steel structure erection or dismantling work*.

### 3.3 PREPARATION

- .1 Work in accordance with Section 01 35 29.06 – Health, Safety and Emergency Procedures.
- .2 Disconnect and re-route electrical and telephone service lines entering buildings to be demolished.
  - .1 Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.
- .3 Disconnect and cap designated mechanical services.
- .4 Do not disrupt active or energized utilities traversing premises designated to remain undisturbed whenever possible. When required, install a temporary system to maintain services. Lines that need to be cut shall be cut where and how in accordance with the requirements of the authorities. Reinstall lines in a secure location.

### 3.4 SAFETY

- .1 Secure place of work in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.
- .2 The Contractor shall ensure safety of worksite at any time, including outside normal work hours. Secure worksite as to ensure public safety in accordance with ASSP A10.34.

- .3 Install, in accordance with laws, codes and regulations, fences, security shelters, safety guard, rails, lighting, alarm panels, etc., as required during execution of work to protect public, Owner and his Representatives as well as users against material loss or damage, injuries, loss of life or any other safety threat that may occur due to neglect, carelessness or incompetence of the Contractor, subcontractors or their employees.
- .4 Where required, the Contractor shall erect protective panels to prevent debris from reaching installations and existing equipment.
- .5 Blasting operations are not permitted during demolition.

### **3.5 DANGEROUS MATERIALS REMOVAL**

- .1 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.
- .2 Prior to start of Work remove contaminated or hazardous materials listed as hazardous, as defined by authorities having jurisdiction, from site and dispose of at designated disposal facilities in safe manner and in accordance with TDGA and other applicable requirement and Section 02 81 01 - Hazardous Materials. Refer to Existing Conditions in PART 1.

### **3.6 VIBRATION CONTROL**

- .1 Limit ground vibrations to protect existing works and structures.
- .2 Near existing works or structures, peak particular ground speed shall not exceed 25 mm/s at existing works or structures.

### **3.7 ADMISSIBLE FLOOR AND ROOF LOADS**

- .1 Unless otherwise indicated, limit construction load on existing floors or roofs to 2.4 kPa except when using temporary shoring.
- .2 When using lifting devices or any heavy equipment exceeding the admissible load on floors, place solid supports and shore structure as indicated in section 3.8.

### **3.8 SHORING, BRACING AND UNDERPINNING**

- .1 The Contractor shall provide temporary work required to ensure shoring and retaining soil whenever required. The Contractor shall ensure the structural integrity of work including stability of concrete or masonry walls during work, under gravity as well as lateral loads.
- .2 Existing works to shore and procedure of shoring are under the sole responsibility of the Contractor and must be approved by the Owner's Representative. Shoring, bracing and underpinning drawings shall bear the seal and signature of a professional engineer, certified by the Ordre des Ingénieurs du Québec (OIQ).
- .3 Provide bracings, ladders, scaffoldings, chutes, etc. as required for shoring works.

- .4 Submit a letter signed by a professional engineer certified by the Ordre des Ingénieurs du Québec (OIQ), stating that the construction of shoring, bracing and underpinning was done in accordance with the plans submitted. The engineer attesting the conformity of temporary shoring must visit the site of work prior to the production of the letter and attach the report of his visit to the letter.
- .5 If the Contractor does not use temporary shoring, the Owner's Representative may request that the Contractor provides a letter signed by a professional engineer certified by the OIQ stating that temporary shoring is not required for a specific part of the work.
- .6 The design and supervision of temporary work is the sole responsibility of the design engineer of such structures and the contractor engaging him. The Owner's Representative shall not be responsible in any way for the design and/or supervision of temporary structures.

### **3.9 DEMOLITION**

- .1 Perform work in accordance with CSA S350 and ASSP A10.6. When performing excavation work, refer to ASSP A10.12. If work is to be carried out in confined space, comply with ASSP 10.43.
- .2 Demolish parts of structure as indicated.
- .3 Around concrete structure specified for demolition on drawings, sawcut elements to their full thickness on the whole perimeter, unless otherwise indicated on drawings.
- .4 Execute demolition work as required to allow other work. Coordinate the location of existing and projected works, as required in planning temporary shoring.
- .5 Exact area or depth of demolition of concrete, masonry and blocks wall indicated on drawings shall not be considered exact and final dimensions need be coordinated with construction drawings and field measurements to be taken after award of contract. Difference from the information on drawings shall not be considered motive for supplementary charges.
- .6 Do not use demolition materials as fill for basement or open pits. Remove from basements and open pits concrete or masonry debris from demolition.
- .7 Reuse concrete from demolition in compliance with ACI 555R.
- .8 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.
- .9 At end of each day's work, leave Work in safe and stable condition.
  - .1 Protect interiors of parts not to be demolished from exterior elements at all times.
- .10 Demolish to minimize dusting. Keep materials wetted as directed by Owner's Representative.
- .11 Demolish masonry and concrete walls in pieces suitable for reuse as specified.
- .12 Remove structural framing.

- .13 Contain fibrous materials to minimize release of airborne fibres while being transported within facility.
- .14 If by lack of precaution, existing reinforcing steel to protect is damaged and cannot be reused, the Contractor shall replace it properly and at its expense.
- .15 Only dispose of material specified by selected alternative disposal option as directed by Owner's Representative or for own use.
  - .1 It is forbidden to dispose of this material to a landfill or incorporate them into a flow of waste for landfill.
  - .2 Additional disposal options may be provided by Owner's Representative, prior to disposal.
- .16 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.
- .17 Store in location designated by Owner's Representative and protect materials and equipment designated for reinstallation, reuse or safekeeping, as directed by other sections of Work.
- .18 Shut off lighting except those required for security purposes at the end of each day.

### **3.10 STOCKPILING**

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources / measures to prevent vandalism, damage and theft.
- .3 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.
- .4 Supply separate, clearly marked disposal bins for categories of waste material. Do not remove bins from site until inspected and approved by Owner's Representative. Please notify Owner's Representative prior to removal of bins from site.

### **3.11 MATERIAL REMOVAL**

- .1 Remove stockpiled material as directed by Owner's Representative, when it interferes with operations of project construction.
- .2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .3 Transport material designated for alternate disposal using approved haulers, facilities and receiving organizations listed in Waste Reduction Workplan and in accordance with applicable regulations.
  - .1 Written authorization from Owner's Representative is required to deviate from haulers, facilities or receiving organizations listed in Waste Reduction Workplan.
- .4 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
  - .1 Disposal facilities must be those approved of and listed in Waste Reduction Workplan.

- .2 Written authorization from Owner's Representative is required to deviate from disposal facilities listed in Waste Reduction Workplan.

### **3.12 DAMAGE TO WORK DESTINED FOR SAFEKEEPING**

- .1 If damage, accidental or not, occurs to existing works destined for safekeeping, Contractor shall contact the Owner's Representative immediately.
- .2 Within twenty-four (24) hours after damage occurs, submit repair plan and procedure stamped and signed by an engineer member of OIQ.
- .3 Immediately after repairs are completed, submit a written report signed by an engineer certifying that repairs are completed according to the repair plan previously submitted.
- .4 Any corrective work shall be without charge.

### **3.13 CLEANING**

- .1 Area of Work and adjacent areas shall be cleaned to be returned to their state prior to beginning Work, to the satisfaction of the Owner's Representative.
- .2 The location of demolished structure shall be cleaned and secured. Any element susceptible to cause harm, affect adversely public health or representing fire risk shall be evacuated from site.

END OF SECTION



**Part 1 General****1.1 RÉFÉRENCES**

- .1 Definitions:
  - .1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
  - .2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
  - .3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .2 Reference Standards
  - .1 Canadian Environmental Protection Act, 1999 (CEPA 1999)
    - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
  - .2 Department of Justice Canada (Jus)
    - .1 Transportation of Dangerous Goods Act, 1992 (TDG Act) [1992], (c. 34).
    - .2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).
  - .3 Green Seal Environmental Standards (GS)
    - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
    - .2 GS-36-00, Commercial Adhesives.
  - .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
    - .1 Material Safety Data Sheets (MSDS).
  - .5 National Research Council Canada Institute for Research in Construction (NRC-IRC)
    - .1 National Fire Code of Canada-[2005].
- .3 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
  - .2 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data :
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit [two] copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures to

Departmental Representative for each hazardous material required prior to bringing hazardous material on site.

- .3 Submit hazardous materials management plan to Departmental Representative that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
  - .1 When exporting hazardous waste to another country, ensure compliance with Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations.
- .4 Storage and Handling Requirements:
  - .1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.
  - .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
  - .3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada requirements.
  - .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
    - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
    - .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.
  - .5 Transfer of flammable and combustible liquids is prohibited within buildings.
  - .6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.
  - .7 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.
  - .8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
  - .9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
  - .10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
    - .1 Store hazardous materials and wastes in closed and sealed containers.

- .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
- .3 Store hazardous materials and wastes in containers compatible with that material or waste.
- .4 Segregate incompatible materials and wastes.
- .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
- .6 Store hazardous materials and wastes in secure storage area with controlled access.
- .7 Maintain clear egress from storage area.
- .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
- .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
- .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
- .11 When hazardous waste is generated on site:
  - .1 Co-ordinate transportation and disposal with Departmental Representative.
  - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
  - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
  - .4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.
  - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
  - .6 Only trained personnel handle, offer for transport, or transport dangerous goods.
  - .7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.
  - .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Departmental Representative.
  - .9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative. and appropriate provincial authority. Take reasonable measures to control release.
- .12 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
- .13 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.

**Part 2 Products****2.1 MATERIALS**

- .1 Description:
  - .1 Bring on site only quantities hazardous material required to perform Work.
  - .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

**Part 3 Execution****3.1 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
  - .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
  - .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
  - .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
  - .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
  - .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
  - .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
  - .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
  - .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as: recyclage de déchets dangereux d'une manière qui en constitue l'élimination;
    - .1 Hazardous wastes recycled in manner constituting disposal.
    - .2 Hazardous waste burned for energy recovery.
    - .3 Lead-acid battery recycling.
    - .4 Hazardous wastes with economically recoverable precious metals.

**END OF SECTION**

**PART 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 03 15 00 – Concrete Accessories.
- .2 Section 03 20 00 – Concrete Reinforcing.
- .3 Section 03 30 00 – Cast-in-Place Concrete.
- .4 Section 03 35 00 – Concrete Finishing.
- .5 Section 03 39 00 – Concrete Curing.
- .6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

**1.2 REFERENCES**

- .1 American Concrete Institute (ACI).
  - .1 ACI 303R-12, Guide to Cast-in-Place Architectural Concrete Practice.
  - .2 ACI 347-04, Guide to Formwork for Concrete.
  - .3 ACI 347.2R-17, Guide for Shoring/Reshoring of Concrete Multistory Building.
  - .4 ACI 347.3R-13, Guide to Formed Concrete Surfaces.
- .2 Canadian Standard Association (CSA)/CSA International.
  - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
  - .2 CSA O86-14, Engineering Design in Wood.
  - .3 CSA O121-17, Douglas Fir Plywood.
  - .4 CSA O151-17, Canadian Softwood Plywood.
  - .5 CSA O153-13, Poplar Plywood.
  - .6 CSA O325-16, Construction Sheathing.
  - .7 CSA O437 Series-93(R2006), Standards on OSB and Waferboard.
  - .8 CSA S269.1-16, Falsework for Construction Purposes.
  - .9 CAN/CSA S269.2-16, Access Scaffolding for Construction Purposes.
- .3 Government of Quebec.
  - .1 Safety Code for the Construction Industry R.R.Q., c. S-2.1, r.4.
- .4 International Concrete Repair Institute (ICRI).
  - .1 Guideline No. 320.1R-1996, Guide for Selecting Application Methods for the Repair of Concrete Surfaces.
  - .2 Guideline No. 320.2R-2009, Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces.

- .5 Underwriters Laboratories of Canada (ULC).
  - .1 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .6 Régie du bâtiment du Québec :
  - .1 Code de construction du Québec - chapitre I, Bâtiment et Code national du bâtiment du Canada 2010 (modifié).

### **1.3 CONTRACTOR'S LIABILITIES**

- .1 The Contractor scope of work includes concrete forming, falseworks, their design and installation. No examination or comments from the Ministry Representative or anyone else shall relieve the Contractor of assuming solely all risks and liability regarding these parts of work.
  - .1 Calculations, layout and construction of formworks are the sole responsibility of the Contractor.
- .2 The Contractor shall provide insulation to be placed in foundation walls. The insulation shall be placed by the Contractor specialized in formworks, in collaboration with the Contractor specialized in reinforcement.

### **1.4 FORMWORKS AND FALSEWORK DESIGN**

- .1 Formwork and falsework design shall be performed by an engineer member of the OIQ employed by the Contractor or mandated to do so.
- .2 Formwork and falsework design shall be done in accordance with laws and regulations in place, including but not limited to the Safety Code for the Construction Industry.
- .3 Special precautions shall be taken during design to limit loads applied on existing structures to values inferior to the maximum allowable loads on these structures.
- .4 Describe the construction sequence incorporated into the design of structures. Show or describe the position of construction joints provided and, if applicable, the principle of formworks and falseworks reuse.
- .5 Calculations shall be made in accordance with recommendations and loads indicated in ACI 347 and ACI 347.2 guides. Wind loads shall conform to the requirements of the Code de la Construction du Québec.
- .6 Designer of formwork and falsework shall consider indications on drawings.

### **1.5 ACTIONS AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.
- .3 Submit descriptions of all formwork materials in direct contact with wet concrete.

- .4 Submit for approval a drawing including location of all sleeves embedded in concrete.
- .5 Submit formworks and falseworks shop drawings.
- .1 The drawings shall bear the seal and signature of a professional engineer, certified by the Ordre des ingénieurs du Québec (OIQ).
- .6 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and formwork drawings.
- .7 Indicate formwork design data including permissible rate of concrete placement, and temperature of concrete, in forms.
- .8 When falseworks or structural element are connected or lean on an existing structure used as support, shop drawings shall indicate maximum forces transmitted in each direction.
- .9 Before concreting, submit a letter signed by a professional engineer certified by the Ordre des ingénieurs du Québec (OIQ), stating that the construction of falseworks was done in accordance with the plans submitted. The engineer attesting the conformity of temporary shoring must visit the site of work prior to the production of the letter and attach the report of his visit to the letter. If the Contractor does not use temporary shoring, the Ministry Representative may request to be provided with a letter signed by a professional engineer certified by the OIQ stating that temporary shoring is not required.

## 1.6 QUALITY CONTROL

- .1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.4	Shoring / Reshoring Procedure.	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter. Inscription to the technical specification's registry.
1.5.6	Formworks and falseworks shop drawings.	<i>At least fourteen (14) days prior to beginning work, per the requirements for shop drawings presentation in the tender documents.</i>	Transmission letter. Inscription to the technical specification's registry.
1.5.10	Certificate of compliance of falseworks.	<i>Refer to terms and conditions of section 01 33 00</i>	Certificate of compliance signed by an engineer and visit report.
1.5.4	Descriptions of formwork materials in contact with wet concrete.	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter. Inscription to the technical specification's registry.
1.5.5	Drawing including location of all sleeves embedded in concrete.	<i>Refer to terms and conditions of section 01 33 00</i>	Location drawing. Inscription to the technical specification's registry.
3.2.2.3	Certificate of compliance for anchors	<i>Refer to terms and conditions of section 01 33 00</i>	Breakpoint Certificate of compliance signed by an engineer

**1.7 WASTE MANAGEMENT AND DISPOSAL:**

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the Ministry Representative.
- .4 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the Ministry Representative.
- .5 Divert unused form release material from landfill to an official hazardous material collection site as approved by the Ministry Representative.

**PART 2 PRODUCTS****2.1 MATERIALS**

- .1 Formwork materials:
  - .1 For concrete without special architectural features, use wood and wood product formwork materials in accordance with CSA O86, CSA O121, CSA O153 and/or CSA O437 Series.
  - .2 Rigid insulation board: in accordance with CAN/ULC S701, type II, thermal rating RSI 0.82 for 25 mm thickness, RSI 1.18 for 38 mm and RSI 1.50 for 50 mm.
- .2 Formwork materials for exposed surface (architectural concrete):
  - .1 The use of « Duraform » type formwork is not allowed for these surfaces.
  - .2 Use brand-new formwork materials. Use brand-new plywood, 19 mm thick, sanded and coated with high quality formwork release agent. For lining only, use three-ply 6 mm thick plywood.
  - .3 For concrete with an exposed surface, use brand-new plywood, high density in accordance with CSA O121.
- .3 Form release agent: use a non-toxic, biodegradable and low VOC product.
  - .1 Approved products: Formshield Pure by Euclid, MasterFinish RL 100 (formerly Cast-Off) by BASF and King Form Release by KING.
- .4 Falsework materials: to CSA-S269.1, table 1. Identify materials through quality indices and present data from tests or any certificate of compliance.
- .5 Form ties:
  - .1 For concrete without special architectural features, use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
  - .2 For concrete with an apparent surface, use snap ties complete with plastic cones and light grey concrete plugs. Cone diameter shall be less than 38 mm. Insure concrete cover of 25 mm or more.

- .3 Unless otherwise indicated, use watertight snap ties with a neoprene washer in the centre of the tie, able to resist 12 meters high water pressure for foundation walls and retaining walls. In general, use watertight snap ties for all concrete work considered watertight.
- .4 Sealing mortar for form ties holes: Cementitious, two-component, fast-setting mortar, grey colored and containing a corrosion inhibitor, such as:
  - .1 Sikatop 123 Plus or Sikatop 123 Plus Winter Grade, at low temperature.
  - .2 Verticoat Supreme by EUCLID;
  - .3 Super-top OV by KING;
  - .4 MasterEmaco N 1501HCR Vertical Overhad (former Zero-C Vertical Overhead Mortar) by BASF;
  - .5 Planitop X or XS by MAPEI.
- .6 Refer to section 03 15 00 for concrete accessories.

### **PART 3 EXECUTION**

#### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings. Allow for a 100 mm tolerance on the elevation of the bottom of excavation at no supplementary charge.
- .2 Prior to concreting, clean formwork and treat surfaces with a form stripping agent in accordance with CSA A23.1.
- .3 Obtain Ministry Representative approval for use of earth forms, or for framing openings not indicated on drawings.
- .4 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .5 Fabricate and erect falsework in accordance with CSA S269.1.
- .6 Do not place shores and mud sills on frozen ground. Bottom of excavation shall be protected against frost at all time. Concrete shall never be poured over a frozen surface.
- .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .8 Fabricate and erect formwork in accordance with CSA S269.1 to produce finished concrete conforming to shape, dimensions, locations and levels indicated. Insure proper temporary bracing to maintain the shape of formwork from pouring to hardening of concrete.
- .9 Geometric configuration and localisation shall be within tolerances required by CSA A23.1, article 6.4.

- .10 Align form joints and make them watertight. Keep form joints to minimum. Adequate reinforcements must be placed at the back of the joints between plywood sheets to ensure obtaining a continuous flat surface able to withstand all stages of concreting without deforming or moving.
- .11 Unless otherwise indicated, use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints.
- .12 For all sharp angles of exposed concrete, provide 25 mm chamfers, even where no indications are given on drawings.
- .13 When formwork's height is significant, windows shall be incorporated into the forms to facilitate concreting. Windows shall be placed to limit free fall of concrete and segregation of ingredients during concrete pouring.
  - .1 Minimally, for vertical elements more than three (3) meters high, access window shall be spaced 2.4 meters apart horizontally and vertically.
  - .2 When pumping concrete, lowering a trunk down into the casing from the top to limit the drop height is likely to create segregation of concrete during the interruption of pumping or when opening the valve before the descent of the trunk. This method cannot be considered as to guarantee proper placing of concrete – the addition of access window in the formwork should be used.
- .14 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated. Refer to section 03 15 00 for requirements regarding expansion or dilatation joint.
- .15 Special care shall be taken in fabrication and erection of formwork for architectural concrete, as indicated on drawings and specifications.
  - .1 It might not be possible to align joints using panels of standard dimensions or maximum spacing between snap ties.
- .16 At least twenty-four (24) hours prior to closing forms, advise the Ministry Representative as to allow inspection of reinforcement.

### **3.2 ANCHORS, SLEEVES AND EMBEDDED ELEMENTS**

- .1 Provide and install into formwork all embedded elements (anchors, sleeves, ducts, machinery anchor bolts, etc.) in accordance with CSA A23.1 article 6.7. Refer to section 03 15 00 – Concrete Accessories for additional requirements.
- .2 Build in anchors, sleeves, and other inserts required to accommodate work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
  - .2 Prior to concreting, ensure that all dimensions required in drawings and specifications and tolerances imposed for the implementation are met.
  - .3 Provide a certificate of compliance signed by an engineer attesting that installation of anchor rods complies to the anchoring plan and that concrete foundations reached the strength required to support the erection of steel structure, in accordance with article 3.24.12 of the Safety Code for the construction industry.

- .3 Tolerances shall be in accordance with standard CSA A23.1 article 6.7.3.
- .4 Sleeves and openings with a side larger than 100 mm shall be examined by the Ministry Representative if not indicated on drawings.
- .5 No sleeve, pipe or duct shall be installed and no openings shall be made into a joist, a beam, a slab, slab capitol or a column unless directed otherwise by the Ministry Representative.
- .6 When authorized by the Ministry Representative, incorporate openings, place sleeves, ties, hangers, ducts or pipes and any other embedded elements as indicated in drawings.
- .7 Unless otherwise indicated, the following guidelines shall be met when installing sleeves, ducts or pipes:
  - .1 Ducts shall be placed between top and bottom rebars;
  - .2 Ducts shall be spaced apart 300 mm or farther. Maximum dimension of ducts shall be less than a third of the thickness of the concrete element or fifty (50) millimetres, whichever is less. Location of ducts shall be approved by the Ministry Representative;
  - .3 Centre-to-centre dimension between sleeves or pipes shall be superior to three (3) times the diameter of the larger element;
  - .4 The exterior diameter of the embedded element shall not be larger than the third of the thickness of the wall, beam or slab into which it is embedded;
  - .5 Do not remove or move rebars in order to place embedded elements. If placement of embedded elements is impossible where prescribed, any modification need to be approved by the Ministry Representative;
  - .6 Nothing shall be embedded into a slab on ground exposed to the effect of bad weather.
- .8 Notify the Ministry Representative and wait for his instructions if the preceding requirements cannot be met.
- .9 Coordinate delivery and placement into formworks of embedded elements with subcontractors.
- .10 Aluminium material embedded into concrete shall be covered with a proper coating to prevent aluminium corrosion.

### **3.3 FORMWORK REMOVAL AND RESHORING**

- .1 Leave formwork in place for the following minimum periods of time after placing concrete:
  - .1 One (1) day for footings, abutment and thrust blocks;
  - .2 Three (3) days for walls less than three (3) meters high and beam sides;
  - .3 Five (5) days for walls three (3) to six (6) meters high;
  - .4 Seven (7) days for column;
  - .5 Twenty-eight (28) days for beams, slabs, decks and any other framing elements, or seven (7) days if formworks are replaced immediately by adequate reshoring. Reshores shall remain set in place for twenty-one (21) days. Falsework drawings in accordance with CSA S269.1 shall indicate the method, materials and locations used for reshores. Each drawing shall bear the seal and signature of an engineer certified by the OIQ.

- .6 Refer to section 03 39 00 – Concrete Curing for the minimum time prior to formwork removal, notwithstanding the indication of the preceding articles. Coordinate the time required before formwork removal with concrete curing.
- .2 Notwithstanding preceding articles, formwork removal is authorized only when the Ministry Representative allows it. The authorization shall be given only if proper methods of curing are ensured, including protection against cold- or hot-weather, rain or any other adverse conditions. Moreover, time prior formwork removal may be increased depending on the process used for concreting, curing conditions and weather conditions.
- .3 The Contractor remains the sole responsible for any damage to concrete following early formwork removal, even if he has been authorized to proceed.
- .4 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .5 Space reshoring in each principal direction at not more than 3 000 mm apart.

### 3.4 FORMWORK FOR ARCHITECTURAL CONCRETE

- .1 Architectural concrete shall be in accordance with article 7.9.2.6 of CSA A23.1 which shall be considered a minimum requirement to be read in conjunction with the following specifications.
- .2 Quality of finish for structural concrete architecturally exposed shall be in accordance with ACI 347.3R Guide to Formed Concrete Surfaces, with surface category as defined in the following table:

Element	Location	Concrete surface category (CSC)
All concrete exposed where no surface category is explicitly defined.		CSC 1

- .3 Requirements of table 3.1a of ACI 347.3R apply integrally to architecturally exposed concrete.
  - .1 For surface category CSC 1 and CSC 2, mock-ups are not required. For concrete in this category, first work performed shall be inspected and the first work judged acceptable shall be considered as reference work for evaluating subsequent work.
- .4 Before beginning forming, examine structural and architectural drawings to identify concrete elements that will be exposed (architectural concrete). Refer to architectural drawings for special requirements. Any concrete element exposed shall be considered as a CSC 1 element unless another category is explicitly defined on specifications or drawings.
- .5 Duraform type formwork shall not be used for architectural concrete.
- .6 Joints and snap ties shall be arranged in symmetrical patterns.

- .7 Procedure to repair defects:
- .1 Procedure to repair defects shall be chosen as to obtain a general impression matching the concrete surface category (CSC) required. Extra care shall be taken in the execution of corrective work. Refer to article 7.3 of ACI 347.3R in preparing repair procedures.
  - .2 The Contractor is responsible to submit repair procedures.
  - .3 Any repair required on CSC 3 or CSC 4 surface category shall at first be performed on existing mock-ups.
  - .4 Refer to Guideline No. 320.2R *Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces* by ICRI when selecting repair materials.
  - .5 Refer to Guideline No. 320.1R *Guide for Selecting Application Methods for the Repair of Concrete Surfaces* by ICRI when selecting application method for repair materials.

### **3.5 PATCHING OF FORM TIE HOLES**

- .1 Refer to article 7.9.3 from CSA A23.1 standard for patching of form tie holes.
- .2 All conical cavities left after removal of the plastic cones on the ends of snap ties shall be filled with grout. Proceed according to the instructions of the grout manufacturer. Moisten the surface beforehand. Ensure a smooth finish with the grout blending into the surrounding concrete surfaces. Allow to cure.
- .3 For exposed surfaces (architectural concrete), products used to fill the holes shall have the same texture and color as the concrete. Provide the technical datasheet of the product for approval by the Ministry Representative.

### **3.6 FIELD QUALITY CONTROL**

- .1 Surveys shall be conducted prior to concreting to measure the level of the top of the formwork. At minimum, five (5) survey points shall be taken for every span. Provide this survey to the Ministry Representative and wait for his approval before placing concrete.
- .2 Survey points shall be used as guide to control slab thickness during concreting.
- .3 During inspection of concrete reinforcement, formworks and falseworks shall be inspected as well. Formwork quality and its cleanliness shall be inspected, as well as solidity of falseworks.
- .4 Following concreting, before removing formworks or shoring, conduct a new survey of the top of the slab consisting of an equal number of survey points as the formwork's survey.

END OF SECTION



**PART 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 20 00 – Concrete Reinforcing.
- .3 Section 03 30 00 – Cast-in-Place Concrete.
- .4 Section 03 35 00 – Concrete Finishing.
- .5 Section 03 39 00 – Concrete Curing.
- .6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

**1.2 REFERENCES**

- .1 American Concrete Institute (ACI).
  - .1 ACI RAP Bulletin 1, Structural Crack Repair by Epoxy Injection, 2003.
- .2 American Society for Testing and Materials International (ASTM).
  - .1 ASTM C 39/C 39M-18, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  - .2 ASTM C 42/C 42M-18a, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
  - .3 ASTM C 496/C 496M-17, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
  - .4 ASTM C 881/C 881M-15, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
  - .5 ASTM C 920-18, Standard Specification for Elastomeric Joint Sealants;
  - .6 ASTM C 1107/C 1107M-17, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
  - .7 ASTM D 624-00(2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
  - .8 ASTM D 638-14, Standard Test Method for Tensile Properties of Plastics.
  - .9 ASTM D 1751-18, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - .10 ASTM D 1752-18, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
  - .11 ASTM D 2628-91(2016), Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
  - .12 ASTM E 1745-17, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

- .13 ASTM E 1993/E 1993M-98(2013), Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- .3 Canadian Standard Association (CSA)/CSA International.
  - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
  - .2 CSA 40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .4 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB 19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
  - .2 CAN/CGSB 51.34-M86(R1988) and CAN/CGSB 51.34-M86 AMEND, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

### 1.3 ATTACHMENTS

- .1 When attachments or anchors are required for concrete work to support vertically or laterally architectural elements, precast concrete panels, mechanical or electrical equipment, or other, manufacturer of said elements is the sole responsible for the design and calculations of attachments. The design engineer (representative of the Ministry) shall not be held liable for any part of this work.
- .2 Steel plates, angles, steel rods, bolts, studs, anchoring elements or any hardware parts in direct contact with, embedded or partially embedded into concrete shall be considered attachments.

### 1.4 ACTIONS AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit shop drawings for all steel elements embedded in concrete. When forces are induced into the concrete by embedded steel elements, provide forces and direction of forces applied to concrete works where they are embedded.
  - .1 The drawings shall bear the seal and signature of a professional engineer, certified by the Ordre des ingénieurs du Québec (OIQ).
- .3 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.

### 1.5 QUALITY CONTROL

- .1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.4. 2	Shop drawings for embedded steel elements.	Refer to terms and conditions of section 01 33 00	Transmission letter. Inscription into the shop-drawing registry.
1.4	Technical descriptions of cast-in-place concrete products and concrete components.	Refer to terms of conditions of the section 01 33 00	Transmission letter. Inscription into the shop-technical descriptions of the products.

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
3.1. 3	Certificate of compliance for anchors.	Refer to terms of conditions of the section 01 33 00	Breakpoint Certificate of compliance signed by an engineer.
3.7. 6	Method of control for sealer.	Refer to terms and conditions of section 01 33 00	Transmission letter. Inscription into the shop-drawing registry.

## 1.6 WASTE MANAGEMENT AND DISPOSAL:

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the Ministry Representative.
- .4 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the Ministry Representative.
- .5 Divert unused hazardous material from landfill to an official hazardous material collections site as approved by the Ministry Representative.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- .1 Sealing joints compound.
  - .1 Sealing joints compound shall figure on the registered products listing from the qualification and certification program of the CGSB. When a product has been certified with a primer, this primer shall be used in conjunction with the sealing compound.
  - .2 Sealing compound for dilation and control joints: polyurethane-based, chemically cured, self-levelling two- or three-component elastometric sealant, in accordance with CAN/CGSB 19.24 and ASTM C 920 (type M, grade P or NS, class 25, use T) standards.
    - .1 Approved products: THC 900 by Tremco, Sikaflex 2C SL by Sika and MasterSeal SL 2 (formerly Sonolastic SL2) by BASF.
  - .3 Sealing compound for concrete slab joints: one-component, moisture-cured, polyurethane-based, non-sag elastometric sealant in accordance with CAN/CGSB 19.24 and ASTM C 920, (type S, grade P or NS, class 25, use T) standards.
    - .1 Approved products: Sikaflex 1a by Sika, Vulkem 116 by Tremco, Eucolastic I d'Euclid and MasterSeal SL 1 (formerly Sonolastic SL 1) by BASF.
  - .4 Sealing compound for vertical joints: two- or three-component, chemically cured, polyurethane-based, elastometric sealant in accordance with CAN/CGSB 19.24 and ASTM C 920, (type M, grade NS, class 25 or 50) standards.
    - .1 Approved products: Sikaflex 2C NS EZ MIX by Sika, Dymeric 240 by Tremco, Eucolastic II d'Euclid or MasterSeal NP 2 (formerly Sonolastic NP 2) by BASF.

- .2 Premoulded joint fillers:
  - .1 Bituminous fiber board: to ASTM D 1571, bituminous impregnated fiber board, premoulded and resilient. Dimensions shall be as indicated on drawings.
    - .1 Substitute product: Deck-o-foam from W.R. Meadows.
  - .2 Sponge rubber: to ASTM D 1752, type I, flexible or firm.
  - .3 Standard cork: to ASTM D 1752, type II.
  - .4 Self-expanding cork: to ASTM D 1752, type III.
- .3 Water repellent.
  - .1 Deep penetrating, 100% silane formulation that produces a hydrophobic treatment on concrete and masonry.
  - .2 Approved products.
    - .1 Baracade silane 100C by Euclid.
    - .2 Sikagard SN100 by SIKA.
    - .3 MasterProtect H 1000 (formerly Hydrozo 100) by BASF.
- .4 Backer rod: closed-cell polyethylene foam, dimensions as required per drawings.
- .5 Steel for embedded steel elements: to CSA G40.21 grade 350W or superior.
- .6 Shrinkage compensating grout: premixed compound to ASTM C 1107/C 1107M type C, 50 MPa minimum compressive resistance after twenty-eight (28) days such as:
  - .1 SikaGrout 212 by Sika;
  - .2 Dry Pact Grout by Euclid;
  - .3 In-Pakt Construction Grout or In-Pakt Construction Grout CT by KING depending on weather conditions;
  - .4 Planigrout 755 by MAPEI.

## **PART 3 EXECUTION**

### **3.1 ANCHOR BOLTS**

- .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
- .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Ministry Representative. Spacing between anchor bolts shall be within a 1.5 mm tolerance.
- .3 Provide a certificate of compliance signed by an engineer attesting that installation of anchor rods complies to the anchoring plan and that concrete foundations reached the strength required to support the erection of steel structure, in accordance with article 3.24.12 of the Safety Code for the construction industry.

**3.2 JOINT FILLERS (BACKING FOAM/BACKER ROD)**

- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Ministry Representative.
- .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .3 Locate and form isolation, construction and expansion joints as indicated.
- .4 Use 12 mm thick joint fillers to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

**3.3 JOINTS SEALING**

- .1 Clean and dry joint surfaces. Cleaning shall be accomplished by mechanical means. All joint surfaces must be clean, sound, dry and frost-free. Joint walls must be free of oils, tar, asphalt, bitumen, grease, paints, coatings, sealers, curing compound residues, and any other foreign matter that might prevent adhesion.
- .2 Bond breaker tape, backing foam or backer rod must be used in bottom of joint to prevent bond. Leave free space of sufficient height to place a thickness of sealant in accordance with manufacturer's recommendations.
- .3 Before applying sealant, apply primary per manufacturer's recommendation. Clean surrounding areas after application.

**3.4 EMBEDDED STEEL**

- .1 Fabrication of embedded steel elements in accordance with CSA S16.
- .2 Ensure galvanic separation (galvanization, neoprene or other) between any steel and aluminium element.

**3.5 APPLICATION – SEALER FOR CONCRETE SURFACES (WATER REPELLENT)**

- .1 Apply a water repellent on all concrete surfaces that may be or are in contact with water, including concrete exposed to weather conditions.
- .2 Concrete shall be cured for twenty-eight (28) days prior to waterproofing surfaces.
- .3 Surfaces shall be clean and dry before applying water repellent. Between twenty-four (24) and seventy-two (72) hours prior to application, surfaces shall be cleaned using a high-pressure (5 000 lb.) water jet to eliminate any residue (coating, laitance, oil, dirt or other) on concrete.
- .4 Air, material and surface temperatures shall be 5 °C or higher during application. Do not apply sealer when temperature is expected to drop under 0 °C within twelve (12) hours.
- .5 Cover or protect with drop cloth nearby shrubbery, landscaping, pavement or other.

- .6 Apply sealer at a maximum rate of 4.3 m<sup>2</sup>/l. Submit method of application and method of control to the Ministry Representative. Follow manufacturer's recommendations, especially when rate of application need be reduced in presence of porous concrete.
- .7 Sealed surface shall be protected against rain and any splashing at least six (6) hours following treatment.

### **3.6 EXECUTION – CHEMICAL ANCHORING SYSTEM**

- .1 Drill hole normal to the surface, 4 mm larger than anchor rods, or more, as indicated by anchoring system manufacturer.
- .2 Borehole shall be free of dust, debris, ice, oil, grease and other contaminants. Use a hammer drill set in rotation-hammer mode for drilling. Use round steel brush and oil-free compressed-air blower for cleaning, per manufacturer's recommendation.
- .3 Prepare and apply epoxy as indicated in manufacturer technical datasheet.
- .4 Partially fill hole with epoxy before placing anchor rod. Inject epoxy to fill out the hole.
- .5 Unless otherwise indicated, anchor depth shall be fifteen (15) times the diameter of the rod.

### **3.7 EXECUTION – CORROSION INHIBITOR**

- .1 Clean rebars using dry or wet sand blast. Remove all concrete, dirt, oil, grease, rust and any other contaminants from surfaces. Use a steel brush to remove all traces of rust.
- .2 Clean concrete by waterblasting or lightly sandblasting to obtain a clean and sound surface free of dirt, dust, oil, grease, efflorescence or any contaminants.
- .3 Allow substrate to dry for twenty-four (24) to seventy-two (72) hours depending on weather conditions before applying inhibitor. Substrate shall be as dry as practical prior to application.
- .4 Using a brush, roller or low-pressure hand-spray equipment, apply the corrosion inhibitor to saturation. Follow manufacturer's recommendation for number of coats and waiting time between applications.
- .5 When applying a follow-up sealer, coating, repair mortar, or concrete or polymer overlay over a surface treated with a corrosion inhibitor, allow at least twenty-four (24) hours or more per manufacturer's recommendation after application. Clean surface by mean of pressure washing or blastcleaning to remove any residue left by the application of corrosion inhibitor.

END OF SECTION

**PART 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 15 00 – Concrete Accessories.
- .3 Section 03 30 00 – Cast-in-Place Concrete.
- .4 Section 03 35 00 – Concrete Finishing.
- .5 Section 03 39 00 – Concrete Curing.
- .6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

**1.2 REFERENCES**

- .1 American Concrete Institute (ACI).
  - .1 ACI 318-14, Building Code Requirements for Structural Concrete with Commentary.
  - .2 ACI 421.1R-08, Guide to Shear Reinforcement for Slabs.
  - .3 ACI 421.2R-10, Guide to Seismic Design of Punching Shear Reinforcement in Flat Plates.
  - .4 SP 66-04, ACI Detailing Manual 2004.
    - .1 ACI 315-99, Details and Detailing of Concrete Reinforcement.
    - .2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.
- .2 American Society for Testing and Materials International (ASTM).
  - .1 ASTM A 143/A 143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
  - .2 ASTM A 641/A 641M-09a(2014), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
  - .3 ASTM A 706/A 706M-16, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
  - .4 ASTM A 722/A 722M-18, Standard Specification for Uncoated High-Strength Steel Bars for Prestressing Concrete.
  - .5 ASTM A 767/A 767M-16, Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
  - .6 ASTM A 780/A 780M-09(2015), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - .7 ASTM A 1035/A 1035M-11, Standard Specification for Deformed and Plain, Low-carbon, Chromium, Steel Bars for Concrete Reinforcement.
  - .8 ASTM A 1044/A 1044M-16, Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete.

- .9 ASTM A 1060/A 1060M-15, Standard Specification for Zinc-Coated (Galvanized) Steel Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .10 ASTM A 1064/A 1064M-18a, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 Canadian Standard Association (CSA)/CSA International.
  - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;
  - .2 CSA A23.3-14, Design of Concrete Structures;
  - .3 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement;
  - .4 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5 CSA S413-14, Parking Structures.
  - .6 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC).
  - .1 RSIC-2018, Reinforcing Steel Manual of Standard Practice.
- .5 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB 1.181-99, Ready-Mixed, Organic, Zinc-Rich Coating.

### **1.3 ACTIONS AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315 standard.
- .3 Submit shop drawings. Indicate placing of reinforcement and:
  - .1 Bar bending details.
  - .2 Lists of reinforcing elements.
  - .3 Quantities of reinforcement.
  - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by the Ministry Representative, with identifying code marks to permit correct placement without reference to structural drawings.
  - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .4 Submit, in conjunction with shop drawings, lists of steel reinforcing elements corresponding to shop drawings.
- .5 Verify on field all dimensions and levels not defined on drawings or that may depend on field conditions.
- .6 The Ministry Representative may take up to ten (10) working days to verify and return shop drawings.

- .7 Corrections and comments made on shop drawings during the revision process do not limit the Contractor responsibility to respect requirements of drawings and specifications. Review of shop drawings is done only to ensure the general conformity in regard to design and contract requirements. Contractor shall confirm and correlate all dimensions and characteristics, choose method of fabrication and construction and execute work safely.
- .8 If revision required on shop drawings are too numerous or too important, the Ministry Representative will return drawings without annotations, awaiting a new submittal. If drawings are submitted more than two times, the Contractor shall pay, by mean of a permanent deduction, the cost of review.
- .9 Work shall not begin before shop drawings have been reviewed by the Ministry Representative.
- .10 The Contractor assumes full responsibility for the exactness of his drawings. He may not claim any extra charge for delays resulting from the discovery, be it on the field or before, of mistakes on his drawings, even if they were examined by the Ministry Representative.

#### 1.4 REBAR DETAILLING

- .1 In general, use details in accordance with *RSIC Reinforcing Steel Manual of Standard Practice*.
- .2 Unless otherwise indicated, development lengths and cover shall be in accordance with articles 7 and 12 of CAN/CSA A23.3 standard.
- .3 Detail lap lengths and bar development lengths as type B tension lap splices unless otherwise indicated. Refer to *RSIC Reinforcing Steel Manual of Standard Practice*, table 17B, for lap lengths.
- .4 Dimensions of ties, spiral reinforcing, hangers and stirrups shall be determined in accordance with minimum concrete cover from article 6.6.6 of CSA A23.1 standard.
- .5 Unless otherwise indicated, hooks required, including stirrups and ties, shall be standard hooks as defined in article 6.6.2.2 of CSA A23.1 standard.

#### 1.5 QUALITY CONTROL

- .1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.3.3	Concrete reinforcing shop drawings	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter. Inscription to the technical specification registry.
3.4.2.	Certificate of compliance for underslab fill	<i>Refer to terms and conditions of section 01 33 00</i>	Certificate of compliance for underslab fill
3.4.3.3	Certificate of compliance for formworks	<i>Refer to terms and conditions of section 01 33 00</i>	Certificate of compliance for formworks
3.4.16	Notice to the Ministry Representative for concrete reinforcing inspection	<i>Refer to terms and conditions of section 01 33 00</i>	Breakpoint. Inspection report.

**1.6 WASTE MANAGEMENT AND DISPOSAL:**

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by the the Ministry Representative.
- .4 Divert plastic materials from landfill to a recycling, reuse or composting facility as approved by the the Ministry Representative.
- .5 Divert unused hazardous material from landfill to an official hazardous material collections site.

**PART 2 PRODUCTS****2.1 LEED REQUIREMENTS**

- .1 A LEED certification is expected for this project. The LEED credits that shall be obtained pertaining to this section are listed below:
  - .1 MRc4.1 and MRc4.2: Materials and resources, recycled content.
  - .2 MRc5.1 and MRc5.2: Material and resources, regional materials.
  - .3 QEIc4.1 and QEIc4.2: Low-emitting materials.
- .2 Reinforcement steel shall contain at least 90% of recycled content in order to contribute to obtaining the MRc4.1 and MRc4.2 credits.
- .3 Reinforcement steel shall be considered regional materials in order to contribute to obtaining the MRc5.1 and MRc5.2 credits.
- .4 Products used such as the zinc-rich coating shall be considered low-emitting materials with a level of volatile organic content (VOC) within the limits required for obtaining QEIc4.1 and QEIc4.2 credits.
- .5 Submit all documents required for LEED submittals, as described in section 01 35 21 – LEED Requirements.
  - .1 Submit delivery slips, origin of materials, percentage of recycled content and total cost of reinforcement steel including delivery but excluding placement.
  - .2 Submit technical datasheets of products used, including zinc-rich coating clearly stating the VOC content.
  - .3 Submit LEED forms duly completed and corresponding datasheets.

**2.2 MATERIALS**

- .1 Substitute different size bars only if permitted in writing by the Ministry Representative.

- .2 Reinforcing steel: unless otherwise indicated, billet bars, to CSA G30.18 grade 400W, or ASTM A 706/A 706M, grade 60.
- .3 Galvanized steel bars: to ASTM A 767/A 767M, class I or II.
- .4 Galvanized carbon steel wire: to ASTM A 641/A 641M.
- .5 Galvanizing of non-prestressed reinforcement: to ASTM A767/A 767M class I or II, minimum zinc coating 610 g/m<sup>2</sup>.
  - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
  - .2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.
  - .3 Temperature of solution equals to or greater than 32 degrees and galvanized steels immersed for minimum of twenty (20) seconds.
  - .4 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
    - .1 In this case, no restriction applies to temperature of solution.
  - .5 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.
    - .1 Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .6 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .7 Adhesive: HY-200, RE-500 v3 by Hilti or equivalent, as indicated on drawings.
- .8 Zinc-rich coating:
  - .1 Use zinc-rich coating to CAN/CGSB 1.181 and ASTM A 780/A 780M containing at least 92% of metallic zinc in dried coat, brush applied.
  - .2 Approved products:
    - .1 Zinc paste 70-40 by Metaflux;
    - .2 ZRC Galvilite by Méta-Plus;
    - .3 Rust-anode by Galvatech (distributor);
    - .4 Zinga by Galvanisation Zinga (distributor).

## 2.3 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA A23.1, ACI 315 standards and RSIC Reinforcing Steel Manual of Standard Practice.
- .2 Fabrication tolerances shall be in accordance with RSIC manual chapter 6 or the following paragraphs, as determined by the more stringent requirement. Bars fabricated without conforming to those tolerances will be rejected.
- .3 Tolerance for cutting rebar.
  - .1 10M and 15M rebar:

- .1 Less than 4.0 meters long:  $\pm 12$  mm;
- .2 4.0 meters or more:  $\pm 25$  mm.
- .2 20M to 35M rebar:  $\pm 25$  mm.
- .3 45M and 55M:  $\pm 25$  mm.
- .4 Tolerance for bent rebars.
  - .1 10M to 35M rebar:
    - .1 Overall length:  $\pm 25$  mm;
    - .2 Overall height:  $\pm 12$  mm;
    - .3 Hook diameter:  $\pm 12$  mm.
  - .2 Ties and stirrups:
    - .1 Overall width and length:  $\pm 12$  mm.
- .5 Obtain the Ministry Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .6 Ship bundles of bar reinforcement clearly identified in accordance with bar bending details and lists.
- .7 Galvanized bars shall be bent after galvanizing.
  - .1 After the bar is bent, minor peeling of coating is considered acceptable. A value of surface peeling up to the bar nominal section area is considered acceptable. For surface peeling higher than the nominal section area, bar will be rejected and need to be replaced.
- .8 All reinforcing steel shall be bent to be parallel to the edge of concrete works, as indicated on drawings. Bending shall be done in shop, as indicated on shop drawings.

## **2.4 SOURCE QUALITY CONTROL**

- .1 Upon request, provide the Ministry Representative with certified copy of mill test report of reinforcing steel, minimum two (2) weeks prior to beginning reinforcing work. Test reports shall indicate physical and chemical properties of steel.
- .2 Upon request, submit in writing to the Ministry Representative, proposed source of reinforcement material to be supplied.
- .3 Identify bundles of bar reinforcement and wire mesh, in accordance with shop drawings, bar bending details and lists before shipping.
- .4 All rebars shall be identified during fabrication. Identification shall include diameter, grade and fabricator. Rebar not properly identified will not be allowed on site.

## **2.5 STORAGE**

- .1 Store materials off ground over wood studs or indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area to prevent rusting.

- .2 Protect reinforcing steel if stored over a long period.
- .3 Replace defective or damaged materials with new.

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

- .1 Galvanizing to include chromate treatment.
  - .1 Duration of treatment: 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A 143/A 143M.

#### **3.2 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except for a written approval by the Ministry Representative.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars which develop cracks or splits.
- .4 Unless otherwise indicated, field weld reinforcement is prohibited. When authorized, weld specially identified rebars.

#### **3.3 CONNECTION TO EXISTING WORK**

- .1 When connecting to existing work, prior to preparing shop drawings, verify dimensions and condition of existing work, report discrepancies and potential problem areas to the Ministry Representative for direction before commencing fabrication. Dimensions of steel elements shall be modified to adapt for the existing conditions and modifications shall be submitted to the Ministry Representative for approval.
- .2 For reinforcement anchored to an existing reinforced concrete or masonry element, use the following procedure, under the sole responsibility of the specialized contractor:
  - .1 Detect existing reinforcement bars prior to drilling to locate anchors;
  - .2 Use manual percussion drilling to drill anchor loads and protect existing reinforcement.
- .3 For reinforcement anchored to an existing unreinforced masonry element, use diamond drilling to drill anchors as to protect the existing work. The contractor may use a different mean of drilling only if he is able to demonstrate that no damage will occur to the existing work due to drilling. If the contractor uses an alternative mean of drilling, any damage occurring to the existing work following drilling shall be automatically considered his responsibility.
- .4 Where new concrete is placed in contact with existing concrete or masonry works, follow the directions below, unless otherwise indicated:
  - .1 Drill holes with a minimum depth of 150 mm up to a maximum of two thirds of the depth of the existing work;

- .2 Place holes at the centre of the existing element, at 300 mm centre-to-centre maximum;
- .3 Place 20M reinforcing bars used as dowels in holes and pack solidly with adhesive and hold dowels in positions until the adhesive as set.
- .4 Unless otherwise indicated, use chemical adhesive in accordance with article 2.2.17.

### 3.4 PLACING REINFORCEMENT

- .1 Clean reinforcing steel before placement. Steel shall be free from mud, oil, or other coatings that adversely affect bond strength. Bar surface shall be in accordance to CSA A23.1 article 6.1.6.
- .2 Prior to placing concrete reinforcement for slabs on grade, Contractor shall demonstrate to the the Ministry Representative the compliance of underslab fill.
- .3 Prior to placing concrete reinforcement in general, Contractor shall demonstrate to the the Ministry Representative the compliance of formworks (see section 03 11 00).
- .4 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1. Refer to article 6.6.7 of this standard for placement and number of supports.
- .5 Attach reinforcing steel solidly to supports to prevent any movement during concreting.
- .6 Support bars are not included on drawings. Use 15M reinforcing bar spaced at 1 000 mm on center to support top reinforcing steel.
- .7 When concrete will never be exposed to weather conditions, use chairs and hangers with nylon- or plastic-covered extremities.
- .8 When concrete will be exposed to weather conditions or sandblasted, use chairs and hangers with nylon- -covered extremities or fabricated with stainless steel.
- .9 For slab-on-grade and footings, reinforcing steel is placed on chairs, supports and/or cement brick, spaced on center 1 000 mm maximum.
- .10 Rocks, piece of rocks, woods or pipes shall not be used to support reinforcing steel.
- .11 Lifting the reinforcing steel with a hook at the time of concreting is prohibited.
- .12 Install dowels and anchors for walls and columns with template before concreting. Spacing of anchors shall be within 1.5 mm of dimensions indicated on drawings.
- .13 At least forty-eight (48) hours prior to placing concrete, obtain the Ministry Representative approval of reinforcing material and placement.
- .14 Ensure cover to reinforcement is maintained during concrete pour.
- .15 During concreting, a worker shall be assigned to replacing reinforcing steel that may have been displaced during the operation.

.16 Drill holes into concrete, place adhesive and anchor steel into existing concrete per manufacturer's recommendations.

.17 Protect reinforcement coating during concreting.

### 3.5 CONCRETE COVER

.1 Unless otherwise indicated, cover thickness for reinforcement in concrete, shall be:

Exposure condition	Exposure class		
	Not exposed	Exposed to freezing thawing	Exposed to chlorides
Cast against and permanently exposed to earth, including footings and piles	75	75	75
Beams, girders and columns	30	40	60
Slabs, walls and joists	25	40	60
Ratio of cover to nominal bar diameter	1.0	1.5	2.0
Ratio of cover to nominal maximum aggregate size	1.0	1.5	2.0

« Not exposed » concrete refers only to concrete that will be continually dry within the conditioned space (i.e., members entirely within the vapour barrier of the building envelope).

Criteria for exposure class « Parking structures » are based on type M protection system in severe exposure class as defined in table 1 of CSA S413.

### 3.6 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

.1 For galvanized steel, use zinc-rich coating to article 2.2.15.

### 3.7 WELDING

.1 Unless written approval, do not weld reinforcement.

.2 When welded splice are specified and location has been approved by the the Ministry Representative, weld reinforcement in accordance with CSA W186 and article 6.6.10 of CSA A23.1 standard. Weldable (W) grade reinforcement shall be used.

.3 Welding shall be done by contractor certified by the Canadian Welding Bureau.

**3.8 INSULATION IN WALLS**

- .1 The Contractor shall take into account that insulation will be placed within foundation wall formworks when placing concrete reinforcing.
- .2 Placement of insulation within formworks shall be done by the formwork contractor, in collaboration with the reinforcement contractor.

END OF SECTION

**PART 1      GENERALS****1.1          RELATED REQUIREMENTS**

- .1      Section 03 11 00 – Concrete Forming.
- .2      Section 03 15 00 – Concrete Accessories.
- .3      Section 03 20 00 – Concrete Reinforcing.
- .4      Section 03 35 00 – Concrete Finishing.
- .5      Section 03 39 00 – Concrete Curing.
- .6      The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

**1.2          REFERENCES**

- .1      American Concrete Institute (ACI).
  - .1      ACI 302.1R-15, Guide for Concrete Floor Slab Construction.
  - .2      ACI 305R-10, Hot Weather Concreting.
  - .3      ACI 306R-16, Recommended Practice for Cold Weather Concreting.
  - .4      ACI 309R-05, Guide for Consolidation of Concrete.
- .2      American Society for Testing and Materials International (ASTM).
  - .1      ASTM A 820/A 820M-11, Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.
  - .2      ASTM C 31/C 31M-19, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
  - .3      ASTM C 33/C 33M-18, Standard Specification for Concrete Aggregates.
  - .4      ASTM C 39/C 39M-18, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  - .5      ASTM C 42/C 42M-18a, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
  - .6      ASTM C 88-18, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
  - .7      ASTM C 109/C 109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
  - .8      ASTM C 143/C 143M-15a, Standard Test Method for Slump of Hydraulic-Cement Concrete.
  - .9      ASTM C 260/C 260M-10a (2016), Standard Specification for Air-Entraining Admixtures for Concrete.
  - .10     ASTM C 330/C 330M-17a, Standard Specification for Lightweight Aggregates for Structural Concrete.

- .11 ASTM C 457/C 457M-16, Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
  - .12 ASTM C 494/C 494M-17, Standard Specification for Chemical Admixtures for Concrete.
  - .13 ASTM C 535-16, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .14 ASTM C 618-19, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
  - .15 ASTM C 873/C 873M-15, Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds.
  - .16 ASTM C 989/C 989M-13, Standard Specification for Slag Cement for Use in Concrete and Mortars.
  - .17 ASTM C 1017/C 1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - .18 ASTM C 1116/C 1116M-10a(2015), Standard Specification for Fiber-Reinforced Concrete.
  - .19 ASTM C 1157/C 1157M-17, Standard Performance Specification for Hydraulic Cement.
  - .20 ASTM C 1202-19, Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration.
  - .21 ASTM C 1240-12, Standard Specification for Silica Fume Used in Cementitious Mixtures.
  - .22 ASTM C 1609/C 1609M-12M, Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading).
  - .23 ASTM C 1611/C 1611M-18, Standard Test Method for Slump Flow of Self-Consolidating Concrete.
- .3 Canadian Standard Association (CSA)/CSA International.
- .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A23.3-14, Design of Concrete Structures.
  - .3 CSA A283-06(R2011), Qualification Code for Concrete Testing Laboratories.
  - .4 CSA A3000-18, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA A3001-18, Cementitious materials for use in concrete.
- .4 Bureau de normalisation du Québec (BNQ).
- .1 NQ 2560-600 (2003), Granulats - Matériaux recyclés fabriqués à partir de résidus de béton, d'enrobés bitumineux et de briques - Classification et caractéristiques.
  - .2 NQ 2621-900 (2005), Bétons de masse volumique normale et constituants.
  - .3 BNQ 2621-905 (2012), Béton prêt à l'emploi - Programme de certification.
- .5 Ministère des Transports du Québec (MTQ).
- .1 Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation, édition 2019 (CCDG 2019).
  - .2 Norme 3301, Bétons de masse volumique normale.
- .6 International Concrete Repair Institute (ICRI).
- .1 Guideline No. 310.1R-2008, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion.
  - .2 Guideline No. 320.1R-1996, Guide for Selecting Application Methods for the Repair of Concrete Surfaces.

- .3 Guideline No. 320.2R-2009, Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces.

### **1.3 DESIGN CRITERIA**

- .1 Alternative 1 - Performance: according to CSA A23.1, and as described in MIXES of PART 2 - PRODUCTS.

### **1.4 ACTIONS AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.
- .3 Minimum four (4) weeks prior to starting concrete work, submit to the Ministry Representative test reports and certificate from testing laboratory certifying that the following materials meet the requirements of this section:
  - .1 Portland cement,
  - .2 Blended hydraulic cement,
  - .3 Supplementary cementing material,
  - .4 Admixtures,
  - .5 Aggregates,
  - .6 Water.
- .4 Provide the Ministry Representative, at minimum fourteen (14) days prior to starting concrete work, with valid and recognized certificate from plant delivering concrete. Certificate shall indicate that plant, materials and methods used in fabricating concrete are in accordance with CSA A23.1 standard.
  - .1 Concrete provider shall be certified by the BNQ in accordance with requirements of BNQ 2621-905 qualification pamphlet.
  - .2 If plant does not have a valid certificate, submit test data and certificate from independent testing laboratory certifying that concrete mix materials meet the requirements of this section.
- .5 Minimum fourteen (14) days prior to starting concrete work, provide proposed quality control procedures for review by the Ministry Representative on following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.
- .6 Minimum fourteen (14) days prior to starting concrete work, provide the Ministry Representative with concrete mix formulas including admixtures for this project. Concrete formulas shall be submitted to testing laboratory for approval prior to beginning work.

- .1 Include analysis results certifying that aggregates used are non-reactive. Provider shall demonstrate that aggregates contain non-significant quantities of pyrrhotite or other harmful minerals.
- .7 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet the specified resistance.
- .8 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.

## 1.5 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with section 01 45 00 - Quality Control.
- .2 Pre-installation Meetings: in accordance with section 01 32 16.07 - Work scheduling - Bar (GANTT) Chart.
  - .1 Ensure key personnel, site supervisor, the Ministry representative, speciality contractor - finishing, forming, concrete producer and testing laboratories attend.
  - .2 Verify project requirements.
- .3 Realize the following activities and submit required documents:

Art.	Prescriptions	Period (Frequency)	Registry
1.4.3 and 2.2	Technical descriptions of products and components of cast-in place concrete.	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter. Inscription into the technical specification registry.
1.4.6	Concrete mix formulas.	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter. Inscription into the technical specification registry.
1.4.5 and 3.4.1	Procedure for hot-weather concreting.	<i>Refer to terms and conditions of section 01 33 00</i>	Procedure for hot-weather concreting
1.4.5 and 3.6.1	Procedure for cold-weather concreting	<i>Refer to terms and conditions of section 01 33 00</i>	Procedure for cold-weather concreting
3.1.2, section 03 20 00	Notice to the Ministry Representative for concrete reinforcing inspection.	<i>Refer to terms and conditions of section 01 33 00</i>	Breakpoint Inspection report
3.1.12	Concrete pour registry	<i>Refer to terms and conditions of section 01 33 00</i>	Concrete pour registry. Delivery slip.
3.12	Concrete and concrete ingredients tests.	<i>Refer to terms and conditions of section 01 33 00</i>	Test reports.
3.3.1.1	Inspection of concrete reinforcement.	<i>Refer to terms and conditions of section 01 33 00</i>	Inspection report

## 1.6 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: deliver to site of work and discharged within one hundred and twenty (120) minutes maximum after batching.
  - .1 Do not modify maximum time limit without receipt of prior written agreement from the Ministry Representative and concrete producer as described in CSA A23.1.

- .2 Deliver concrete using means to prevent separation of concrete mix component or any alteration to consistency.
- .3 Waste management and disposal:
  - .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 19 - Management and disposal of construction / demolition waste.
  - .2 Divert unused concrete and concrete materials to local quarry after receipt of written approval from the Ministry Representative.
  - .3 Provide on-site adequate space for the safe washing of concrete trucks.
  - .4 Divert unused admixtures from landfill to an official hazardous material collections site.
  - .5 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  - .6 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Portland Cement: to CSA A3001 or ASTM C 1157, type GU, unless otherwise indicated.
- .2 Blended hydraulic cement: to CSA A3001 or ASTM C 1157, type GUB-SF, unless otherwise indicated.
- .3 Supplementary cementing materials: to CSA A3001.
  - .1 Fly ash and natural pozzolan: to ASTM C 618.
  - .2 Ground granulated blast-furnace slag: to ASTM C 989/C 989M.
  - .3 Silica fume: to ASTM C 1240.
- .4 Water: to CSA A23.1, article 4.2.2.
- .5 Non-reactive to alkalis aggregates: to CSA A23.1, article 4.2.3 and ASTM C 33/C 33M, normal weight coarse aggregate.
  - .1 The particles must be clean, durable, without dust or deleterious materials, containing less than 25% of flat particles and less than 45% elongated particles, as determined by testing according to CSA A23.2-13A.
  - .2 Loss by abrasion (to ASTM C 535, CSA A23.2-16A) shall be less than 50%. Loss shall be less than 12% after five (5) cycles of testing soundness by use of sodium sulfate or magnesium sulfate (ASTM C 88, CSA A23.2-9A).
  - .3 Aggregates should not be made of fine-grained limestone and crystalline limestone.
  - .4 The use of potentially reactive aggregates will be permitted only if compensatory measures as defined in CSA A23.2-27A are used. The use of a mixture containing potentially reactive aggregates is subject to the written approval of the Ministry Representative, under favorable opinion of the laboratory responsible for the quality control of materials.

- .6 Fine aggregates (sand): to CSA A23.1, article 4.2.3 and ASTM C 33/C 33M, normal weight.
- .7 Lightweight aggregates: to ASTM C 330/C 330M.
- .8 Recycled aggregates: to NQ 2560-600.
- .9 Admixtures:
  - .1 Air entraining admixture: to ASTM C 260.
  - .2 Chemical admixture: to ASTM C 494/C 494M or ASTM C 1017/C 1017M when added to flowing concrete. The Ministry Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
  - .3 Anti-washout admixture: Eucon AWA by Euclid, MasterMatrix UW450 by BASF or Sika Stabilizer Aquagel by Sika.
- .10 Evaporation retardant: such as MasterKure ER 50 (formerly Confilm) by BASF, Eucobar by Euclid or Evapre by W.R. Meadows.

## 2.2 MIXES

- .1 Provide concrete to meet content and performance requirements defined by the Ministry Representative in accordance with CSA A23.1 on following articles. Refer to table 1 and table 2 of CSA A23.1 for requirements related to class of exposure.
- .2 Ensure that concrete supplier meet component and performance requirements identified hereafter and control compliance as indicated in article FIELD QUALITY CONTROL or PART 3.
- .3 Concrete mix used for **footings, foundation walls and concrete for supports**, shall meet the following requirements:
  - .1 Cement: Portland cement type GU (10);
  - .2 Nominal size of coarse aggregate: 20 mm;
  - .3 Slump at discharge:  $80 \pm 30$  mm;
  - .4 Air content: 4 to 7 %;
  - .5 Class of exposure: F-2;
  - .6 Minimum compressive strength: 30 MPa at twenty-eight (28) days.
- .4 Concrete mix used for columns (ground floor to roof), shear walls and structural slabs (interior) shall meet the following requirements:
  - .1 Cement: Portland cement type GU (10);
  - .2 Nominal size of coarse aggregate: 20 mm;
  - .3 Slump at discharge:  $80 \pm 30$  mm;
  - .4 Air content: 0 to 3 %;
  - .5 Class of exposure: N;
  - .6 Minimum compressive strength: 35 MPa at twenty-eight (28) days.
- .5 The concrete mix used for the concrete in the construction of **slabs on interior floors and cleanliness bases** must comply with the following requirements:
  - .1 Cement: Portland cement type GU (10);
  - .2 Maximum nominal size of coarse aggregate: 20 mm;
  - .3 Subsidence at the time and at the point of discharge:  $80 \pm 30$  mm;

- .4 Air content: 0 to 3 %;
  - .5 Exposure class: N-CF;
  - .6 Minimum compressive strength: 30 MPa at twenty-eight (28) days.
- .6 The concrete mix used for concrete in the construction of unreinforced exterior concrete works, **including sidewalks, exterior slabs, garage floors, steps, pavement, curbs, gutters, protection posts and fence pilasters** must be compliant to the following requirements:
- .1 Cement: Portland cement type GUB-SF (10-SF);
  - .2 Nominal size of coarse aggregate: 20 mm;
  - .3 Slump at discharge:  $80 \pm 30$  mm, except for curbs where slump shall be  $30 \pm 20$  mm;
  - .4 Air content: 5 to 8 %;
  - .5 Class of exposure: C-2 – for reinforced elements use C-1 class;
  - .6 Minimum compressive strength: 35 MPa at twenty-eight (28) days.
- .7 Concrete mix used for **lean concrete** shall meet the following requirements:
- .1 Cement: Portland cement type GU (10);
  - .2 Nominal size of coarse aggregate: 20 mm;
  - .3 Slump at discharge:  $80 \pm 30$  mm;
  - .4 Air content: 5 to 8 %;
  - .5 Class of exposure: N;
  - .6 Minimum compressive strength: 15 MPa at twenty-eight (28) days.
- .8 Concrete mix used for **duct banks** shall meet the following requirements:
- .1 Cement: Portland cement type GU (10);
  - .2 Nominal size of coarse aggregate: 10 mm;
  - .3 Slump at discharge:  $150 \pm 30$  mm;
  - .4 Air content: 5 to 8 %;
  - .5 Water to cementitious material ratio: 0.6 max;
  - .6 Nominal cement content: 250 kg/m<sup>3</sup>;
  - .7 Minimum compressive strength: 20 MPa at twenty-eight (28) days.
- .9 Pilasters included within foundation walls shall be built with the same concrete as the foundation walls. Stand-alone pilasters or independent columns within ground shall be built using the same concrete mix as columns.
- .10 Concrete supplier and Contractor shall ensure that all concrete meet the following requirements:
- .1 Unless otherwise indicated, aggregates shall be of normal weight.
  - .2 For all parts of work, concrete mix shall be homogeneous and when cured, have the strength, resistance to deterioration, durability, appearance and other properties required by this specification.
  - .3 Mix design shall ensure durability, strength, workability and other properties required for concrete.
  - .4 Mix shall ensure that concrete flows everywhere into formworks, wrap up reinforcing bars completely but without allowing segregation of materials or excessive bleeding
  - .5 Concrete shall be free from surface blemishes, loss of mortar or color variations.

- .11 For floors with a trowel finish, Concrete Provider and Contractor shall ensure that concrete mix is appropriate to obtain the level of quality desired for the slab finish.
  - .1 Use a concrete mix having a minimum compressive strength of 25 MPa and a maximum water-to-cementitious ratio of 0.55, as specified for class N-CF concrete.
  - .2 For slab poured directly on a vapour retarding membrane, use a maximum water-to-cementitious ratio of 0.45 or less. If using a mix with a ratio higher than 0.45, the Contractor shall allow for a longer drying period for the slab to obtain the relative humidity appropriate to place floor covering.
  - .3 To ensure proper placement and finishing, consider using superplasticizer. Initial concrete slump should be near 60 mm and final slump should reach near 130 mm following addition of superplasticizer.
- .12 For slabs on ground screeded by machine, 40 mm blended coarse aggregates may be used.
- .13 When concrete thickness is less than 200 mm, maximum size of coarse aggregate shall be 14 mm.
- .14 Nominal size of coarse aggregate indicated for mixes should be considered a maximum rather than an absolute. The Contractor may, at his discretion, use smaller aggregates to facilitate concrete placement or for any other consideration, if it results in concrete with equal properties.

### 2.3 SPECIAL REQUIREMENTS

- .1 Use of admixtures.
  - .1 Provide samples of admixtures on the Ministry Representative's request.
  - .2 Follow manufacturer's recommendations for admixtures use.
  - .3 Ensure compatibility of admixtures, between them and with all components of concrete mix.
  - .4 Use of admixture shall never affect adversely concrete durability including resistance under freeze-thaw cycles.
- .2 Internal vibrators shall be used for consolidating concrete.
- .3 Do not modify concrete mix formulas without the Ministry Representative approval. If source of supply for concrete materials is modified, new concrete mix formulas need be approved by the Ministry Representative.
- .4 No water shall be added into concrete mix during transport or after arrival on jobsite

### 2.4 METHODS OF TEST FOR CONCRETE

- .1 Reference values indicated in this section shall be obtained from tests in accordance with standards indicated in the following table:

Tests	Standard
Air content	ASTM C 457/C 457M, CSA A23.2-4C
Compressive strength of 50 mm cube	ASTM C 109/C 109M

Tests	Standard
Air content specimens	ASTM C 457/C 457M, CSA A23.2-4C
Compressive strength of concrete cylinders	ASTM C 873/C 873M, CSA A23.2-9C
Degradation of coarse aggregates	ASTM C 535, CSA A23.2-16A
Degradation of fine aggregates	ASTM C 88, CSA A23.2-9A
Flat and elongated particles in coarse aggregate	CSA A23.2-13A
Ion chloride permeability	ASTM C 1202
Obtaining and curing concrete test specimens	CSA A23.2-3C
Obtaining and testing drilled cores of concrete (compressive resistance)	ASTM C 42/C 42M, ASTM C 39/C 39M, CSA A23.2-14A
Obtaining concrete test specimens	ASTM C 31/C 31M, CSA A23.2-1C
Slump	ASTM C 143/C 143M, CSA A23.2-5C
Slump-flow (self-consolidating concrete)	ASTM C 1611/C 1611M, CSA A23.2-5C

## PART 3 EXECUTION

### 3.1 PREPARATION

- .1 Place formworks in accordance with section 03 11 00 – Concrete Forming. Place embedded elements and concrete reinforcing in accordance with sections 03 15 00 – Concrete Accessories and 03 20 00 - Concrete Reinforcing.
- .2 Obtain the Ministry Representative's approval before placing concrete.
  - .1 Provide forty-eight (48) hours minimum notice prior to placing of concrete.
- .3 During concreting operations:
  - .1 Development of cold joints is not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
  - .3 Placing of concrete shall be done in accordance with article 7.4 of CSA A23.1 standard.
- .4 Pumping of concrete is permitted only after approval of equipment and mix, conditional to execution in accordance with testing laboratory recommendations.

- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing concrete, formworks shall be cleaned and free of water.
- .7 Prior to placing of concrete, obtain the Ministry Representative's approval of proposed method for protection of concrete during placing and curing.
- .8 Approval is given before concreting, conditional to:
  - .1 Previous approval of formworks and concrete reinforcing after inspection by the Ministry Representative.
  - .2 Favorable climatic conditions, namely an external temperature between 5 and 25°C and the absence of rain or snow, unless the Ministry Representative has approved arrangements (shelter, heating, etc.) previously.
- .9 Protect previous work from staining.
- .10 Take special precautions where concrete will be exposed to prevent any damage.
- .11 Clean and remove stains prior to application for concrete finishes.
- .12 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken. Submit concrete works registry at the end of each phase of work.
- .13 Where new concrete is placed in contact with existing concrete or masonry works, follow the directions below, unless otherwise indicated:
  - .1 Drill holes with a minimum depth of 150 mm up to a maximum of two thirds of the depth of the existing work;
  - .2 Place holes at the centre of the existing element, at 300 mm centre-to-centre maximum;
  - .3 Place 20M reinforcing bars used as dowels in holes and pack solidly with adhesive and hold dowels in positions until the adhesive is set.
  - .4 Unless otherwise indicated, use chemical adhesive in accordance with section 03 20 00.
- .14 Do not load new concrete until authorized by the Ministry Representative.

### **3.2 PRODUCTION OF CONCRETE**

- .1 Provide ready-mixed concrete, fabricated in concrete plant, delivered and offloaded to site in accordance with section 5.2 of CSA A23.1 standard. Alternatively, provide concrete fabricated on site in accordance to the same section. When concrete is fabricated on site, submit methods and equipment for approval by the Ministry Representative.
- .2 Producer of ready-mixed concrete is the sole responsible for formulation of concrete. Producer shall take all steps required to ensure production of high quality, uniform concrete.

- .3 Request from concrete provider delivery slip for each delivery of concrete and hand over one copy to the Ministry Representative. Delivery slip shall include: name and address of the batch plant, truck number, name of Contractor, designation of the job (name and location), class or designation of the concrete, amount of concrete delivered and cumulative amount, time of loading, of beginning of unloading and of end of unloading, maximum size of coarse aggregate, slump and air content required, admixtures used, amount and type of cement and water quantity.
- .4 **Adding water after initial batching at concrete plant is prohibited**, notwithstanding any indications given in article 5.2.5.3.2 of CSA A23.1 standard. Use water-reducing admixture to ASTM C 494, type F or G, to correct concrete's slump.
- .5 Plan fabrication of concrete and spread deliveries to site to ensure that pouring is continuous.
- .6 Never again batch concrete or mortar after beginning of hardening.
- .7 Concrete temperature at discharge shall be within limits of table 14 of CSA A23.1, tested to article 5.2.5.4 of the same standard. Use protective measures whenever necessary.

### 3.3 INSTALLATION / APPLICATION

- .1 Prior to concreting, the Contractor shall demonstrate to the satisfaction of the Ministry Representative the conformity of the following work. Ensure that the Ministry Representative has released the following breakpoints before starting any subsequent activity
  - .1 Concrete reinforcement work (see section 03 20 00);
  - .2 Anchors, sleeves and embedded elements work (see section 03 11 00 article 3.2);
  - .3 Joint fillers work (see section 03 15 00 article 3.2).
- .2 Prior to concreting, ensure that the following procedures and / or methods have been submitted and approved by the Ministry Representative:
  - .1 Methods for cold-weather concreting (see article 3.6.1);
  - .2 Methods for hot-weather concreting (see article 3.4.1).
- .3 Execute cast-in-place concrete work in accordance with CSA A23.1.
- .4 Saturate with water hardened concrete surfaces where new concrete will be placed.
- .5 Bond fresh concrete to rock or hardened concrete in accordance with CSA A23.1 article 7.8.5.
- .6 Concrete shall look good, be free from honeycomb, cold joints, burrs or other defects.
- .7 Wherever concrete will be exposed, take special precautions in placing concrete and in using good quality brand-new formworks.
- .8 Ensure no shocks or impacts occur on formworks and on freshly poured concrete.
- .9 Deposit concrete in horizontal layers, 500 mm thick maximum, as near as possible to its final position.

- .10 The Contractor is the sole responsible for choosing free-drop height of concrete as to obtain a high-quality work. In general, free-drop shall not exceed 1.5 m to prevent segregation. Use chutes, slides and/or trunks whenever necessary.
- .11 For placing concrete for any concrete element, specifically columns, shear walls and any element with significant reinforcing quantity, use superplasticizer admixture to facilitate placing.
- .12 Internal vibrators shall be used for consolidating concrete. Vibrators shall be applied at such spacing intervals as to compact all concrete properly. Do not vibrate excessively as to prevent segregation. Do not use vibration to force concrete horizontally in place. Follow requirements of CSA A23.1 article 7.4.4.2 and ACI 309R for consolidating concrete.
- .13 Do not place concrete in water unless special authorization is given. Follow the Ministry Representative and testing laboratory instructions strictly. If a special authorization is given for placing concrete in water, use an anti-washout admixture.
- .14 Under adverse weather or if equipment failure occurs, take measures to prevent deterioration of freshly poured concrete. When discontinuing work, prepare construction joints and protect fresh concrete with membranes.
- .15 If Contractor does not use shores, the Ministry Representative may request that the Contractor demonstrates, by mean of a letter signed by an engineer member of the Ordre des ingénieurs du Québec (OIQ), that shores are not required for that part of works.
- .16 When placing concrete for slabs, follow the requirements of ACI 302.1R standard.
- .17 Place grout under machinery bases and pedestals, per manufacturer's recommendations, to obtain a bearing surface of 100% of the area covered by grout.

### **3.4 HOT-WEATHER CONCRETING**

- .1 Hot-weather concreting shall be done in accordance to CSA A23.1, article 7.1.1 and ACI 305R. Submit, for approval by the Ministry Representative, hot-weather concreting procedure prior to beginning works.
- .2 The Contractor shall protect in-place concrete against the effects of heat and dry weather. During very hot periods, the Contractor must protect formworks, reinforcement and concreting equipment against the direct rays of the sun or cool them by spraying water.
- .3 When outside temperature is 25°C or more, or when the Ministry Representative judges that the temperature may rise to 25°C or more during concreting, use special precautions to maintain concrete temperature as low as practicable, and never higher than 30°C when minimum dimension of concrete element is smaller than 1 m, 25°C when this dimension is between 1 and 2 m and 20°C for elements larger than 2 m.
- .4 Costs for hot-weather concreting are included in concrete pricing.

### 3.5 PROTECTION AGAINST DRYING

- .1 During placement of concrete, Contractor shall estimate the rate of superficial moisture evaporation using figure D.1 of CSA A23.1 standard. When the rate is higher than  $0.50 \text{ kg}/(\text{m}^2 \cdot \text{h})$ , the Contractor shall use the supplementary measures defined by article 7.1.1 of CSA A23.1, such as:
  - .1 Wet support before placing concrete.
  - .2 Lower concrete temperature.
  - .3 Cover concrete surface prior to and between different steps when finishing concrete.
  - .4 Vaporize water (use fogging) continuously after concrete placement, taking care that ponding does not occur.
  - .5 Start curing immediately after final finishing; or
  - .6 Place and finish concrete by night or early in the morning.
- .2 In addition to measures defined in article 3.5.1, the Contractor may use an evaporation retardant to article 2.1.14 as a supplementary measure. The evaporation retardant shall be used immediately after concrete placement, following the manufacturer's recommendations. Depending on climatic conditions, many successive applications may be required.
- .3 The Ministry Representative or the representative from the testing laboratory may require the use of the supplementary measures listed above if the Contractor is not able to demonstrate that the rate of superficial moisture evaporation is lower than  $0.50 \text{ kg}/(\text{m}^2 \cdot \text{h})$ .

### 3.6 COLD-WEATHER CONCRETING

- .1 Cold-weather concreting shall be done in accordance with CSA A23.1, article 7.1.2 and ACI 306R. Submit, for approval by the Ministry Representative, cold-weather concreting procedure prior to beginning works.
- .2 Before placing concrete under cold-weather conditions, all equipment needed to protect concrete shall be available on site of works.
- .3 Obtain approval from the Ministry Representative before pouring concrete when exterior temperature is below  $5^{\circ}\text{C}$ .
- .4 When outside temperature is  $5^{\circ}\text{C}$  or below, or when the Ministry Representative judges that temperature may fall below  $5^{\circ}\text{C}$  during concreting, ensure that concrete temperature remains above  $16^{\circ}\text{C}$ , and never higher than  $32^{\circ}\text{C}$ . Heat water and aggregates if necessary before mixing.
- .5 When concreting is not done under heated enclosures, the Ministry Representative may stop concreting if temperature drops to  $-10^{\circ}\text{C}$  or below or if winds or snow affects adversely concreting.
- .6 Before concreting, inner walls, reinforcing bars and bottom of formworks shall be cleaned free of snow or ice. Heat formwork and reinforcing bars if necessary. No concrete shall be poured where surfaces or reinforcing bars temperature is below  $5^{\circ}\text{C}$ .
- .7 After concreting, maintain surface temperature of concrete at  $21^{\circ}\text{C}$  for a minimum of three (3) days or  $10^{\circ}\text{C}$  for a minimum of seven (7) days. Concrete temperature shall remain over freezing point for a minimum of seven (7) days and concrete shall not be exposed under freeze-thaw cycles for a minimum of fourteen (14) days.

- .8 Use of calcium chloride, other de-icing salts or chemical products as substitute to proper curing and protection methods is prohibited.
- .9 After protection, concrete temperature shall be lowered progressively, up to a maximum of 6°C per day, until concrete reaches the outside temperature.
- .10 If heated enclosures are used, the Contractor shall, if necessary, moisten air to maintain concrete and formwork moist. Stationary heaters can be used as long as concrete surfaces will not be exposed to heating gases resulting from combustion.
- .11 Costs for cold-weather concreting are included in concrete pricing.

### **3.7 CONSTRUCTION JOINTS**

- .1 Refer to CSA A23.1, article 7.2 for construction joints.
- .2 When concrete works are of a volume or complexity such that placing cannot be done in one operation, the Contractor shall, with approval of the Ministry Representative, add construction joints even where there is no indication on drawings. Costs for materials and handiwork required to execute construction joints shall be assumed by the Contractor.
- .3 The Contractor shall submit a drawing with location and details for construction joints to the Ministry Representative, whom may take up to two (2) weeks before approving it.
- .4 Irregular construction joints are prohibited.
- .5 Concrete reinforcement shall be continuous through the construction joints.
- .6 Construction joints indicated on drawings are mandatory and shall not be moved.
- .7 Before placing new concrete, Contractor shall prepare joint in accordance with the following requirements:
  - .1 Tighten formworks at joint.
  - .2 Clean thoroughly hardened concrete to obtain a surface free of foreign matter, laitance, damaged concrete, etc.
  - .3 Saturate surface with water.
  - .4 Cover hardened concrete with a mortar of same composition than mortar used for concrete and add a bonding agent following the manufacturer's recommendations.

### **3.8 CONCRETING OVER EXISTING CONCRETE WORKS**

- .1 Pour concrete shown on drawings in accordance with CSA A23.1, article 7.4.
- .2 Clean thoroughly concrete used as substrate to obtain a surface free of foreign matter, dusts, damaged concrete, etc.
- .3 When needed, clean existing reinforcing bar by grinding or any other means except sandblasting or waterblasting. When loss of steel exceeds 25% of reinforcing bar section, replace existing reinforcing bars and add dowels if needed.

- .4 Obtain the Ministry Representative approval for exposed surfaces before placing formworks.
- .5 Prepare surface in accordance with CSA A23.1 article 7.8.3.2, method c) or d). All laitance, dirt, dust, debris, grease or any other foreign matter that may adversely affect bond between existing and new concrete shall be removed. Surface shall be rough and clean before placing new concrete.
- .6 Apply bonding agent just before placing new concrete, in accordance with CSA A23.1 article 7.8.4.2 and manufacturer's recommendations.
- .7 Existing concrete surfaces shall be saturated surface dry (SSD) before placing new concrete. Moisten existing concrete surface for a minimum of four (4) hours before concreting and allow one (1) hour to drain water from surface before placing new concrete.

### **3.9 CONCRETE CURING AND FINISHING**

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .2 Using chisel, break concrete projections left by the open joints of the formwork.
- .3 Finishing in accordance with section 03 35 00 – Concrete Finishing.
- .4 Curing in accordance with section 03 39 00 – Concrete Curing.
- .5 Do not load new concrete before concrete has reached the required strength.

### **3.10 CONSTRUCTION TOLERANCES**

- .1 Follow requirements of CSA A23.1, article 6.4, for construction tolerances for cast-in-place concrete.
- .2 In case of non-compliance, the Ministry Representative may require the demolition of the non-compliant element and the construction of a new one, following tolerances to article 6.4, without any additional cost. Alternatively, a permanent deduction may be applied to the global price of the contract as a compensation for the lower quality of the work. The Ministry Representative will be the sole judge of the appropriate withholding amount, which may amount up to the equivalent cost of the demolition and reconstruction of the element.

### **3.11 FIELD QUALITY CONTROL**

- .1 Conduct tests as follows and in accordance with section 01 45 00 - Quality Control. Submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory, certified according to CSA A283, designated by the Ministry Representative for review in accordance with CSA A23.1.

- .3 The Contractor shall cooperate fully to facilitate testing by allowing access to work site and equipment, providing manpower and materials needed to prepare cylinders, and providing a proper secure space for storing samples.
  - .1 Inform testing laboratory at least twenty-four (24) hours before pouring concrete, no matter the volume of concrete to be poured.
  - .2 Set aside on site a place protected against weather conditions where concrete cylinders will be stored, at a temperature of at least 10°C and at most 25°C before being delivered to laboratory.
- .4 One group of test shall be carried out to evaluate compressive strength for every 50 m<sup>3</sup> of concrete, but not less than one group of test for each class of concrete poured in a given day.
- .5 Tests shall be carried out in accordance with the indication of article 0 of this specification. A group of test shall include, as a minimum, three (3) cylinders, one slump test and one air content test. Test air content for each concrete truck when concrete will be exposed to freeze-and-thaw cycles or exposed to de-icing salts.
- .6 For concrete with fibres, the first group of test for each concrete mix shall include flexural testing of two (2) 150 x 150 x 500 mm beams to ASTM C 1609/C 1609M.
- .7 Slump tests shall be carried out in sufficient number to ensure uniform consistency of concrete.
- .8 Testing laboratory shall take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .9 The Owner will pay for the costs of tests indicated above.
- .10 Non-Destructive Methods for Testing Concrete shall be conducted in accordance with CSA A23.2.
- .11 Inspection and testing by the Ministry Representative or testing laboratory cannot replace nor complete the Contractor's quality control. No inspection can liberate the Contractor from his obligations in this respect.
- .12 If tests demonstrate that concrete resistance is inferior to specification or to requirements of CSA standards, the Ministry Representative may require obtaining drilled cores from the concrete work for testing. If said tests demonstrate that concrete resistance follows requirements, cost of tests will be assumed by the Owner. If not, costs shall be paid by the Contractor. The Ministry Representative may require that drilled cores be obtained and tested when, based on his opinion, concrete pouring or curing was not done in accordance with the specifications of this section.

### **3.12 INTERPRETATION OF COMPRESSIVE STRENGTH TEST RESULTS**

- .1 Interpretation of compressive strength test results will be done in accordance with article 4.4.6.6.1 of CSA A23.1 standard. Concrete meets the requirements of this specification for compressive strength if:
  - .1 The average value of a group of three (3) consecutive tests equals or exceeds the specified strength.
  - .2 Compressive strength equals at least the specified resistance minus 3.5 MPa for all individual tests.

- .2 When test results do not meet the above requirements, the Ministry Representative may require, without any additional costs from the Contractor, that:
  - .1 Mix proportions are changed for the remainder of work.
  - .2 Additional curing is done on the portion of the work represented by test specimens.
  - .3 Cores be drilled from the portion of structure in question, in accordance with ASTM C 42/C 42M, ASTM C 39/C 39M and CSA A23.2-14C, interpreted to article 4.4.6.6.2 of CSA A23.1.
  - .4 The portion of structure is submitted to load tests, in accordance with CSA A23.3, article 20.

### 3.13 NON-COMPLIANT WORK

- .1 Structural defect.
  - .1 Work or part of work has a structural defect when concrete strength, as interpreted by article 3.13 of this specification, does not meet the specified resistance.
  - .2 Moreover, work or part of work presents a structural defect if one of the following conditions occur:
    - .1 Concrete mix formula was not approved prior to pouring,
    - .2 The Ministry Representative and/or testing laboratory was not informed before concreting,
    - .3 Concrete pouring was not done following the requirements of this specification.
  - .3 Notwithstanding the results of any tests done during concrete pouring, work or part of work presenting a structural defect has interpreted by article 3.14.2 is considered as if not meeting the specified strength requirement per article 3.13.1.
  - .4 When specific requirements are given for mixes formula, such as chloride ion permeability or spalling due to salt, to ensure or improve durability of concrete, failure to meet these requirements is considered a structural defect.
- .2 Esthetic defect.
  - .1 Work or part of work has an esthetic defect when concrete is soiled, contaminated by debris, contains honeycombs, surface voids or bug holes, protrusion, smudges, change in colors or any other similar defect.
  - .2 Notwithstanding the article above, presence of surface voids, bug holes and/or honeycombs in concrete with a class of exposure C-1 or C-XL is considered presenting a structural defect as in article 3.14.1.
  - .3 The following definitions shall be used when determining esthetic deficiencies:
    - .1 Surface voids or bug holes: Small regular or irregular cavities, usually not exceeding 15 mm in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and compaction.
    - .2 Honeycombs: Concrete or part of concrete that, due to lack of the proper quantity of fine aggregates or vibrations, contains abundant interconnected large voids or cavities; honeycombs may result from improper consolidation. Any regular or irregular voids exceeding 15 mm in diameter are considered honeycombs.
    - .3 Protrusion: any part of concrete work protruding 10 mm or more from concrete work.

- .4 Smudges: any spillage of concrete from formwork.
  - .5 Changes in color: any change in color that affects adversely the overall look of the concrete work.
- .3 Cracking in new concrete work:
- .1 Presence of cracks with openings of 0.5 mm or more in new concrete work is considered a defect. Presence of a network of cracks with openings of 0.3 mm or more is considered a defect. One or more cracks of a total length exceeding 1.5 m on an area of 0.25 m<sup>2</sup> constitute a network of cracks.

### 3.14 CORRECTIVE WORK

- .1 Structural defect.
- .1 If, after taking the measures identified in section 3.13.2 of this specification, the Ministry Representative still believes that concrete of part of or of all of the works does not meet the strength requirements, he may require strengthening or replacement (demolition and reconstruction) of part of or of the whole work as appropriate. All costs shall be assumed by the Contractor.
- .2 Esthetic defect.
- .1 Make sure the Ministry Representative has inspected defects before beginning surface repairs.
  - .2 Any damaged concrete soiled or containing debris shall be repaired in accordance with the Ministry Representative directives.
  - .3 Honeycombs made visible after removal of formworks will be scraped to solid concrete, to a minimum depth of 10 mm. Repairs shall be circumscribed by saw cuts of a regular shape without angles of 60 degrees or less. Zone of repairs shall extend at least 50 mm into sound concrete near honeycombs.
  - .4 When necessary, concrete faces will be cut to obtain sharp regular edges using saw. Surfaces will be cleaned, and cavities coated with an epoxy bonding agent then filled with an epoxy modified grout, held in place by formworks if necessary.
  - .5 Protrusions, burrs, smudges, etc. due to formworks shall be grinded.
  - .6 If concrete faces finish is not satisfactory, if the extent of repair needed is too extensive or if concrete presents significant changes of colors, the Ministry Representative may require the application of a coating product (cement-based paint, epoxy-based grout, or any other product deemed appropriate) on all exposed faces, without any costs to the Owner.
  - .7 Corrective work shall conform to article 3.4 of section 03 11 00 – Formwork.
- .3 Cracks in new concrete.
- .1 Cracks with openings of 0.5 mm or more will be injected as described in section 03 15 00 – Concrete Accessories.
  - .2 Where a network of cracks is present, the Ministry Representative may require one of the following actions:
    - .1 Application of a coating product (cement-based paint, epoxy-based grout, or any other product deemed appropriate).
    - .2 Partial demolition and reconstruction with an appropriate product.

- .4 Procedure for repairing deficiencies.
  - .1 The Contractor is responsible to submit methods for repairing deficiencies. He needs to obtain the Ministry Representative approval of said method before proceeding with reparations.
  - .2 Refer to Guideline No. 310.1R *Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion* by ICRI when preparing methods for repairing deficiencies. Refer to chapters 5 to 7 when determining geometry and extent of surfaces to demolish prior to repairing.
  - .3 Refer to Guideline No. 320.2R *Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces* by ICRI when selecting repair materials.
  - .4 Refer to Guideline No. 320.1R *Guide for Selecting Application Methods for the Repair of Concrete Surfaces* by ICRI when selecting application method for repair materials.
- .5 Inform the Ministry Representative after finishing demolition prior to reparation, at least forty-eight (48) hours before applying repair materials, to allow for inspection.

END OF SECTION



**PART 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 15 00 – Concrete Accessories.
- .3 Section 03 20 00 – Concrete Reinforcing.
- .4 Section 03 30 00 – Cast-in-Place Concrete.
- .5 Section 03 39 00 – Concrete Curing.
- .6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections

**1.2 REFERENCES**

- .1 American Concrete Institute (ACI).
  - .1 ACI 302.1R-15, Guide for Concrete Floor Slab Construction.
- .2 American National Standards Institute (ANSI).
  - .1 ANSI/NFSI B101.1-2009 Test Method for Measuring Wet SCOF of Common Hard-Surface Floor Materials.
  - .2 ANSI/NFSI B101.3-2012 Test Method for Measuring Wet DCOF of Common Hard-Surface Floor Materials.
- .3 American Society for Testing and Materials International (ASTM).
  - .1 ASTM C 920-18, Standard Specification for Elastomeric Joint Sealants.
  - .2 ASTM E 430-11, Standard Test Methods for Measurement of Gloss of High-Gloss Surfaces by Abridged Goniophotometry.
  - .3 ASTM E 965-15, Standard Test Method for Measuring Pavement Macrotexture Depth Using a Volumetric Technique.
  - .4 ASTM E 1155M-14, Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers [Metric].
  - .5 ASTM F 710-17, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
  - .6 ASTM F 1869-16a, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- .4 Canadian Standard Association (CSA)/CSA International.
  - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

- .5 Concrete Floors Contractors Association of Canada (CFCA).
  - .1 Specification Bulletin, Polished Concrete – Gloss & Aggregate Exposure, April 12, 2011.
- .6 International Concrete Repair Institute (ICRI).
  - .1 Guideline No 310.2R-2013 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

### 1.3 PERFORMANCES

- .1 Products and workmanship quality: in accordance with section 01 61 00 – Common Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

### 1.4 TECHNICAL DATASHEETS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets. WHMIS datasheets for products used on concrete shall include volatile organic compound (VOC) content. Datasheets shall be in accordance with Health Canada and Human Resources and Skills Development Canada requirements.
- .3 Submit instructions relating to products application.

### 1.5 QUALITY CONTROL

- .1 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.3.2	Declaration of compatibility of products	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter. Inscription to the technical specification registry.
1.4	Technical datasheets for concrete finishing products	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter. Inscription to the technical specification registry.
1.8.5	Evaluation of moisture content of substrate	<i>Refer to terms and conditions of section 01 33 00</i>	Breakpoint. Tests report.
3.11.3	Flatness/levelness testing	<i>Refer to terms and conditions of section 01 33 00</i>	Inspection report

### 1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal and the requirements of the waste reduction plan.
- .2 Place materials defined as hazardous or toxic in designated containers.

- .3 Ensure that empty recipients are sealed and stored properly before elimination.
- .4 Divert unused hazardous material from landfill to an official hazardous material collections site as approved by the Ministry Representative, in accordance with all applicable legislation.
- .5 Dispose of waste generated by work (scarification, stripping of floor, etc.) in an environmentally sound manner.

## **1.7 ENVIRONMENTAL REQUIREMENTS**

- .1 Temporary lighting:
  - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 square meters of floor being treated.
- .2 Electrical power:
  - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area:
  - .1 Make work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature:
  - .1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:
  - .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer. Moisture content shall be controlled by laboratory test and a written report presented prior to product application.

## **PART 2 PRODUCTS**

### **2.1 N/A**

## **PART 3 EXECUTION**

### **3.1 FINISHING OF FORMED SURFACES**

- .1 Clean and finish formed surfaces in accordance with article 7.9.2 of CSA A23.1 standard. Use smooth-form finish in accordance with article 7.9.2.6 for exposed surfaces. Rough-form finish in accordance with article 7.9.2.5 is deemed acceptable for all other surfaces.
- .2 For all corners of exposed concrete, chamfer corners to 25 mm, even if no indications are given on drawings.
- .3 Refer to section 03 11 00 – Concrete Forming for patching of form tie holes.

### 3.2 PREPARATION OF SLABS

- .1 Examine slab surfaces and environmental and workmanship conditions to ensure that all manufacturer's requirements are met for the application of finishing products. Verify slab levels in regards to shop drawings and manufacturer's requirements.

### 3.3 SLAB FLATNESS TOLERANCES

- .1 Tolerances for slab and floor finish shall be in accordance to table 21 of CSA A23.1 standard. Method to ASTM E 1155M shall be used to determine slab flatness by determining F numbers. The Contractor shall mandate, at their own expense, a specialized laboratory to perform in situ measurements and provide F numbers for each concrete slab (slab on grade and structural slabs) in compliance with the above-mentioned standards. Results shall be sent to the Ministry representative maximum 48 hours after in situ measurements.
- .2 Refer to articles 7.6.1.1 and 7.6.1.4 of CSA A23.1 and the following table to determine slab flatness and methods of finishing. When a slab does not belong specifically to a category listed on the following table or no other specifics indications are given elsewhere, use tolerances associated with class **B**.

Class	Examples	Recommended Method	Global F number	
			F <sub>F</sub>	F <sub>L</sub>
A	"Conventional" slab	Manual screeding, trowelling using steel trowels	20	15

\*Refer to table 21 of CSA A23.1 standard. The above table was developed using the information contained in table 21.

### 3.4 SLAB FINISH

- .1 Concrete slab finish shall be done in accordance with CSA A23.1 article 7.6 and ACI 308R requirements. Requirements hereby presented shall be read in conjunction with those standards.
- .2 Do not sprinkle dry cement or dry cement and sand mix on concrete surfaces.
- .3 Control excess bleeding water using methods in accordance with CSA A23.1. Avoid any damage to concrete surfaces.
- .4 Initial Finishing.
- .1 After the placing, spreading and vibrating of concrete, screed surfaces using properly designed screed or straight-edge.
  - .2 Using bull float, darby or mechanical equipment as appropriate, work concrete to remove high spots and ridges and to fill voids and hollows. Coarse aggregate shall be slightly embedded into concrete. Surface level shall be as indicated on drawings.
  - .3 Complete initial finishing before any bleeding or free water appears on the surface of concrete.

- .5 Final Finishing – General.
  - .1 Final finishing includes edging, grooving, floating and trowelling. Commence final finishing as soon as bleed water has disappeared and concrete has hardened enough to prevent working of excess mortar to the surface.
  - .2 Unless otherwise indicated, surfaces shall be monolithic, trowelled using steel trowel to obtain a smooth, non-slip, without streaks, trowel marks or ripples.
  - .3 Finishing quality shall meet all quality requirements for the installation of flooring.
- .6 Final Finishing – Stairs and landings.
  - .1 Finishing quality shall be sufficient to allow proper installation of nonslip coating. Surfaces shall be monolithic, trowelled using steel trowel to obtain a smooth, abrasive, without streaks, trowel marks or ripples.
  - .2 When specified on architectural drawings, embed one carborundum band in per step over the full width of the stair.
  - .3 Special care shall be taken to obtain uniform horizontal step nosing.
- .7 Finishing – Sidewalks.
  - .1 Finish surface at levels and slopes determined on drawings. Unless otherwise indicated, transversal slope shall be 1V:40H toward pavement.
  - .2 Level surface using screed bearing on forms.
  - .3 Use wood trowels for first trowel pass.
  - .4 Before concrete hardening, but after a proper delay, sweep the surface using a rough broom or brush, to create a surface without irregularities, holes or any other defect. Surface shall be nonslip.
  - .5 Prepare cross joints with the appropriate tool for this purpose. Round sidewalk and joints edges with an iron rim of 10 mm radius.
- .8 Final Finishing – Ramps.
  - .1 If needed, surface finish shall allow installation of waterproof membrane. Surface shall be smooth, without streaks, trowel marks or ripples. Finish shall be monolithic, trowelled using wood trowels, and nonslip grooves shall be added to a ramp without membrane.
- .9 Ensure that tolerances indicated in section 3.3 are met.
- .10 Other works.
  - .1 Using carborundum, grind straight edges of concrete to obtain a 3 mm radius.

### 3.5 CONTROL JOINTS

- .1 Before twenty-four (24) hours have passed following concreting, cut control joints in accordance with CSA A23.1 standard,
- .2 For slabs and toppings, use specialized cutting tools to cut control joints – hand operated concrete saw is not allowed. Vertical joints shall be cut immediately after formwork removal.
- .3 When concrete has hardened and surface is dry, follow requirements of section 03 15 00 – Concrete Accessories for joints caulking.

- .4 Unless otherwise indicated, refer to drawings for control joints location. Where there is no indications, use the general requirements as follow:
  - .1 Saw cut width shall be 6 mm.
  - .2 Saw cut depth shall be 40 mm. Where reinforcing steel is present, depth shall be modified as to prevent any damage to reinforcing steel.
  - .3 Maximum spacing between joints on slabs and concrete toppings shall be 4.5 m in each direction, as indicated in article 7.2.2 of CSA A23.1 standard.

### **3.6 SLAB WITH FLOOR COVERING**

- .1 The General Contractor, concrete provider and concrete finisher are jointly and severally liable for slab preparation to receive floor covering, including conformity with the following criteria:
  - .1 Concrete curing shall be completed.
  - .2 Maintain ambient temperature of not less than 10 degrees C from at least 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
  - .3 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer. Where no indications are given, the moisture-vapor emission rate must be inferior to 3 lb by 1000 ft<sup>2</sup> (1.465 kg by 100 m<sup>2</sup>) per 24 hours as determined by tests performed in accordance with ASTM F 1869.
  - .4 PH of slab shall be between 5 and 9.
  - .5 Moisture content and pH shall be controlled by independent laboratory testing and a written report presented prior to product application. The General Contractor is responsible to ensure proper testing and shall assume all costs related to testing.
- .2 Prepare slab to receive resilient flooring in accordance with ASTM F 710.
- .3 Verify whether joint sealing compound or cementitious floor screed (or similar product) should be used to fill control joint prior to applying floor covering.

### **3.1 FIELD QUALITY CONTROL**

- .4 Site tests: conduct tests as follows and in accordance with section 01 45 00 - Quality Control. Submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .5 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory, certified to CSA A283, in accordance with CSA A23.1.
- .6 *The Contractor shall demonstrate the conformity of the concrete slabs to the flatness criteria of article 3.3 by tests performed by the laboratory for all concrete slabs on the project.*
- .7 Prior to placing floor covering, or prior to polishing, the Contractor shall provide a written report by the Laboratory responsible for field quality control demonstrating that the slab meets criteria for pH and moisture-vapor emission rate.

**3.7 SLAB LEVELLING**

- .1 Where slab flatness does not meet requirements, apply a cementitious floor screed.
- .2 Prepare surfaces by sandblasting, by manual scarification or manual chipping using a "Needle Gun" to provide a surface profile CSP-4 as specified in guideline 310.2R *Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair* of ICRI.
- .3 Apply cementitious floor screed per manufacturer's recommendations.

END OF SECTION



**PART 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 03 11 00 – Concrete Forming.
- .2 Section 03 15 00 – Concrete Accessories.
- .3 Section 03 20 00 – Concrete Reinforcing.
- .4 Section 03 30 00 – Cast-in-Place Concrete.
- .5 Section 03 35 00 – Concrete Finishing.
- .6 The Contractor shall obtain a copy of all sections even if they do not pertain directly to his speciality. When bidding, the Contractor agrees implicitly with articles and requirements of all sections in these specifications, including those he might not have read. The Contractor should consult the table of contents of the specifications to be aware of the complete list of sections.

**1.2 REFERENCES**

- .1 American Association of State Highway and Transportation Officials (AASHTO).
  - .1 AASHTO M 182-05(2017), Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.
- .2 American Concrete Institute (ACI).
  - .1 ACI 308R-16, Guide to Curing Concrete.
- .3 American Society for Testing and Materials International (ASTM).
  - .1 ASTM C 171-16, Standard Specification for Sheet Materials for Curing Concrete.
  - .2 ASTM C 309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .3 ASTM C 1315-11, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- .4 Canadian Standard Association (CSA)/CSA International.
  - .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .5 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB 19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.

**1.3 ACTIONS AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with section 01 33 00 – Submittal Procedures.
- .2 Submit Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.

- .3 At least fourteen (14) days prior to curing concrete, submit to the Ministry Representative methods for curing concrete and to control quality of concrete curing.

#### 1.4 QUALITY CONTROL

- .1 Quality control: in accordance with section 01 45 00 – Quality Control.
- .2 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.3.3	Method for curing concrete	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter. Inscription to the technical specification registry.
1.3.1	Technical datasheets for curing products, including blankets and membrane	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter. Inscription to the technical specification registry.

#### 1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse/recycling in accordance with section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Ensure that empty recipients are sealed and stored properly before elimination.
- .4 Divert unused hazardous material from landfill to an official hazardous material collections site as approved by the Ministry Representative, in accordance with all applicable legislation.
- .5 Dispose of waste generated by work in an environmentally sound manner.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

- .1 Water: to CSA A23.1, article 4.2.2.
- .2 Membranes, sheet materials: to ASTM C 171.
- .1 Approved products: UltraCure by McTech Group, Transguard 4000 by Reef Industries, Reliable Cure by Reliable Concrete Accessories or Conkure by Sweeney Materials.
- .3 Jute or burlap cloth: to ASTM C 171 and AASHTO M 182.

**PART 3 EXECUTION****3.1 GENERAL REQUIREMENTS**

- .1 Follow requirements of section 03 30 00 – Cast-in Place Concrete for concreting.
- .2 Concrete curing in accordance with CSA A23.1, article 7.7 and ACI 308R. Refer to those standards when choosing curing methods.
- .3 Use of curing compound is prohibited.
- .4 Whenever possible, curing methods shall be chosen such that concrete is moistened by direct contact with water.
  - .1 Use methods reviewed to the Ministry Representative satisfaction and as defined in CSA A23.1 standard to eliminate bleeding water. Ensure no damage is done to concrete surfaces.
- .5 During curing, ensure that concrete remains unloaded and is protected against chocks, vibrations, weather conditions or any other element that might affect quality of works.

**3.2 WET CURING**

- .1 Water used for curing concrete shall be clean and without matters that may leave marks on concrete.
- .2 Exposed faces of concrete shall be moistened for at least seven (7) days and protected against weather conditions and other works. Concrete temperature shall remain at or above ten (10) degrees Celsius.
- .3 When concrete has to be protected against cold weather, maintain protection at least twelve (12) hours after the end of wet curing.
- .4 When temperature is twenty-five (25) degrees Celsius or more, or twenty (20) degrees Celsius for mass concrete, use water jet, wet sand or jute for initial curing of concrete.
  - .1 Moisten formworks before concreting and until formworks are removed.
- .5 If required by ambient conditions, exposed concrete surfaces must be covered with tarpaulins or protected by other means acceptable to the Ministry Representative.
- .6 Use two layers of constantly wet jute or burlap clothes for curing walls or other vertical elements.
- .7 Non-formed concrete surfaces shall remain wet for a minimum of seven (7) days.
- .8 Formed concrete surface (beams, columns, walls, etc.) shall be cured for at least seven (7) days, as follows:
  - .1 Before formwork removal: three (3) days, but not less than the duration in section 03 11 00 – Concrete Forming.
  - .2 Wet curing following formwork removal: four (4) days.

**3.3 MEMBRANE CURING**

- .1 Effect of sun, wind, cold or rain can adversely affect concrete curing. Exposed faces of concrete shall be covered partially or completely by tarpaulin or protected by any other means approved by the Ministry Representative.
- .2 Rather than using a method in accordance with article 3.2 of this section, the Contractor may use blankets specially designed for curing concrete. Depending on weather conditions, use sheet materials designed for hot weather. Method for using sheet materials shall be as follow:
  - .1 Begin placing immediately after concrete has hardened enough to prevent damages.
  - .2 Spray water over a first strip where sheet materials will be installed. Surface shall be covered by 3 to 6 mm of water.
  - .3 Unroll sheet materials over wet concrete. Add water when needed.
  - .4 Use squeegee to smooth out wrinkles and air bubbles.
  - .5 Spray water over next strip and repeat preceding operations. Lap strips over 75 mm minimum. At roll ends, overlap over 300 mm minimum. Cover the entire surface of slab.
  - .6 Inspect slab frequently and repair immediately any damage to sheet materials.
  - .7 Remove sheet materials after seven (7) days of curing or later. Do not reuse sheet materials.

**3.4 USE OF CURING COMPOUNDS**

- .1 Use of curing compound is prohibited.

END OF SECTION

**PART 1      General****1.1            RELATED SECTIONS**

- .1      Section 04 05 12 – Masonry mortar and grouting
- .2      Section 04 22 00 - Concrete Unit Masonry.
- .3      See Structure.

**1.2            REFERENCES**

- .1      Canadian Standards Association (CSA International).
  - .1      CSA A179-94(R1999), Mortar and Grout for Unit Masonry.
  - .2      CSA-A371-94 (R1999), Masonry Construction for Buildings.

**1.3            SAMPLES**

- .1      Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Submit samples as follows:
  - .1      Two of each type of masonry unit specified.
  - .2      One of each type of masonry accessory specified.
  - .3      Minimum required for testing purposes.

**1.4            TEST REPORTS**

- .1      Submit laboratory test reports in accordance Section 01 33 00 – Submittal Procedures.
- .2      Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.
- .3      For clay elements, respect CSA and ASTM requirements mentioned above. Specify initial absorption rate of proposed elements.

**1.5            DELIVERY, STORAGE, AND HANDLING**

- .1      Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2      Deliver materials to job site in dry condition.
- .3      Keep materials dry until use except where wetting of bricks is specified.
- .4      Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
- .5      Eliminate broken, warped, scratched and defective items.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Collect and separate for disposal paper, plastic and corrugated cardboard packaging material in accordance with Waste Management Plan.

**1.7 PROTECTION OF WORK**

- .1 Protect masonry work and adjacent work from dirt and damage.
- .2 Protect finished work from mortar spatter with non-staining tarps.
- .3 Provide temporary shoring of masonry work until permanent lateral support is in place.

**PART 2 Products****2.1 MATERIALS**

- .1 Masonry materials are specified in Related Sections mentioned in 1.1.
- .2 When preparing the mortar and handling the masonry elements, take all necessary precautions to eliminate any possibility of efflorescence.

**PART 3 Execution****3.1 INSTALLATION**

- .1 Do masonry work in accordance with CSA-A371 except where specified otherwise.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment. Install the reinforcement and the mortar according to the indications in the structural documents.

**3.2 CONSTRUCTION**

- .1 Jointing.
  - .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.
  - .2 When raked joints are prescribed, allow the mortar to harden sufficiently to remove excess water, and then rake the joints evenly with a flat mirror to compress the mortar and make smooth surface seals of uniform depth of 6 mm.
  - .3 Flush all concealed or coated wall joints, tiles, insulation or any other similar material, except paint or a thin film finish of the same type. Run flush all vertical joints on 150 mm high, at the base of the walls receiving a rubber baseboard.
- .2 Exposed Masonry Units
  - .1 Remove chipped, cracked or otherwise damaged units from exposed structures and replace with units in good condition.
- .3 Cutting.
  - .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.

- .2 Make cuts straight, clean, and free from uneven edges.
- .4 Building-In.
  - .1 Build in items required to be built into masonry.
  - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
  - .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .5 Joints: When work is interrupted in mid-course or at building corners:
  - .1 Step-back blocks starting from most recent full course.
  - .2 At no time shall a section of wall under construction be more than 1220 mm higher than an adjacent section of wall.
- .6 Support of loads.
  - .1 Use grout to CSA A179 where grout is used in lieu of solid units.
  - .2 Install building paper below voids to be filled with concrete; keep paper 25 mm back from faces of units.
- .7 Provision for movement.
  - .1 Leave 3 mm space below shelf angles.
  - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
  - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.

### 3.3 SITE TOLERANCES

- .1 Tolerances in notes to Clause 5.3 of CSA-A371 apply.
- .2 The following tolerances are permitted for visible masonry work:
  - .1 From fixed reference point: 3 mm for length of 2.5 meters.
  - .2 At openings: additional 6 mm.
- .3 Assume full responsibility for precision of dimensions, plumbing and leveling of Work, and continuous verification with graduated rod.
- .4 Masonry courses shall be of equal height, horizontal and vertical joints shall be of constant width, and both coursing and jointing shall match existing pattern.
- .5 Place first masonry course without mortar for Ministerial representative's approval of joint locations.

### 3.4 WORK ON EXISTING STRUCTURES

- .1 Make openings in the existing structure as indicated.
- .2 Openings in the walls must be approved by the Architect.
- .3 Rehabilitate existing structures for this purpose, use materials that harmonize with those already in place.

**3.5 OPENINGS TO CLOSE**

- .1 Close all openings around elements that cross the wall to preserve the fire resistance and acoustic properties of the masonry walls.

**3.6 COOPERATION WITH OTHER TRADES**

- .1 Make openings in masonry where necessary or where indicated.
- .2 Carefully execute, at indicated locations and dimensions, housings and openings for conduits.
- .3 Where masonry encloses conduits or plumbing, ensure flush setting as required. Do not close openings or housings for plumbing or conduits until receiving confirmation that inspections and tests have taken place.
- .4 In cooperation with all other trades, verify if all elements to be integrated into masonry walls are in place, or if they are to be installed prior to or at the time of wall construction. To this end, check all mechanical, electrical, and structural documents, as well as documents of any other consultant.

**3.7 CLEANING**

- .1 When masonry work is finished, remove all stains, spatters, or surplus mortar with wooden paddle.
- .2 As needed. Patch or replace defective mortar with fresh mortar to match existing mortar, according to requirements of these specifications.
- .3 Rub surfaces with non-darkening alkaline cleaning solution in accordance with manufacturer's recommendations.

**END OF SECTION**

**PART 1 General****1.1 RELATED SECTIONS**

- .1 All sections of division 04.
- .2 See structural documents.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CSA A179-94(R1999), Mortar and Grout for Unit Masonry.

**1.3 PRODUCT DATA**

- .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide instructions for:
  - .1 Reference standards for product in question.
  - .2 "Factory-prepared mix standards" table indicating mortar characteristics (compression strength, water retention, air contents).
  - .3 Test certificates for mortar mix batches delivered to site for use in work.

**1.4 SAMPLES**

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

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Collect and separate for disposal paper, and corrugated cardboard packaging material in accordance with Waste Management Plan.

**PART 2 Products****2.1 MATERIALS**

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Mortar and grout: to CSA A179 standard.
- .3 Grout for filling the cells of the blocks: see structure documents.
- .4 Type 10 Portland cement, to CAN/CSA-A5 standard.
- .5 Type "S" hydrated lime, to ASTM C270-91 (1997) standard.

.6 Water: Drinking water, clean, free from ice, oil, acid, alkalis, organic matter, sediment or any other harmful material.

.7 Use of admixtures in not permitted.

## **2.2 MORTAR TYPES**

.1 Factory-mixed mortar with compression strength similar to adjacent masonry elements. Mortar may be delivered with sand mixed into matrix: add water according to instructions.

.2 Mortar for interior concrete blocks.

.1 Non-Loadbearing: type M based on Property specifications.

.3 Grout: to CSA A179, Table 3.

## **2.3 COLOUR**

.1 Concrete block masonry: colourless mortar.

## **PART 3 Execution**

### **3.1 CONSTRUCTION**

.1 Do masonry mortar and grout work in accordance with CSA A179 except where otherwise specified.

### **3.2 MIXING**

.1 Mixing to be done with mechanical mixer; clean and free of dried mortar, rust, or other contaminant; do not defrost equipment with salt or antifreeze.

.2 Use 1 cubic foot containers for precision measurement of required quantity of sand according to grout type. Measuring sand with shovel is not permitted.

.3 Prepare mortars according to supplier's instructions in regards to proportion of water to cementitious materials, as well as steps to follow in mixing. Perfectly respect water quantities required per sack of mortar as prescribed by manufacturer.

.4 Total mixing time to be no less than 8 minutes and no more than 10 minutes. Let rest 2 minutes and remix 2 minutes. For mortar coloured on-site, mixing to be between 8 and 12 minutes to ensure complete and uniform dispersion of pigments.

### **3.3 INSTALLATION TIMEFRAME FOR MORTAR AND GROUT**

.1 Mortar to be used and applied within 2.5 hours following mixing; when air temperature is equal or higher than 25°C, timeframe is reduced to 1.5 hours. Past these limits, mortar must be rejected.

**3.4 REMIXING**

- .1 Remixing of mortar stiffened due to evaporation is not permitted; such mortar must be rejected.

**3.5 COLOUR UNIFORMITY**

- .1 In order to ensure uniformity of mortar colour, Contractor should:
  - .1 Use clean water from a single source.
  - .2 Avoid adding water after initial mixing in order to make mortar more workable.
  - .3 Always smooth joints within the same time after initial application of mortar.

**END OF SECTION**



**Part 1 General****1.1 RELATED SECTIONS**

- .1 All sections of this division.
- .2 See structure for frame, grout and head anchors.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN3 A165 SERIES-94(R2000), CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene or corrugated cardboard packaging material in appropriate on-site containers for recycling in accordance with Waste Management Plan.
- .3 Divert damaged or unused concrete materials from landfill to local recycling facility approved by Ministerial representative.

**Part 2 Products****2.1 MATERIALS**

- .1 Standard concrete elements, type H / 15 / A / M: in accordance with CAN3-A165.1 series standards.
  - .1 Dimensions: 190 x 190 x 390 mm, 56% solid
- .2 Special-shaped units: rounded-edged units must be used for exposed corners, and specially shaped units for lintels and connecting beams; other special shaped units must be provided as indicated.
- .3 Concrete units for wall ties (lintel blocks), type S / 15 / A / M: in accordance with CAN3-A165.1.
  - .1 Dimensions: 140 x 190 x 390 mm and 190 x 190 x 390mm (as existing).

**Part 3 Execution****3.1 GENERAL**

- .1 Concrete Units
  - .1 Brickwork: stretcher bond or as existing work
  - .2 Seat height: 200 mm for a row of elements and a joint.
  - .3 Seams: concave throughout the height of the masonry walls

- .2 Lintels for concrete masonry units:
  - .1 When no steel or reinforced concrete lintel is prescribed, install lintels of reinforced concrete over the openings in the masonry.
  - .2 Support at the ends of the lintels: at least 200 mm.

### **3.2 CLEANING**

- .1 Allow mortar splatters on masonry work to partially dry and then remove with a trowel. Finish by lightly rubbing the surface of the joints with a small piece of concrete and then with a brush.

**END OF SECTION**

**PART 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 .1 It is the responsibility of the specialized contractor to get a copy of all sections of this specification even if they seem irrelevant to his specialty. The contractor acknowledges implicitly accepts the clauses and requirements of all sections of the specification, even if it fails to refer to certain sections. Refer to the table of contents for a complete list of the sections of the specification.

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM A 36/A 36M-14, Standard Specification for Carbon Structural Steel.
  - .2 ASTM A 108-18, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
  - .3 ASTM A 123/A 123M-17, Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Product.
  - .4 ASTM A 193/A 193M-17, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service or High Pressure Service and Other Special Purpose Application.
  - .5 ASTM A 194/A 194M-18, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
  - .6 ASTM A 500/A 500M-18, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - .7 ASTM A 563-15, Standard Specification for Carbons and Alloy Steel Nuts.
  - .8 ASTM A 572/A 572M-18, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
  - .9 ASTM A 780/A 780M-09(2015), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - .10 ASTM A 913/A 913M-15, Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process.
  - .11 ASTM A 992/A 992M-11(2015), Standard Specification for Structural Steel Shapes.
  - .12 ASTM A 1011/A 1011M-18a, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
  - .13 ASTM A 1085/A 1085M-15, Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
  - .14 ASTM D 6386-16a, Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
  - .15 ASTM F 436/F 436M-18a, Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
  - .16 ASTM F 959/F 959M-17a, Standard Specification for Compressible–Washer– Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series.
  - .17 ASTM F 1136/F 1136M-11, Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners.
  - .18 ASTM F 1554-15e1, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 ksi Yield Strength.

- .19 ASTM F 3125/F 3125M-15a, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- .2 Canadian Standards Association (CSA)/CSA International.
  - .1 CSA B167-16, Overhead travelling cranes - Design, inspection, testing, maintenance, and safe operation.
  - .2 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement;
  - .3 CSA G40.20/G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .4 CSA S16-14, Design of Steel Structures.
  - .5 CAN/CSA S136-16, North American Specification for the Design of Cold Formed Steel Structural Members.
  - .6 CSA W47.1-09, Certification of companies for fusion welding of steel.
  - .7 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
  - .8 CSA W55.3-08(R2013), Certification of companies for resistance welding of steel and aluminium.
  - .9 CSA W59-18, Welded Steel Construction (Metal Arc Welding).
- .3 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB 1.40-97, Anticorrosive Steel Alkyd Primer.
  - .2 CAN/CGSB 1.105-M91, Quick-drying Primer.
  - .3 CAN/CGSB 1.181-99, Ready-mix Organic Zinc-Rich Coating.
  - .4 CAN/CGSB 31-GP-108MA, Inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.
  - .5 CAN/CGSB 85.10-99, Protective Coatings for Metals.
  - .6 CAN/CGSB 85.100-93, Painting.
- .4 Government of Quebec.
  - .1 Safety Code for the Construction Industry R.R.Q., c. S-2.1, r.4.
- .5 Canadian Institute of Steel Construction (CISC) / Canadian Paint and Coatings Association (formerly known as Canadian Paint Manufacturers Association – CPMA).
  - .1 Handbook of Steel Construction, 11<sup>th</sup> Edition.
  - .2 Code of Standard Practice, 8<sup>th</sup> Edition, 2015.
  - .3 Guide for Specifying Architecturally Exposed Structural Steel, 2<sup>nd</sup> Edition, March 2012.
  - .4 CISC/CPMA 1-73a, A Quick-drying One-coat Paint for Use on Structural Steel.
  - .5 CISC/CPMA 2-75, A Quick-drying Primer for Use on Structural Steel.
- .6 Master Painters Institute.
  - .1 Architectural Painting Specification Manual.
  - .2 MPI-INT 5.1-08, Structural Steel and Metal Fabrications.
  - .3 MPI EXT 5.1-08, Structural Steel and Metal Fabrications.
- .7 Ministère des Transports du Québec (MTQ).
  - .1 Cahier des charges et devis généraux – Infrastructures routières – Construction et réparation, édition 2019 (CCDG 2019).

- .8 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International.
- .1 SSPC SP 1-15, Solvent Cleaning.
  - .2 SSPC SP 2-18, Hand Tool Cleaning.
  - .3 SSPC SP 6/NACE No. 3-07, Commercial Blast Cleaning.
  - .4 SSPC SP 6 (WAB)/NACE WAB 3, Commercial Wet Abrasive Blast Cleaning (NACE SP0815-2015).
  - .5 SSPC SP 7/NACE No. 4-07, Brush-Off Blast Cleaning.
  - .6 SSPC SP 7 (WAB)/NACE WAB 4, Brush-Off Wet Abrasive Blast Cleaning (NACE SP1015-2015).
  - .7 SSPC SP 11-13, Power Tool Cleaning to Bare Metal.

### 1.3 DESIGN CRITERIA

- .1 Design details and connections in accordance with requirements of CSA S16 and CAN/CSA S136 to resist forces, moments, shears and allow for movements indicated.
- .2 Beam assemblies shall have a depth equal to at least 50% of its depth.
- .3 Shop assemblies shall be welded. Field assemblies shall be bolted, using at least two (2) high-strength bolts per assembly.
- .4 Refer to an established manual recognized within the industry for connections design, such as the *Handbook of Steel Construction*.
- .5 Additional forces into connecting elements:
  - .1 Design connections as to not generate additional forces into connected elements.
  - .2 Connections generating torsion or flexure into connected elements are prohibited and will not be accepted by the representative of the Ministry.
  - .3 Any modifications to details and connections due to changes requested by the Ministry Representative shall be made free of charge.
- .6 Unless otherwise indicated, design connections to withstand the following loads:

Elements	Loads
Element loaded in bending (beam, column)	Maximum of support reaction considering the uniform load corresponding to the member strength in bending or 50% of the member strength in shear.
Element resisting significant point loads.	Member strength in shear.
Columns	Compressive resistance and shear resistance of member.
Joist girders	Tensile strength of member.

- .7 Splices in gravity columns shall have a minimum factored shear resistance equal to the sum of  $0.2 * Z * F_y / h_s$  of the column above and below in both orthogonal axis as indicated in article 27.1.4 of CSA S16 standard.
- .8 For non-standard connections, submit sketches and design calculations stamped and signed by qualified professional engineer member of the Ordre des ingénieurs du Québec (OIQ).
- .9 For braces connections, submit sketches and design calculations stamped and signed by qualified professional engineer member of the Ordre des ingénieurs du Québec (OIQ).

#### **1.4 SHOP DRAWINGS**

- .1 Submit shop drawings, including fabrication and erection drawings, as well as list of materials used in accordance with section 01 33 00 – Submittal Procedures.
- .2 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
  - .1 Description of methods.
  - .2 Sequence of erection.
  - .3 Type of equipment used in erection.
  - .4 Temporary bracings.
- .3 Ensure that drawings submitted for connections, including all members and connection components designed by the fabricator are stamped and signed by a qualified engineer recognized by the OIQ. A letter stamped and signed by the engineer listing all drawings with applicable revisions and stating that the connections have been designed and reviewed under the engineer's guidance may be provided rather than stamping and signing each individual shop drawing.
- .4 Refer to articles 4.2 and 4.3 of CSA S16 standard for information that must be indicated on shop and erection drawings. Include locations and dimensions of the protected zones as well as a complete description of the fabrication operation that are prohibited in those zones.
- .5 Provide an erection procedure signed by a qualified engineer recognized by the OIQ where the columns are anchored with fewer than 4 anchor rods or where the position of the anchor rods does not ensure stability of the columns in all their axes, as directed in article 3.24.11(2) of Quebec Safety Code for the construction industry.
- .6 If the Ministry Representative considers that significant or numerous revisions are required on drawings, they shall be returned without annotations to be submitted again. If more than two revisions are required to drawings, the Contractor is liable for the cost associated with any further review.
- .7 Contractor remains sole responsible for the exactness of drawings. No charge may be added for costs incurred by delays occurring due to mistakes uncovered on the Contractor's drawings on the work site, regardless of whether the drawings have been or have not been examined by the Ministry Representative.
- .8 Structural steel fabrication shall not begin before approval of shop and erection drawings.

## 1.5 QUALITY CONTROL

- .1 Submit an electronic copy of mill test reports fourteen (14) days prior to fabrication of structural steel. Include following information:
  - .1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
  - .2 Provide mill test reports certified by metallurgists qualified to practice in Quebec. Reports shall state that tests were made in accordance with CSA G40.20/G40.21.
- .2 Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.
- .3 Realize the following activities and submit required documents:

ART.	PRESCRIPTIONS	PERIOD (FREQUENCY)	REGISTRY
1.4.1	Shop drawings for structural steel frame elements.	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter. Inscription into the shop drawing registry.
1.4.2	Erection drawings for structural steel frame elements.	<i>Refer to terms and conditions of section 01 33 00</i>	Inscription into the work procedure registry.
1.4.5	Erection procedure for columns with fewer than four (4) anchors.	<i>Refer to terms and conditions of section 01 33 00</i>	Transmission letter Inscription into the work procedure registry
3.5.1 and section 03 11 0 0 art. 3.2.2.3	Certificate of compliance for anchor rods.	<i>Refer to terms and conditions of section 01 33 00</i>	Certificate of compliance
3.7	Inspection and tests of materials and connections.	<i>Refer to terms and conditions of section 01 33 00</i>	Test reports.

## 1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .2 Collect and separate packaging materials for recycling, in accordance with waste management plan.
- .3 Divert unused metal products to a metal recycling facility approved by the Ministry Representative.
- .4 Divert unused paints material from landfill to an official hazardous material collections site as approved by the Ministry Representative.
- .5 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

**PART 2 PRODUCTS****2.1 MATERIALS**

- .1 Structural steel: unless otherwise indicated, use:
  - .1 W-, WT-, HP-, M- and S-sections: to ASTM A 913/A 913M or ASTM A 992/A 992M, grade 50;
  - .2 Square and rectangular hollow structural section (HSS): to ASTM A 500/A 500M class C, grade C (50 ksi);
    - .1 HSS to CSA G40.20/G40.21 350W class C or H or to ASTM A 1085/A 1085M may be used **except** as braces or as beam or column acting as moment-resisting frame that are part of the seismic force resisting system (SFRS).
  - .3 Round hollow structural section (HSS): to ASTM A 500/A 500M class C, grade B (46 ksi) or ASTM A 1085/A 1085M;
  - .4 Angle (L-) and channels (C-): to CSA G40.20/G40.21 350W;
  - .5 Plates 65 mm thick or less: to CSA G40.20/G40.21 350W, yield strength of 350 MPa or to ASTM A 572/A 572M grade 50 (345 MPa);
- .2 Cold-formed steel: to ASTM A 1011/A 1011M.
- .3 Anchor rods: as indicated on drawings and as follows:
  - .1 Reinforcing bars: to CSA G30.18, grade 400W or 500W;
  - .2 Anchor rods: to ASTM A 36/A 36M;
  - .3 High strength anchor rods: to ASTM A 193/A 193M, type B7 or ASTM F 1554 grade 105.
- .4 Structural bolts: to ASTM F 3125/F 3125M, unless otherwise indicated. Use type 1 bolts, except for weathering steel for which type 3 bolts shall be used.
  - .1 For zinc/aluminium coated bolt, coating shall comply with ASTM F 1136/F 1136M.
- .5 Nuts: to ASTM A 563 (imperial):
  - .1 For bolts, use recommended nuts to table 1 of ASTM F 3125/F 3125M. Nuts to ASTM A 194/A 194M grade 2H may be used as specified in note 'E' of this table.
  - .2 For high-strength anchor rods, use nuts of grade D (38 mm diameter or less) or DH (more than 38 mm diameter) to ASTM A 563.
- .6 Washers: to ASTM F 436/F 436M.
- .7 Compressible washer: to ASTM F 959/ F 959M.
- .8 Tension control structural bolt, nut and washer: to ASTM F 3125/F 3125M grade F 1852 or F 2280.
- .9 Welding material: to CSA W48 and CSA W59, certified by the Canadian Welding Bureau (CWB).
  - .1 Welding material shall comply with article 27.1.5.3 of CSA S16 when appropriate.
- .10 Hot-dipped galvanizing: to ASTM A 123/A 123M.
- .11 Shear studs: to CSA W59, appendix H, type B and article 5.5.6 of this standard. Material used for studs shall comply with ASTM A 108, grade 1010 to 1020 (inclusively).

- .12 Conditioner and rust remover: to CAN/CGSB 31-GP-108MA.
- .13 Zinc-rich coating:
  - .1 Use zinc-rich coating to CAN/CGSB 1.181 and ASTM A 780/A 780M containing at least 92% of metallic zinc in dried coat, brush applied.
  - .2 Approved products:
    - .1 Zinc-paste 70-40 by Metaflux;
    - .2 ZRC Galvilite by Meta-Plus;
    - .3 Rust-anode by Galvatech (distributor).
    - .4 Zinga by Galvanisation Zinga (distributor).
- .14 Thermal break material:
  - .1 For any connection acting not purely in shear, material used for thermal break shall have a minimum compressive strength of 250 MPa and an elastic modulus of at least 4 500 MPa.
  - .2 For a connection acting only in shear, requirements of the preceding article need not apply.
  - .3 Material shall have a maximal thermal conductivity of 0.300 W/mK and a thickness of 25 mm, unless otherwise indicated on drawings.

## 2.2 SHOP PAINTING

- .1 Unpainted steel shall be used for structural steel on the interior of building not exposed to view. Take special precautions to minimize outside storage of unpainted elements. Refer to section 2.5 Storage.
- .2 The following surfaces shall not be painted:
  - .1 Surfaces to be encased in concrete.
  - .2 Surfaces to receive field installed stud shear connectors and steel decks.
  - .3 Surfaces and edges to be field welded.
  - .4 Faying surfaces of friction-type connections.
  - .5 Below grade surfaces in contact with soil.
- .3 Shop paint primer:
  - .1 To CISC/CPMA 1 and CAN/CGSB 1.105 for structural steel on the interior of building, exposed to view and without topcoat.
  - .2 To CISC/CPMA 2 and CAN/CGSB 1.40 for any other use of structural steel. Primer shall be compatible with topcoats.
- .4 Clean, prepare surfaces and shop prime structural steel in accordance with CSA S16, CAN/CSA S136, MPI INT 5.1/MPI EXT 5.1 except where members are to be encased in concrete.
- .5 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface to:
  - .1 SSPC SP 2 for structural steel on the interior of building, exposed to view and without topcoat;
  - .2 SSPC SP 7 or SSPC SP 7 (WAB)/NACE WAB 4 for structural steel on the interior of building, exposed to view where topcoat will be applied;
  - .3 SSPC SP 6/ NACE No 3 or SSPC SP 6 (WAB)/NACE WAB-3 for structural steel on the exterior of building.

- .6 Apply one coat to steel surfaces to achieve dry film thickness of 1.5 to 2.0 mils (37 to 50  $\mu\text{m}$ ) for all painted steel surfaces.
- .7 Apply paint under cover, on dry surfaces, when surface and air temperatures are above 5 degrees C.
- .8 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .9 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.
- .10 Unless otherwise indicated, do not apply primer on steel elements to be fireproofed. If, upon approval, primers are used, products shall be compatible with fireproofing product.

### 2.3 GALVANIZATION

- .1 All steel in contact or that may be in contact with aluminium, even if no indication are given on drawings, shall be galvanized. All steel exposed to outside conditions shall be galvanized as well.
- .2 Galvanization of structural steel shall be hot-dip galvanizing.
- .3 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface to SSPC SP 6/NACE No. 3 or SSPC SP 6 (WAB)/NACE WAB 3.
- .4 When welding is required on members that are going to be galvanized, welds shall be continuous (sealed).
- .5 Minimum zinc coating thickness shall comply with tables 1 and 2 of ASTM A 123/A 123M. In general, zinc-coating shall be a minimum of 705 g/m<sup>2</sup>.
- .6 Realize quality control in accordance with ASTM A 123/A 123M.
- .7 Galvanized bolted elements prior to assembly.
- .8 When galvanized steel need to be painted after galvanizing, surface preparation shall comply with ASTM D 6386. In general, use the following method:
  - .1 Do not passivate after galvanizing;
  - .2 Use light manual sanding for surface preparation after galvanizing;
  - .3 Clean surface with a metal conditioner and rust remover;
  - .4 Rinse with pressurized clean water;
  - .5 Paint shall be applied immediately following cleaning.

### 2.4 STORAGE

- .1 Store materials off ground over wood studs or indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area as to prevent rusting.
- .2 Protect structural steel if stored over a long period.
- .3 Replace defective or damaged materials with new ones.

**PART 3 3. EXECUTION****3.1 GENERAL**

- .1 Structural steel work: in accordance with CSA S16 and CAN/CSA S136.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components or both as applicable. Part of the work may be sublet to a division 3 fabricator or erector; however, the Division 1 or 2 fabricator or erector shall retain responsibility for the sublet work.
- .4 Submit certification that welded joints are qualified by Canadian Welding Bureau (CWB).
- .5 Provide to trade responsible for these works templates and steel elements to be embedded into concrete or masonry.
- .6 Ensure galvanic separation (galvanization, neoprene or other) between any steel and aluminium element.

**3.2 FABRICATION**

- .1 Fabricate structural steel in accordance with CSA S16 and CAN/CSA S136 and in accordance with reviewed shop drawings. Structural steel shall be brand-new, free of loose mill scale, rust, oil, dirt and foreign matter.
- .2 Prior to ordering/buying structural steel, final shop drawings shall be approved by the Ministry Representative.
- .3 Do not substitute members without written approval from the Ministry Representative.
- .4 Structural bolt holes shall be drilled or punched. Do not use thermally or manually cut holes. Fastener holes shall be made in accordance with article 28.4 of CSA S16.
- .5 Steel fabrication shall be done in accordance with CSA S16 article 28 for tolerances, especially article 28.6.
- .6 Do not splice steel elements in tension or in the middle third of elements subjected to bending.
- .7 Reinforce openings so as to maintain the original strength of the element.
- .8 For all structural steel exposed to weather conditions, or where indicated on drawings, continuously seal members by continuous welds where indicated. Grind smooth.
- .9 Install shear studs in accordance with CSA W59. Unless otherwise indicated, use 19.1 mm diameter and 152 mm long studs.

### 3.3 CONNECTION TO EXISTING WORK

- .1 When connecting to existing work, prior to preparing shop drawings, verify dimensions and condition of existing work, report discrepancies and potential problem areas to the Ministry Representative for direction before commencing fabrication. Dimensions of steel elements shall be modified to adapt for the existing conditions and modifications shall be submitted to the Ministry Representative for approval.
- .2 For plates anchored to an existing reinforced concrete or masonry element, use the following procedure, under the sole responsibility of the specialized steel contractor:
  - .1 Detect existing reinforcement bars prior to drilling to locate anchors;
  - .2 Use manual percussion drilling to drill anchor loads and protect existing reinforcement.
  - .3 Measure anchor location on site after drilling prior to fabricating steel plates and adapt dimensions as needed without charges.
- .3 For plates anchored to an existing unreinforced masonry element, use diamond drilling to drill anchor as to protect the existing work. The contractor may use a different mean of drilling only if he is able to demonstrate that no damage will occur to the existing work due to drilling. If the contractor uses an alternative mean of drilling, any damage occurring to the existing work following drilling shall be automatically considered his responsibility.

### 3.4 MARKING

- .1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

### 3.5 ERECTION

- .1 Prior to beginning erection, ensure that the certificate of compliance for anchor rods installation has been provided, in accordance with article 3.2.2.3 of section 03 11 00 of the technical specifications.
- .2 Erect structural steel, as indicated and in accordance with CSA S16 and CAN/CSA S136 and in accordance with reviewed erection drawings.
- .3 Steel structure erection and dismantling work shall be done in accordance with Quebec's *Safety Code for the construction industry*, article 3.24 *Steel structure erection or dismantling work*.
- .4 Erection shall be done in accordance with CSA S16 article 29 for tolerances, especially article 29.3.
- .5 Field cutting or altering structural members: to approval of the Ministry Representative.
- .6 Protect galvanized steel against any damage, be it from manipulation, storage, contact with lifting equipment or others. Damaged galvanized elements due to welds, impacts, etc. shall be galvanized anew in accordance with article 2.2.10. If approved by the Ministry Representative, surfaces may be repaired in accordance with ASTM A 780/A 780M.

- .7 Any defect shall be submitted to the Ministry Representative as quickly as possible. The Ministry Representative will determine corrections needed.
- .8 During erection, brace structure to ensure stability and lateral load resistance. Contractor shall use temporary bracing wherever necessary to maintain work integrity and ensure workers safety. Contractor is the sole responsible for determining erection methods and means of temporary bracing.
- .9 Once the structural steel frame has been set in place, adjusted and aligned, tighten bolts and put in place non-shrink grout under the columns as indicated on drawings.
- .10 The only mean of tightening structural bolts authorized is the turn-of-nut method. Refer to article 23.7 of CSA S16 standard and article 15.7.6.1.1 of *Cahier des charges et devis généraux (CCDG)* of Ministère des Transports, de la Mobilité Durable et de l'Électrification des Transports du Québec (MTMDET).
- .11 Twist-off structural bolts to ASTM F 1852 may be used where ASTM F 3125/F 3125M grade A325 structural bolts are specified (or ASTM F 2280 for grade A490 bolts) except for slip-critical assemblies where twist-off structural bolts shall never be used.
- .12 Clean with mechanical brush and touch up shop primer bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .13 Where applicable, verify tension of braces for braces with tensioner and submit inspection report. Contractor shall demonstrate to the satisfaction of the Ministry Representative that the results are conclusive. Verify that the Ministry Representative liberate the breakpoint before overlaying finishes are applied.

### 3.6 THERMAL BREAK

- .1 Where a tubular section or any other similar section passes through the insulated enclosure of the building and/or is in a situation that could create a thermal bridge according to architectural criteria, drill the profile at regular and sufficient intervals in order to allow injecting urethane. The diameter of these injection holes must not exceed 10 mm. For the specification and placement of the urethane, see architectural drawings and specifications.
- .2 For any steel element passing through the insulated enclosure of the building or likely to create a thermal bridge in any other way, provide a connection incorporating thermal break using equipment in accordance with article 2.20.

### 3.7 FIELD QUALITY CONTROL

- .1 The following non-exhaustive list presents elements likely to be inspected *by the independent laboratory of the Ministry Representative is:*
  - .1 Origin of structural steel;
  - .2 Certification of welders and erector;
  - .3 Braces connections and details: all braces assemblies will be inspected;
  - .4 Bolted connections: tension, type, diameter and grade;

- .5 Welded connections: workmanship quality, conformity to drawings and shop drawings requirements, welding quality;
  - .6 Plumbness (verticality) of columns;
  - .7 Studs;
  - .8 Steel deck fastening;
  - .9 General workmanship.
- .2 Origin of structural steel:
- .1 The Inspector shall be able to validate the source of structural steel and its conformity to the specifications.
- .3 Certification of welders and erector:
- .1 The Inspector shall validate certification of erector and welders. Include copies of certification cards in inspection report.
- .4 Bolted connections:
- .1 Inspection shall validate compliance with the requirements of tables 7 and 8 of CSA S16 standard.
- .5 Welded connections:
- .1 Testing laboratory shall inspect all welds visually. Non-destructive testing may be done upon request by the Ministry Representative.
  - .2 Where required, non-destructive tests shall be carried out by mean of: magnetic particle, radiography or ultrasonic testing. The Ministry Representative will determine the method of testing.
- .6 Plumbness (verticality) of columns:
- .1 Inspection shall determine compliance with the requirements of CSA S16 standard article 29.3.3.
- .7 Studs:
- .1 Inspection of studs shall be done in accordance with article 5.5.6.6 of CSA W59 standard, except that at least one in every 100 (rather than 150) stud shall be tested.
- .8 General workmanship:
- .1 General workmanship and conformity to drawings and specifications requirements shall be reviewed. Evaluation by visual inspection shall determine any non-conformity, with special attention to connections, presence of slotted holes not specifically required, presence of reinforcing members for holes and quality of coatings (paints, galvanization) including touch up.
- .9 The Contractor shall cooperate freely to allow testing by providing all the necessary assistance on site required by the testing laboratory. If an item (welding or bolted connection, column, etc.) is deemed defective by the Ministry Representative, another inspection shall be performed on the elements immediately preceding and following the defective item. The Contractor shall assume costs of additional testing. All corrective work required shall be performed, without charges, to the satisfaction of the Ministry Representative.

- .10 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by the Ministry Representative.
- .11 Submit test reports to the Ministry Representative within three (3) days of completion of inspection.
- .12 Any element identified as non-compliant shall be corrected and inspected again. When additional inspections are required to validate corrections on non-compliant elements, the Contractor shall assume the cost of inspection.

### **3.8 FIELD PAINTING**

- .1 Touch up damaged surfaces and surfaces without shop coat with primer identical to shop-applied primer, after preparation to SSPC SP 6/NACE No. 3 or SSPC SP 6 (WAB)/NACE WAB-3. Apply in accordance with CAN/CGSB 85.10 and MPI Architectural Painting Specification Manual.
- .2 Galvanized steel: using a compatible finish product, touch up damaged, welded or cut surfaces, to obtain a uniform coating.
  - .1 Use zinc-rich coating to CAN/CGSB 1.181 and ASTM A 780/A 780M as indicated in article 2.2.13 of this section.
  - .2 Surface to touch up shall be prepared in accordance with SSPC SP 11. Clean surface to expose bare steel.
  - .3 Apply coating by brush.
  - .4 Dry film thickness shall be at least 130  $\mu\text{m}$ .

END OF SECTION



**PARTIE 1. GENERAL****1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM A 53 / A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A 269-08, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3 ASTM A 307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA Group
  - .1 CSA G40.20-13 / G40.21-13, General requirements for rolled or welded structural quality steel / Structural quality steel
  - .2 CAN / CSA G164-18, Hot dip galvanizing of irregularly shaped articles.
  - .3 CSA S16-14, Design of Steel Structures.
  - .4 CSA W48-14, Filler metals and allied materials for metal arc welding (prepared in collaboration with the Canadian Welding Bureau).
  - .5 CSA W59-13 UP4, Welded steel construction (metal arc welding).
- .3 Health Canada - Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .4 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 1.40, Anticorrosive Structural Steel Alkyd Primer
  - .2 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .5 Green Seal Environmental Standards (GS)
- .6 National Association of Architectural Metal Manufactures (NAAMM)
  - .1 AMP 510-92, Metal Stair Manual.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit the required documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data sheets
  - .1 Submit required data sheets and manufacturer's instructions and documentation for the proposed profiles, plates, pipes, tubes and bolts. Data sheets must indicate product characteristics, performance criteria, size, limitations and finish.

- .2 Submit two (2) copies of Material Safety Data Sheets (MSDS) required by WHMIS, in accordance with Section 01 35 29.06 - Health and Safety Requirements.
  - .1 For coatings, primers, paints and other finishes applied on work site, indicate the VOC content (in g/l).
- .3 Sealed Shop Drawings
  - .1 Shop drawings must indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details and accessories.
  - .2 Take into account all related work when preparing shop drawings. Perform coordination necessary to avoid any conflict.
  - .3 The shop drawings must bear the seal and signature of a structural engineer, of recognized competence in the field of the external envelope, and member of the Ordre des ingénieurs du Québec.
    - .1 This seal certifies that the design of the support elements ("Z" bars) and the ventilated steel plate facade system meets the requirements of the applicable contract documents and codes of laws.

### **1.3 CALCULATION CRITERIA**

- .1 All fasteners must be designed to withstand overloads in the vertical and horizontal directions as required by the NBC.
- .2 The dimensions provided in the documents are advisory only. They must be verified, signed and sealed by an engineer, member in good standing of the Ordre des ingénieurs du Québec.

### **1.4 QUALITY ASSURANCE**

- .1 Test reports: Submit certified test reports showing compliance of products, materials and equipment with specified physical properties and performance criteria.
- .2 Certificates: Submit Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

### **1.5 TRANSPORT, STORAGE AND HANDLING**

Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.

- .1 Delivery and Acceptance: Deliver materials and equipment 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 equipment so that they do not sit on the floor, in a dry, clean, well-ventilated, indoor area, as recommended by the manufacturer.
- .2 Replace damaged materials and equipment with new materials and equipment.

## **1.6 MEASUREMENT**

- .1 Verify all existing dimensions, clearances and spacings on work site prior to all shop fabrication.
- .2 Notify the Departmental Representative of any significant changes from the verified shop drawings.

## **1.7 PROTECTION**

- .1 The exposed surfaces of stainless steel elements must be covered with a strong self-adhesive paper or peelable plastic film prior to shipping the items to the work site. Surfaces should be removed from their protective coating only at the time of final cleaning of the building. Provide the instructions necessary to remove the protections.
- .2 Special attention will be given to exposed "galvanized finish" elements to prevent these parts from being damaged during transport and installation. These units must have a uniform appearance without stains, without brand identifications, etc. The aesthetic quality of the appearance of these units is very important and the Architect will be demanding on the result.

## **PARTIE 2. PRODUCTS**

### **2.1 MATERIALS/MATERIALS**

- .1 Steel profiles and plates: 300W grade, to CSA G40.20 / G40.21.
- .2 Grade 304 stainless steel profiles and plates, commercial quality.
- .3 Steel Pipe: To ASTM A53-99b standards, standard weight, galvanized Type E, Grade A, seamless.
- .4 Steel tubes: according to CAN / CSA-G40.20 / G40.21 standard, 300W, square or rectangular, of configuration and dimensions according to the indications or according to the nature of the work.
- .5 Welding:
  - .1 Welding materials: CSA W59 compliant
  - .2 Welding electrodes: to CSA W48 series standards.
- .6 Bolts, fasteners and anchors
  - .1 Bolts and anchor bolts: to ASTM A307
  - .2 High strength bolts when required: to ASTM A325

- .3 Exposed fasteners must be compatible with material that they cross or to which they are attached, and with the same finish.
- .4 Provide all fasteners required for the proper manufacture of the works
- .7 Grout: non-shrink, nonmetallic, fluid, having a strength of 15 MPa and a tensile strength of 7.9 MPa at 24 hours.
- .8 Any other steel element required to complete the work.

## **2.2 METAL FABRICATIONS - GENERAL**

- .1 Structures must be straight, square, true to line and conform to specified dimensions; joints must be tight and properly secured.
- .2 Unless otherwise specified, only shake-proof fasteners must be used for screwed connections or as indicated.
- .3 Whenever possible, the structures must be adjusted and assembled in the workshop and delivered ready to be erected.
- .4 Exposed welds must be continuous over the entire length of the joint; they must be ground smooth and flush with adjacent finished surfaces.
- .5 Bend the stainless steel shapes so that the edges are clean, straight and precisely formed.
- .6 Each element will be made in one piece. The corners will be sharp and precise.
- .7 Hide fasteners when possible.
- .8 Unless otherwise indicated the visible mechanical fasteners will be screws or Torx bolts with point located in discreet places in respect of the design.
- .9 Stainless steel surfaces must be free of warping, indentations, dents, and other defects.

## **2.3 FINISH**

- .1 Stainless steel: to ASTM A167-99A, grade 304, brushed finish #4 according to ASTM A167.
- .2 Galvanization: 600 g/m<sup>2</sup> hot dip galvanizing process according to CAN/CSA-G164.
- .3 Factory applied primer: According to CAN/CGSB 1.40.
- .4 Zinc primer: Zinc rich paint, prepared to CAN/CGSB-1.181.

## **2.4 INSULATION COATING**

- .1 Aluminum members and surfaces must be isolated from the materials listed below using bituminous paint.

- .1 Metallic members and surfaces of different types, except stainless steel, zinc and small white bronze members and surfaces.
- .2 Concrete, mortar and other masonry materials.
- .3 Wood.

## **2.5 SECURITY ANCHORS**

- .1 All equipment and accessories provided for in this project must be anchored with secure and tamper-proof fasteners.
- .2 All accessories in concrete must be fastened using HILTI "HVA" or HIT HY 150 chemical anchors for lighter work.
- .3 In concrete blocks, all accessories must be fastened using HILTI HIT HY 20 adhesive, for masonry work.
- .4 In all secure inmate detention areas: Use concealed fasteners or Torx point screws where fasteners are exposed.
- .5 Bolts and Anchor Bolts: See ASTM A325, Type 1 Aluminum Carbon Aicer Bolts, Galvanized Finish; ASTM A194, Grade 2H nuts, galvanized finish; ASTM F436, Type 1 washers; ASTM A307, prison manufacturing.

## **2.6 SHOP PAINTING**

- .1 Primary: VOC content up to 250 g/L according to GS-11.
- .2 Surfaces must be cleaned according to the instructions in Volume 2 of the Steel Structures Painting Council manual.
- .3 Metal members, unless they are galvanized or bedded in concrete, must be coated with one (1) layer of primer applied in the shop.
- .4 Surfaces inaccessible after assembly must be coated with two (2) layers of distinctly coloured sealer.
- .5 The primer must be used as supplied by the manufacturer, without any modification. It must be applied to dry surfaces, free of rust, grease and deposits, at a temperature of at least 7 degrees Celsius.
- .6 Surfaces to be welded on site must be cleaned and must not be painted.
- .7 For the painting of metal parts, see section 09 91 23 - Painting - Interior Work.

## **2.7 SAS AND MESH DOOR**

- .1 Supply and install a mesh airlock made of 10 x 38 mm steel bars, fully welded, in painted steel

- .2 Intermediate flat frame elements, 10 x 38 mm, in painted steel
- .3 10 x 38 mm curved steel bar to paint
- .4 Hardware, see section 08 71 00 - Door Hardware
- .5 Install 10 mm steel plates for the installation of the hardware, according to the indications on drawings
- .6 Any other element described in the drawings.
- .7 Fully welded. See drawings for dimensions.

## **2.8 WINDOW PROTECTION GRID (tower)**

- .1 Construct and install protective grids, in front of each new windows, of hot-dip galvanized steel, of profiles as indicated on the drawings, shaped to the shapes and dimensions indicated.
  - .1 The grids must be made of galvanized steel tubes. To paint.
  - .2 The exposed ends of the protective grids must be closed and welded.
  - .3 End flanges should be used to secure the protection grids to the walls.
  - .4 Bars to be configured so that free space between two bars is never greater than 140 mm.
  - .5 Continuous deep penetration arc welds to be made at all meetings. Remove weld spatter and grind to obtain a smooth finish.
- .2 Protective grids must be galvanized once assembled.
- .3 See section 09 91 99 for the paint system to use.

## **2.9 GALVANIZED STEEL CLADDING (tower)**

- .1 Cladding boards: Smooth surface class, for vertical installation, in accordance with CGSB 93.4.
  - .1 Finish: F1S category
  - .2 Color: at the discretion of the Departmental Representative.
  - .3 Finish: little shine.
  - .4 Thickness of bare metal: 3 mm
  - .5 Insulating filler element: polyurethane, as indicated in the drawings, see prescriptions in section 07 21 29.03 - Insulation spray - polyurethane foam.
  - .6 Profile: shaped interlocking edge boards pre-drilled to receive fasteners.
- .2 Soffit: smooth surface category, perforated, in accordance with CGSB 93.4.
  - .1 Finish: F1S category

- .2 Color: at the discretion of the Departmental Representative.
  - .3 Finish: little shine.
  - .4 Thickness of bare metal: 3 mm
  - .5 Insulating filler element: polyurethane, as indicated in the drawings, see prescriptions in section 07 21 29.03 - Insulation spray - polyurethane foam.
  - .6 Profile: shaped interlocking edge boards pre-drilled to receive fasteners.
  - .7 Perforations: as shown in the drawings.
- .3 Exposed trim (interior and exterior trim moldings)
- .1 Finish: F1S category.
  - .2 Color: at the discretion of the Departmental Representative.
  - .3 Finish: little shine.
  - .4 Thickness of bare metal: 3mm.
  - .5 Dimension and profile: see drawings.
- .4 Accessories :
- .1 Exposed trim: interior and exterior corners, counter flashings, trim strips, bibs, star strips and window frames should be of the same material as the cladding, and be pre-drilled to receive the fasteners.
- .5 Fasteners:
- .1 Nails and screws must comply with CSA B111 and ANSI B18.6.4, respectively. Special fabrication, these fasteners must be stainless steel.

## **2.10 SUB-GIRT**

- .1 "Z" or "J" bars in galvanized steel. Provide "L" galvanized steel wire stiffeners the width of the "Z" bar, if required. Spacing as shown in the drawings.
- .2 All horizontal and vertical "Z" sub-entremises must be adjustable and perforated (horizontal only), and must be Z-275 zinc coated (G-90) grade A steel.
- .3 Caliber of the sub-girts to be according to the load and the calculations of the engineer. The caliber must be signed and sealed by an engineer, member in good standing of the Ordre des ingénieurs du Québec.
- .4 Attachment faces to be 50 mm, in length and maximum effective depth according to the dimensions and spacing in the drawings, maximum assembly deflection of  $L / 180$ .

## **2.11 FIXED TABLES AND BENCHES**

- .1 Made entirely of stainless steel. Assemble by welding as much as possible.
- .2 3 mm stainless steel table top on 25 x 50 x3 mm HSS frame and 25 x 25 x 3 mm angles

- .3 Stiffeners: steel plates 150 x 150 x 6 mm Quantity: 4
- .4 Bench: in 6 mm stainless steel, fixed to a 6 mm steel plate welded to an HSS
- .5 Dimensions and assemblies as described on the plans.

## **2.12 HEATING CABINET DUCT PROTECTOR**

- .1 Paintable steel, 20 gauge Dimensions as indicated in the drawings
- .2 Position to coordinate with mechanical documents

## **2.13 PAINTED STEEL INTERIOR WALL CLADDING**

- .1 In the places indicated on the plans, cover the walls with 20 gauge painted steel panels, on concrete panels.
- .2 Construction adhesive to bond stainless steel sheets to concrete panels such as LEPAGE, PL PREMIUM. Adhesive should be used according to the manufacturer's recommendations.
- .3 Provide tamperproof mechanical fasteners to help with adhesion. To be approved by the Departmental Representative beforehand.

## **2.14 FINISH OF WELDING AREAS (STAINLESS STEEL)**

- .1 If the polishing lines are parallel to the weld line, grind the weld with a rough or soft wheel and then finish the polishing with a disc polisher fitted with sandpaper #80 or #120. Keep the disc in line with the weld so that the polish lines are parallel to those of the original polish.
- .2 Take care to bring the metal of the gasket to the same level as the base metal to avoid residual ridges or grooves. Since the gauge of the sandpaper will leave varying lines with use. Take separate samples before proceeding with the final polishing.
- .3 If the original polish lines are not parallel to the weld line, do the final polish in the direction of the original polish. If the original polish lines are not in the same direction on either side of the weld, do the final polish in the direction of the weld.
- .4 When polishing is done by hand, back the sandpaper against a block of wood and guide yourself along the weld line of the joint.

## **PARTIE 3. EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of conditions: before proceeding with installation of metal elements, ensure

that the condition of the surfaces / supports previously installed under other sections or contracts is acceptable and allows the work to be carried out in accordance with the written instructions from the manufacturer.

- .1 Visually inspect surfaces / substrates in the presence of the Departmental Representative.
- .2 Inform the Departmental Representative of any unacceptable conditions immediately upon discovery.
- .3 Do not proceed with work until unacceptable conditions have been corrected.

### **3.2 INSTALLATION**

- .1 Perform welding work in accordance with CSA W59, unless otherwise specified.
- .2 Welding companies must be certified either under the provisions of Division 1, or pursuant to section 2.1 of CSA W47.1 in the case of fusion welding or CSA W55.3 in the case resistance welding.
- .3 Provide a certificate that all welded joints are certified by the Canadian Welding Bureau.
- .4 Erect metalwork square, plumb, straight and true, accurately fitted, with tight joints and intersections.
- .5 Provide and install secure and tamper-proof anchors approved by the Architect and Correctional Service Canada, such as studs, staples, anchor rods, bolts and expansion bushings, wing bolts, and rocking anchors. Exposed fasteners must be compatible have the same finish as the material they pass through or are attached to.
- .6 Provide necessary components for work done by sub trades, in accordance with the nomenclature and submitted shop drawings.
- .7 Perform on site connections using bolts according to CSA S16 standard or by welding.
- .8 Deliver jigs and parts to be bedded in concrete and embedded into masonry to the appropriate location.
- .9 Spot prime rivets, welds, bolts and burnt or scratched surfaces, after completion of erection.
  - .1 Primer: VOC content up to 250 g/L, according to GS-11.
- .10 Touch-up galvanized surfaces with zinc primer where burned by field welding.
  - .1 Primer: VOC content up to 250 g/L, according to GS-11.

### **3.3 INSTALLING THE STEEL CLADDING ON THE TURRET**

- .1 Install exterior finishes in accordance with the requirements of CGSB 93.5 and the written instructions of the manufacturer.
- .2 Continuously lay out starter strips, interior corner pieces, curbs, soffits, bibs, flashings

and sills and window bay flashings and trims as indicated.

- .3 Carefully place exterior angle pieces, filler pieces and closure pieces so as to obtain a well-shaped and contoured work.
- .4 Lay the soffits as shown in the drawings.
- .5 Make sure the joints of the exterior cladding are perfectly aligned and butted.
- .6 Fix units in such a way that they do not interfere with the thermal movements of contraction and dilation.
- .7 Caulk joints between adjacent parts and structures with sealant in accordance with Section 07 92 00 - Joint Sealants.

### **3.4 CLEANING**

- .1 Nettoyage en cours de travaux : effectuer les travaux de nettoyage conformément à la section 01 74 00 - Cleaning.
- .2 Leave work site clean at the end of each day.
- .3 Final Cleaning: Remove surplus materials, rubbish, tools, and equipment from work site in accordance with Section 01 74 00 - Cleaning.
- .4 Clean metal structures as soon as possible after installation to remove dust from construction work or the surrounding environment.
- .5 Waste Management: Sort waste for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .6 Remove bins and recycling bins from site and dispose of materials at appropriate facilities.

### **3.5 PROTECTION**

- .1 Protect equipment and installed elements from damage during work.
- .2 Repair damage caused by metalwork installation to adjacent materials and equipment.

**END OF SECTION**

**1 GENERAL****1.01 RELATED SECTIONS**

- .1 Section 05 50 00 – Metal fabrication
- .2 Section 07 21 29.03 – Sprayed Insulation
- .3 Section 07 52 00 – Membrane sealing
- .4 Section 07 62 00 – Sheet Metal flashing and trim
- .5 Section 07 92 00 – Joint sealants
- .6 Section 08 11 15 – Secure steel door and frames
- .7 Section 08 50 00 – Aluminium windows

**1.02 REFERENCES**

- .1 CSA B111 1974 (R1998), Wire Nails, Spikes and Staples.
- .2 CAN/CSA G164 FM92 (C1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA O121 FM1978 (C1998), Douglas Fir Plywood.
- .4 CAN/CSA O141 F91 (C1999), Softwood Lumber.
- .5 CSA O151 FM1978 (C1998), Canadian Softwood Plywood.
- .6 CAN/CSA-O80 SERIES-08 (R2012) CONSOLIDATED - Wood Preservation
- .7 CAN/CSA O325.0 F92 (C1998), Construction Sheathing.
- .8 ASTM D-3201, Standard Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Based Products
- .9 NLGA Standard Grading Rules for Canadian Lumber, 2000.

**1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit samples in accordance with Client's general conditions and as specified.

**1.04 QUALITY ASSURANCE**

- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood in accordance with CSA standards.

**1.05 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Pile wood in separate rows separated by sticks to enable air circulation.
- .3 Store prefabricated works in ventilated area protected from humidity or extreme temperature variations.

**2 PRODUCTS****2.01 CONSTRUCTION LUMBER**

- .1 Wood other than what is specified in Engineering.
- .2 Structural timber: Unless otherwise indicated, must be softwood, S4S finish (surfaced all four sides), moisture content not exceeding 19 %, and in accordance with:
  - .1 ACNOR O141;
  - .2 NLGA, (Standard Grading Rules for Canadian Lumber), 1987 edition.
- .3 Furrings, spacers, nailing strips, nailing base, nailing, subframes, battens.
  - .1 S2S finish elements are acceptable.
  - .2 Dim wood: light framing classification, standard or superior category.
  - .3 Boards: Standard or superior category.
- .4 MSR lumber based on acceptable constraint for all work.
- .5 Abutting glued elements (finger-jointed) are not acceptable.

**2.02 PANELS**

- .1 Canadian softwood plywood: according to CSA standard O151, classification "construction", "standard" grade.
- .2 Lightweight concrete panels : composite fiber cement panel consisting of Portland cement compound reinforced with synthetic fibers and additives, such FINNEX panel or approved equivalent.

**2.03 ACCESSORIES**

- .1 Joint sealing tape: self-adhesive, air-tight adhesive tape of the type recommended by the manufacturer of the vapor barrier, 75mm wide.
- .2 Screen door: stainless steel, opening percentage 44%.

**2.04 FASTENERS**

- .1 Nails, spikes and staples: to CSA B111 standard.

- .2 Nails for bridging (existing boards and new plywood): twisted nails 4.05mm in diameter x 86mm in length, for pneumatic nailer.
- .3 Bolts: with nuts and washers and, unless otherwise stated, 12.5mm diameter.
- .4 Proprietary fasteners: rocker bolts, expansion pads with lag screws, lead sleeves or inorganic fiber sleeves with screws, approved by the Departmental Representative.
- .5 Fasteners: galvanized steel for outdoor elements, and interior elements in very humid places. Galvanization compliant with ACNOR G164 standard.
- .6 All Purpose Adhesive: to CSA O112 series standards.
  - .1 VOC content of no more than 140 g / L.
  - .2 According to the requirements of the cladding's manufacturer.

## **2.05 PAINT**

- .1 See section 09 91 23 – Interior Painting.

## **3 EXECUTION**

### **3.01 EXAMINATION**

- .1 Vérifier si les supports et les ouvertures murales sont prêts à recevoir les éléments. S'assurer que les supports sont de niveau, d'aplombs, solides et aptes à recevoir les éléments.
- .2 Report all defects to Professional. Proceed with installation only after unacceptable conditions have been remedied.

### **3.02 MANUFACTURER INSTRUCTIONS**

- .1 Comply with written manufacturer requirements, recommendations and specifications, including all technical bulletins available, handling, storage and application instructions of products, and information on data sheets.

### **3.03 ASSEMBLY OF ELEMENTS**

- .1 Comply with the requirements of Part 9 of the NBC 2005 Edition and the following requirements.
- .2 Install elements according to the lines, elevations and levels indicated.
- .3 Construct the continuous members from pieces of longest practical length.

- .4 The curved side of the members resting on the support points of the frame must be at the top of the element.
- .5 Install members square and plumb, true to line, levels and elevation.
- .6 Install the joist elements so that their camber is upward.
- .7 Install a waterproof membrane between the wood elements and the masonry or concrete surfaces.
- .8 Assemble, anchor, fasten and brace members to provide the necessary strength and rigidity.
- .9 Countersink where necessary so that bolt heads do not protrude.

### **3.04 TEMPORARY PROTECTION**

- .1 Construct all protective work for workers, such as parapets, ladders, ramps, platforms, tiers, walkways, etc.; Change, move and repair as needed during performance of work in accordance with requirements in of applicable regulations in force.
- .2 Provide and install all temporary partitions and enclosures required to prevent loss of heat, unauthorized intrusion and inconveniences caused by inclement weather, weather variations or dispersion of debris and dust.

### **3.05 ROOF**

- .1 Carpentry work on the roof according to the details of the drawings:
  - .1 Build fascia; install battens, nailing bases, nailing rods, and other wooden supports to receive the cover and secure them.
- .2 Roof framing members must be securely fastened to the underlying frame with galvanized steel bolts, washers and nuts so that they resist the stresses of the roofing elements. Coordinate the installation of these elements with the roof works with which they are intimately connected.

### **3.06 FURRINGS AND SPACERS**

- .1 Install furrings and spacers necessary to remove from wall and support sashes, heating cabinets, wall and ceiling finishing elements, overlays, borders, soffits, sidings and any other type of work.
- .2 Install elements plumb, aligned and level. Maximum admissible deviation is 1:600.

### **3.07 SUBFRAMES AND NAILING BASES**

- .1 Provide and install all filler pieces, subframes and nailing bases required for work from other trades, including for windows, soffits and all other elements requiring solid and rigid fastening.
- .2 Cut and adjust filler pieces and nailing bases to underlying framing elements.
- .3 All elements installed must be verified and accepted by Departmental Representative before being concealed by other work.

**3.08 FASTENERS**

- .1 Assemble, anchor, fasten, attach and brace elements to ensure required solidity and rigidity.
- .2 Unless otherwise indicated, fasteners must be installed in accordance with requirements of part 9 of NBD.
- .3 As needed, countersink holes so bolt heads are below surface.

**3.09 VARIOUS WORK**

- .1 Perform all work necessary for complete performance of project.

**3.10 CLEANING**

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

**3.11 PROTECTION**

- .1 Protect equipment and installed elements from damage during work.
- .2 Repair any damage caused by carpentry work to adjacent materials and equipment.

**END OF SECTION**



**Partie 1      General****1.1      RELATED SECTIONS**

- .1      Section 07 21 13 - Panel Insulation.
- .2      Concrete - See engineering documents.

**1.2      REFERENCES**

- .1      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-37.2-M88 (Withdrawn 2005), Emulsified Asphalt, Mineral-Colloid Type, Unfilled, for Dampproofing and Waterproofing, and for Roof Coatings
  - .2      CAN/CGSB 37.3-M89 (Withdrawn 2005), Application of Emulsified Asphalts for Dampproofing or Waterproofing
  - .3      CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing
  - .4      CGSB 37-GP-10Ma (Withdrawn 2005), Application of Asphalt Lap Cement
  - .5      CGSB 37-GP-15M-76 (Withdrawn 2005), Application of Asphalt Primer for Asphalt Roofing, Dampproofing and Waterproofing
  - .6      CAN/CGSB 37.16-M89 (Withdrawn 2005), Filled, Cutback Asphalt for Dampproofing and Waterproofing
  - .7      CAN/CGSB 37.29-M89 (Withdrawn 2005), Rubber-Asphalt Sealing Compound
- .2      CSA Group
  - .1      CAN/CSA-A123.4- [F04 (C2008)], Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems
- .3      Canadian Construction Materials Centre (CCMC)
- .4      American Society for Testing and Materials International (ASTM)
  - .1      ASTM E96-95, Standard Test Method for Water Vapour Transmission of Materials

**1.3      ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Data sheets
  - .1      Submit manufacturer's instructions, printed product literature and data sheets for bituminous dampproofing application. Data sheets must indicate product characteristics, performance criteria, size, limitations and finish.

- .2 Submit the required data sheets in accordance with Section 01 33 00 Submittal Procedures.
- .3 Provide manufacturer's instructions when work requires special handling, installation procedures or cleaning methods.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Transport, store and handle materials and equipment in accordance with 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 Store materials off ground in a dry place, protected from the elements.
- .4 Store materials on supports in such a way as to avoid any deformation.
- .5 Remove from the storage area only the quantity of materials that will be used on the same day.
- .6 Store materials in accordance with manufacturers' written instructions.
- .7 Replace damaged materials and equipment with new materials and equipment.

#### **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Sort waste for reuse and recycling.
- .2 Remove all packaging materials from the site and forward to appropriate recycling facilities.
- .3 Ensure that empty containers are sealed and stored properly, out of the reach of children, for disposal.
- .4 Fold metal strapping, flatten and place in the designated area for recycling.
- .5 Send bituminous dampproofing, sealants and bituminous impregnation products to an appropriate recycling facility.

#### **1.6 SITE CONDITIONS**

- .1 Ambient conditions: temperature, relative humidity and moisture content.
  - .1 Apply dampproofing products only when the ambient temperature and the temperature of the surfaces to be treated are within the limits prescribed by the manufacturer.
  - .2 Do not proceed with the installation when a cold wind could prevent proper curing of the bituminous product by accelerating its setting.
  - .3 Maintain ambient temperature and surface temperature to be waterproofed above

- 5 degrees Celsius during the 24 hours preceding application of the dampproofing product, during the application and during the next 24 hours.
- .4 Do not apply water repellents in wet weather.
  - .2 Comply with the safety requirements set out in the Workplace Hazardous Materials Information System (WHMIS) with respect to the use, handling, storage and disposal of bituminous products, sealants, primers and impregnation products and caulking products.
  - .3 Ventilation
    - .1 Provide ventilation to the area where the work is carried out as directed by the architect, using portable supply and exhaust fans.
  - .4 Make sure that the surfaces are ready to receive the bituminous water repellent and that the curing of the concrete is complete.
  - .5 The commencement of the work or any part of the work will signify acceptance of the basic work.

## **Partie 2 Products**

### **2.1 MATERIALS**

- .1 Water repellent for foundations, for buildings or sections of buildings without a basement:
  - .1 When the temperature is above +5 °C: waterproofing bituminous emulsion, in accordance with standard CAN/CGSB-37.2, and having the following characteristics:
    - .1 Colour: black
    - .2 Solid content:  $\pm 57\%$
    - .3 Minimum application temperature: + 5 °C
    - .4 Odorless, non-toxic and free from volatile organic compounds
    - .5 Reference product: 700-01 by Henry Bakor or equivalent approved by the architect.
  - .2 When the temperature is below +5 °C: Coating of medium consistency, solvent-based, waterproofing against water and humidity, composed of selected bitumens and fibers and allowing the application in a thick layer, in accordance with the CAN standard/CGSB 37.16-M89 ASTM D4479/4479M, Type 1, and having the following characteristics:
    - .1 Colour: black
    - .2 Solid content:  $\pm 54\%$
    - .3 Reference product: 700-01 by Henry Bakor or equivalent approved by the architect.

**Partie 3 Execution****3.1 EXAMINATION**

- .1 Verification of conditions: before proceeding with the application of bituminous damp proofing, ensure that the condition of the surfaces / substrates previously implemented under other sections or contracts is acceptable and allows the work to be carried out in accordance with the manufacturer's written instructions.

**3.2 PREPARATORY WORK**

- .1 Before proceeding with the installation, perform the following:
  - .1 Seal the exterior joints between the foundation walls and the footings, the joints between the concrete ground slab and the foundation walls, as well as the perimeter of the elements which pass through the surfaces to be dampproofed with a sealant.
  - .2 Seal cracks where the membrane will be applied.
  - .3 Surfaces must be sound and free from frost, grease, formwork oil or other foreign particles. The concrete must be free of burrs, pits or other irregularities.
  - .4 Do not apply to wet surfaces.
  - .5 Determine the type of dampproofing material according to the minimum application temperatures.

**3.3 APPLICATION**

- .1 Follow all manufacturer's recommendations, installation instructions and technical bulletins.
- .2 Application of the dampproofing coating at a temperature above + 5 °C (40 °F)
  - .1 Apply a coat of water-repellent foundation emulsion diluted to 20% with water at a rate of 0.5 l/m<sup>2</sup> (1 gal/100 ft<sup>2</sup>).
  - .2 Appliquer une 2<sup>e</sup> couche d'émulsion hydrofuge pour fondation à raison de 1.0 à 1.5 l/m<sup>2</sup> (2 à 3 gal/100 pi<sup>2</sup>), laissé sécher.
- .3 Unless otherwise specified, apply sealant in accordance with CGSB 37-GP-10Ma.

**3.4 OVERVIEW OF THE WORK**

- .1 Coat with one (1) continuous and uniform coat of dampproofing to the exterior surface of the foundation walls from 150 mm below the final height of the footings, including the top and sides of the footings.
- .2 Apply two (2) additional coats of dampproofing to the vertical surfaces of the corners and to the construction joints, over a width of at least 230 mm on either side of the corners and joints, as well as around the corners and around openings in the feedthroughs over a width of 230 mm.

**3.5 PROTECTION AND CLEANING**

- .1 Protect freshly applied product from rain and water until completely dry.
  - .1 During the work, protect adjacent structures against excessive spraying.
  - .2 Once installation is complete, remove surplus materials and equipment, waste materials, tools and safety barriers from the work site.
- .2 Protect installed products and elements from damage during work.
- .3 Repair damage to adjacent materials and equipment caused by dampproofing application.

**END OF SECTION**



**PARTIE 1      General****1.1            RELATED WORK**

- .1      Concrete, see structural documents.
- .2      Section 07 11 13 - Bituminous Dampproofing
- .3      Section 07 26 00 – Vapour barrier

**1.2            REFERENCES**

- .1      Underwriters Laboratories of Canada (ULC)
  - .1      CAN/ULC-S701.1: 2017, Standard for Thermal Insulation, Polystyrene Boards
- .2      CAN/ULC - S102.2 -07, Surface Burning Characteristics of Floor Coverings and and Miscellaneous Materials and Assemblies
- .3      American Society for Testing and Materials International, (ASTM).
  - .1      ASTM C612-14, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

**1.3            INFORMATIONAL SUBMITTALS**

- .1      Submit the data sheets in accordance with Section 01 33 00 Submittal Procedures.
- .2      Submit a laboratory report of adhesion compatibility between the different products used.

**1.4            DELIVERY**

- .1      Deliver the insulation in the original unopened manufacturer's packaging.

**1.5            STORAGE**

- .1      Store insulation off ground in well-ventilated areas.
- .2      Protect the insulation from ultraviolet radiation by covering it with a light-colored opaque plastic film.

**1.6            WASTE MANAGEMENT AND DISPOSAL**

- .1      Sort and recycle waste according to Section 01 74 10 - Construction Waste Management And Disposal.
- .2      Remove all packaging materials from the site and forward to appropriate recycling facilities.
- .3      Recover and sort the packaging and place it in the appropriate bins arranged on site for recycling, in accordance with the waste management plan.

**1.7            SITE CONDITIONS**

- .1      Perform the work of this section when the temperature and relative humidity of the ambient air are within the requirements of the manufacturer's technical bulletin.

**PARTIE 2 Products****2.1 MATERIALS**

- .1 Extruded polystyrene insulation (foundation perimeter and sub-slab): conforms to CAN/ULC-S701, Type 4, rigid, closed cell, with integrated high density skin.
  - .1 Panel dimensions: 600 x 2400 mm, thickness indicated in the drawings;
  - .2 Compressive strength: 210 KPa;
  - .3 Thermal resistance according to ASTM C-177 or ASTM C 518: 0.87 m<sup>2</sup> °C/W/25 mm;
  - .4 Border: rebated;
  - .5 Reference products: STYROFOAM SM FROM DOW or Formular C-300 from Owens Corning or equivalent approved by the architect.
- .2 Polystyrene Insulation Adhesive: Synthetic rubber and solvent based, conforming to CGSB 71-GP-24, Type 2 and having the following properties:
  - .1 Solids content: ± 70%
  - .2 Application temperature: -12 °C to + 40 °C
  - .3 Water vapour permeance: 0.03 perm, and
  - .4 Acceptable product: 230-21 from HENRY-BAKOR inc. or other substitute product recommended by the insulation manufacturer and approved by the architect.

**PARTIE 3 Execution****3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Comply with the manufacturer's requirements, recommendations and specifications, including technical bulletins and installation instructions specified in the product catalogs and packaging cartons, and specifications in the data sheets.

**3.2 QUALITY OF WORK EXECUTION**

- .1 To install insulation under the entire slab surface, lay the insulation staggered over the compacted gravel when the support materials are dry.
- .2 Install the insulation to provide continuous thermal protection to the elements and open spaces of the building.
- .3 Carefully adjust the insulation around ducts and other protrusions.
- .4 Carefully cut and trim insulation so that it fully occupies the free spaces. Make tight joints and stagger vertical joints. Use only insulation boards with edges that are not chipped or broken. Use the largest panels possible to minimize the number of joints.
- .5 Do not cover the insulation before the installation work has been verified by the architect. Following the architect's acceptance, begin installing the vapour barrier according to the recommendations of the estimate and the manufacturer.

**3.3 SUPPORT CHECK**

- .1 Check the substrate on which the insulation will be placed and immediately inform the architect of any detected defect.
- .2 Before starting work, make sure that the substrate is solid, straight, smooth and dry, and that it is free of snow, ice, frost, dust and debris.

**3.4 INSULATION ON EXTERIOR WALLS**

- .1 Lay the panels against the exterior face of the walls, as indicated on drawings.
- .2 Secure with at least 5 screws and washers per panel fixed in jambs.

**3.5 INSULATION ON THE FOUNDATION (OUTSIDE SIDE OF FOUNDATION)**

- .1 Exterior installation: Lay panels against the outside face of the perimeter foundation walls, to at least 2440 mm below the surface of the finished floor, and glue them with adhesive.
- .2 Place adhesive pads the size of a walnut at 150 mm center distance. Once flattened, the balls will be 40 to 50 mm in diameter. Follow the manufacturer's recommendations.
- .3 Push the insulation into place by hand pressing in several places to ensure maximum contact.
- .4 Secure the panels to prevent movement during backfilling.

**3.6 CLEANING**

- .1 Upon completion remove surplus materials, rubbish, tools, equipment and safety barriers.

**END OF SECTION**



**PART 1 General****1.1 REFERENCES**

- .1 CAN/ULC-S702-97, Mineral Fibre Thermal Insulation for Buildings.

**1.2 TECHNICAL DATA SHEETS**

- .1 Submit the technical data sheets in compliance with requirements of Section 01 33 00 – Submittal Procedures.

**PART 2 Products****2.1 INSULATION MATERIALS**

- .1 Mineral fibre thermal insulation :
  - .1 In accordance with CAN/ULC-S702 standards, mineral fibre thermal insulation, for buildings;
  - .2 Thermal resistance ( $m^2 K/W$ ) : 3.5 / 152mm thickness;
  - .3 Reference product : Pink inorganic Fiberglass thermal insulation, preformed batt without membrane such as FiberGlas EcoTouch Insulation by Owens Corning or approved equivalent.

**PART 3 Execution****3.1 INSTALLATION OF INSULATION**

- .1 Install the insulation in such a way as to ensure continuous thermal protection for the components and empty construction spaces of the building.
- .2 Do not compress the insulation to make it fit in the spaces to be insulated.
- .3 Do not cover the insulation until the installation work has been inspected and approved by the ministerial representative.

**END OF SECTION**



## **1 GENERAL**

### **1.01 RELATED SECTIONS**

- .1 Section 05 50 00 – Metal fabrications
- .2 Section 06 10 00 – Carpentry.
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim
- .4 Section 08 11 16 – security steel doors and frames
- .5 Section 08 50 00 – Aluminium windows

### **1.02 REFERENCES**

- .1 Canadian Urethane Foam Contractors' Association (CUFCA)
- .2 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC S101 89, Standard Methods of Fire Tests of Building Construction and Materials.
  - .2 CAN/ULC S102 1988 C2000, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  - .3 CAN/ULC S705.1 01, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification. Includes Amendment 1.2.
  - .4 CAN/ULC S705.2- Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application .
  - .5 CCMC 13244-L, Spray-Applied Rigid Polyurethane Foam Insulation.
  - .6 AIR INS inc. Report AS-00201-A Water Vapour Transmission
  - .7 AIR INS inc. Report A1-02627-A Air Barrier
  - .8 GREENGUARD Certification level, school and child

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit product descriptions, samples and data sheets in accordance with Client's general conditions.

### **1.04 QUALITY ASSURANCE**

- .1 Applicators to conform to CUFCA Quality Assurance Program.
- .2 Upon request of Department Representative, apply insulation to a section at least 10 m<sup>2</sup> in size with typical characteristics of entire project; this sample may be part of the final Work.

**1.05 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name, product, expiration date, weight, applicable standards and other instructions or appropriate technical reference.
- .2 Store materials and in accordance with manufacturer's temperature recommendations.
- .3 Remove off-site empty isocyanate and resin containers as specified in CAN/ULC S705.2.

**1.06 SITE CONDITIONS**

- .1 At commencement of work and at all times during performance of work, allow access to site to representative or any other people designated by Departmental Representative so they may provide required technical assistance.
- .2 Perform work from this section when temperature of surfaces and ambient air temperature fall within requirements in the manufacturer's technical bulletin.
- .3 Perform work from this section when relative ambient air humidity is below 80%.
- .4 Prepare surfaces in accordance with CAN/ULC S705.2 and with manufacturer recommendations.

**1.07 PROTECTION**

- .1 Ensure adequate ventilation in zone in which insulation is applied to guarantee safe work environment.
- .2 Ensure protection of workers in accordance with local regulations and manufacturer standards and recommendations.
- .3 Protect adjacent surfaces and material from damage likely to be caused by projection outside planned limits.

**2 PRODUCTS****2.01 ENVIRONMENTAL REQUIREMENTS**

- .1 Product must not contain any CFCs and HCFCs and no Ozone-depleting Substances, ZERO ODS.
- .2 Product must comply with GREENGUARD certification, level, school and child requirements.

## 2.02 MATERIALS

- .1 On Site Foamed Insulation: Thermal insulation made of closed cell spray polyurethane foam, made from recycled plastic; compliant with CAN / ULC S705.1-01, and having the following characteristics:
  - .1 Thermal resistance at 90 days / 23° C: RSI 1.05 by 25 mm
  - .2 Airtightness (25 mm): 0.00004 L / (s • m<sup>2</sup>) @ 75 Pa
  - .3 OACS content: 0
  - .4 Flame Spread (CAN / ULC-S102.2): <500
- .2 Primer: Compliant with insulation manufacturer's recommendations, considering the nature and condition of the surfaces of the structures to be insulated.
- .3 Oily metal surface primer: according to the manufacturer's recommendations.
- .4 Membrane Primer: As recommended by the membrane manufacturer.

## 3 EXECUTION

### 3.01 APPLICATION

- .1 Apply insulation to clean surfaces in accordance with CAN/ULC S705 and manufacturer's printed instructions. Use primer where recommended by manufacturer.
- .2 Apply insulation to areas shown in plan details to ensure uniform thermal insulation of building elements.

### 3.02 VERIFICATION

- .1 Verify whether work already performed is in a condition to receive work described in this section. Report any anomaly or non-concordance. Only undertake work once corrective actions have been taken.
- .2 To provisions of CAN/ULC S705.2 and following requirements, verify these conditions:
  - .1 Surfaces that must be covered with thermal foam insulation must be free of excess humidity, frost, oil, rust and any other foreign matter that could have a negative impact on the product's adherence. In case of doubt, apply primer.
  - .2 Ensure the complete curing of substrates: concrete, mortar, sealers, membranes, primers or any other potential surfaces, before spraying foam.
  - .3 Ensure adherence of membranes and sealers to various substrates is adequate by taking into account weather conditions for applying membranes, sealers and spray insulation.
- .3 Respect acceptable humidity levels for the different materials.
- .4 In the event of particular conditions, report situation in writing and follow manufacturer recommendations.
- .5 Ensure that all work that must be completed before application of insulation is completed.

**3.03 INSTALLATION**

- .1 Follow recommendations of CAN/ULC S705.2 with regard to use of primer.
- .2 Apply insulation to clean and dry surfaces when weather conditions comply with prescriptions of CAN/ULC S705.2 and manufacturer instructions.
- .3 Spray insulation in successive layers at least 15mm thick each in order to obtain a minimum total thickness indicated in drawings.
- .4 Do not spray insulation closer to 75 mm (3 in) from chimneys, vapour conduits, built-in light fixtures and other heat sources.

**3.04 TOLERANCE**

- .1 Apply product to have a total average thickness (9 readings on a 1 m<sup>2</sup> surface) of  $\pm 6$ mm based on specifications in drawings. Perform at least one test every 150 m<sup>2</sup> of sprayed surface.
- .2 Apply insulation to ensure that insulating value is uniform across entire surface, as stipulated in NBC 1995 article 9.25.2.3. 1).

**3.05 FIELD QUALITY CONTROL**

- .1 Upon request of consultant, manufacturer must prepare field quality control report.

**3.06 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
  - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.

**END OF SECTION**

**PARTIE 1 General****1.1 RELATED WORK**

- .1 Structure documents
- .2 Section 06 10 00 - Carpentry
- .3 Section 07 21 13 - Panel insulation

**1.2 SUBMITTAL PROCEDURES**

- .1 Submit required data sheet indicating product characteristics and performance criteria.
- .2 Submit work samples in accordance with Section 01 33 00 - Submittal Procedures.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Transport, store and handle materials and equipment in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
- .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 equipment so that they do not sit on the ground in a clean, dry, well-ventilated area, as recommended by the manufacturer.
  - .2 Replace damaged materials and equipment with new materials and equipment.

**PARTIE 2 PRODUCTS****2.1 SHEET VAPOUR BARRIER UNDER SLAB**

- .1 Under slab vapour barrier conforming to ASTM E 1745 Classes A, B and C:
  - .1 Maximum rate of moisture transfer in the slabs: 1.45 kg/100 m<sup>2</sup>/24 hours
  - .2 Thickness: 15 mm
  - .3 Water vapour permeance (ASTM E 96): 0.018 perm
  - .4 Tensile strength (ASTM E 154): 14.7 N mm (84 lb/in)
  - .5 Puncture resistance (ASTM D 1709): 4394 g

**2.2 SELF-ADHESIVE VAPOUR BARRIER**

- .1 Self-adhesive vapour barrier with non-asphaltic adhesive underside and reinforced surface of woven polypropylene laminated with non-woven polyester:
  - .1 Thickness: 0.6 mm
  - .2 MD/XD tensile strength (ASTM D5147): 12.3/12.4 Kn/m

- .3 Elongation at Break MD/XD (ASTM D5147): 25%/26%
- .4 MD/XD Tear Strength (ASTM 1970): 467/552 N
- .5 Low temperature flexibility (ASTM D514): - 35 °C
- .6 Puncture resistance (Muller Burst D751-95): 1034 kPa
- .7 Air permeability (ASTM E283): <0.001 L / (s.m<sup>2</sup>)
- .8 Water vapour permeability (ASTM E96-B): 0.012 perms
- .9 Resistance to water infiltration (ASTM D1970): passed
- .10 Application in cold weather: - 15 °C
- .11 Reference product: Lexcor Permate Stick or approved equivalent.

### **2.3 ACCESSORIES**

- .1 Joint sealing tape for under slab vapour barrier: self-adhesive, air-tight adhesive tape of the type recommended by the manufacturer of the vapour barrier, 75 mm wide.
- .2 Self-adhesive vapor barrier primer/adhesive: Lexcor Multigrip, as recommended by the manufacturer.
- .3 Sealants: in accordance with the requirements of section 07 90 00 - Sealants for joints.

## **PARTIE 3 EXECUTION**

### **3.1 INSTALLING UNER SLAB VAPOUR BARRIER**

- .1 All mechanical, electrical or other works in the ground must have been carried out or accepted by the competent authorities before starting the installation of the vapour barrier.
- .2 Lay the vapour barrier under the new sections of the concrete floor slab. Overlap joints at least 300 mm between new sheets and adjacent existing vapour barrier.
- .3 To minimize the number of joints, use the largest sheets possible.
- .4 Make sure the leaves form a continuous protective barrier. If necessary, repair the perforations and tears with a piece 150mm longer than the perforations and seal.

### **3.2 LAP JOINTS**

- .1 Seal lap joints as follows:

- .1 Attach the first sheet to the support
- .2 Apply a continuous bead of sealant on a solid support, at the location of the joint
- .3 Overlap the neighboring sheet over a width of at least 150 mm and press it firmly against the sealing bead
- .4 Fix sheet to wood support using clips placed on lap joints, opposite the sealing bead
- .5 Make sure the sealing bead is continuous. Smooth out any folds and ripples that form on the sheet where it overlaps the sealant.

### **3.3 SELF-ADHESIVE VAPOUR BARRIER INSTALLATION**

- .1 Install the self-adhesive vapour barrier according to the manufacturer's recommendations.
- .2 The surface of the substrate should be clean, dry, and free of dust. Do not apply if the surface is damp or wet.
- .3 Apply Lexcor Multigrip Primer / Adhesive to the substrate as well as to all membrane overlaps, as recommended by the manufacturer.
- .4 To minimize the number of joints, use the largest sheets possible.
- .5 Make sure the leaves form a continuous protective barrier. If necessary, repair the perforations and tears with a piece 150mm longer than the perforations and seal.

### **3.4 CLEANING**

- .1 After completion of installation and performance monitoring, remove surplus materials and equipment, waste, tools and equipment from the work site.

**END OF SECTION**



**PART 1 General****1.1 RELATED SECTIONS**

- .1 Section 06 10 00 - Carpentry
- .2 Section 07 21 29.03 - Projected Insulation - Polyurethane Foam
- .3 Section 07 92 00 - Joint Sealants

**1.2 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - 1 CAN/CGSB-19.13M-FM87, Sealing Compound, One Component, Elastomeric, Chemical Curing.
  - .2 CAN/CGSB-19.18M-FM87, Sealing Compound, One Component, Silicone Base, Solvent Curing.
  - .3 CAN/CGSB-19.24M, Multicomponent, Chemical-Curing Sealing Compound.
  - .3 CGSB-19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
  - .5 Part 5 of the National Building Code of Canada, Environmental Separation.
  - .6 Sealant and Waterproofer 's Institute - Sealant and Caulking Guide Specification.

**1.3 INFORMATIONAL SUBMITALS**

- .1 Submit the required data sheets in accordance with the requirements of Section 01 33 00 - Submittal Procedures.
- .2 Technical sheets
  - .1 Submit technical data sheets as well as manufacturer's specifications and documentation for each of the specified products. The data sheets must include product characteristics, performance criteria, size, limitations and finish.
  - .2 Submit material safety data sheets required under Material Information System.
  - .3 Provide manufacturer's instructions, including any modifications to specific handling, installation and cleaning procedures.

**1.4 QUALITY ASSURANCE****.1 Qualification**

.1 Applicator: the implementation of materials must be carried out by a company specializing in the execution of the work provided for in this section, (with at least five (5) years of experience, with supporting references).

.1 Installation air and water vapor barrier systems must be approved by the manufacturer.

**.2 Inspection**

.1 At the beginning of the work and at all times during its execution, allow access to the site to the representative or to other persons designated by the manufacturer, so that they can provide any technical assistance required.

**.3 Sample of the work**

.1 Construct a sample of the element in accordance with Section 01 45 00 - Quality Control.

.2 Construct a representative exterior wall panel. The panel must illustrate interface and products and seals between different materials.

.3 The wall panel must be constructed at the location determined by the Departmental Representative.

.4 The sample can be part of the finished work.

.5 Wait twenty-four (24) hours before starting work, to allow the Departmental Representative to inspect the sample of the element.

**1.5 STORAGE AND TRANSPORT**

.1 Transport, store and handle materials and equipment in accordance with Section 01 61 00 - General Product Requirements.

.2 Transport, store and handle materials and equipment in accordance with manufacturer's written instructions.

.3 Store primers at a temperature above + 5 °C to facilitate application. Keep any product containing solvents away from open flames and sources of excessive heat.

.4 Store materials delivered in rolls upright, overlapping edge up.

.5 Evacuate from the site any material that has been altered, exposed to bad weather or with corrugated, torn or crushed parts. Any defective material, even if it has already been installed, will be refused and must be immediately removed and replaced, regardless of the area involved.

**1.6 INSTALLATION CONDITIONS**

- .1 Make sure that the substrates and the work already carried out are in condition to receive the works described in this section. Report any anomaly or mismatch to the Departmental Representative. Do not start work until corrective measures have been taken. Make sure that the surfaces to be covered are clean, smooth and dry.
- .3 Apply the plaster only after ensuring that it will be covered after a maximum of six (6) weeks of exposure to open air.
- .4 The commencement of the work or any part of the work means the existing substrates and structures are accepted.

**Part 2 Products****2.1 PRIMERS**

- .1 Primer for self-adhesive membrane on galvanized steel sheet. Rubber-based:
  - .1 colour: blue
  - .2 solids content: 40%
  - .3 application temperature: -12 to 40 °C
  - .4 Reference product: Blueskin LVC primer from HENRY Inc or approved equivalent.

**2.2 MEMBRANE**

- .1 Air / vapor barrier membrane: self-adhesive, consisting of an SBS rubberized bitumen compound laminated to a crossed polyethylene film, and having the following physical properties:
  - .1 color: blue
  - .2 thickness: 1.0 mm
  - .3 minimum application temperature: + 5 °C
  - .4 elongation at break (ASTM D412 modified): 200% minimum
  - .5 resistance of the membrane to rupture (ASTM D412 modified): 3.4 MPa minimum
  - .6 film tensile strength (modified ASTM D412): 40 MPa minimum
  - .7 flexibility at low temperature (CGSB 37-GP-56M): - 30 °C
  - .8 water vapor permeance (ASTM E96): 2.8 ng /Pa m<sup>2</sup>s (0.05 perms)
  - .9 air permeability at 75 Pa (ASTM E283-91): 0.0005 1/sm<sup>2</sup>
  - .10 air permeability after test at 3000 Pa (ASTM E331-89): no change
  - .11 Reference product: Blueskin SA of HENRY Inc or approved equivalent.

**2.3 SEALANT**

- .1 Based on synthetic rubber, solvent type, and having the following physical properties:
  - .1 colour: cream
  - .2 solids content: 72%
  - .3 application temperature: from - 12 °C to + 40 °C
  - .4 long-term flexibility (CGSB 71-GP-24M): no breakage
  - .5 water vapor permeance (ASTM E96): 3.2 mm film before drying  $\Psi$  1.7 ng/Pa m<sup>2</sup>s (0.03 perms)
  - .6 air permeability at 100 Pa, applied at a rate of 3l/m<sup>2</sup>: 0.0131/m<sup>2</sup>: 0.0131/m<sup>2</sup>s
  - .7 Reference product: Air-Bloc 21 from HENRY Inc or approved equivalent

**Part 3 Execution****3.1 INSPECTION**

- .1 Ensure that surfaces and conditions are adequate for the work of this section.
- .2 Ensure all surfaces are clean, dry, sound, even, continuous and in compliant with the manufacturer's requirements.
- .3 Report any unsatisfactory conditions to the Departmental Representative in writing.
- .4 Do not start work before deficiencies have been corrected. Beginning work implies that the Contractor accepts the conditions.

**3.2 PREPARATORY WORK**

- .1 Remove loose or foreign matter that might impair adhesion of materials.
- .2 Ensure substrates are free of surface moisture prior to application of membrane and primer.
- .3 Ensure metal closures are free of sharp edges and burrs.
- .4 Prime the surface of the substrates that are to receive adhesives and sealing compounds according to the manufacturer's instruction.

**3.3 INSTALLATION REQUIREMENTS**

- .1 Protection and cleaning:
  - .1 throughout the duration of the present works, protect them as well as the works located nearby; protect adjacent surfaces and materials from excessive spray.
  - .2 regularly and at the end of each working day, clear the site of rubbish and other materials not used or which could interfere with the proper execution of the work.

**3.4 PRIMER**

- .1 Apply primer by roller, brush or sprayer at a rate of up to 6.13 m<sup>2</sup>/L, allow to dry 30 minutes (or longer in cold weather) before laying the membrane.

**3.5 INSTALLATION OF THE SELF-ADHESIVE MEMBRANE**

- .1 Remove protective film and press firmly in place. Overlap the lateral and longitudinal joints for a minimum of 50 mm.
- .2 Press the self-adhesive membrane with a steel or polypropylene roller to ensure contact over the entire surface, including the joints.
- .4 At the end of each working day, seal the end of the membrane at the meeting line with the substrate with the sealant.
- .5 Seal with waterproofing mastic around penetrations and at joints with other building elements acting as air barriers to ensure continuity of waterproofing.

**3.6 PROTECTION OF WORK**

- .1 Protect finished work in accordance with the prescriptions of section 01 61 00 - General Product Requirements.
- .2 Do not permit adjacent work to damage work of this section.
- .3 Protect finished work against bad weather.

**END OF SECTION**



**PARTIE 1      General****1.1            RELATED REQUIREMENTS**

- .1      See engineering documents
- .2      Section 05 50 00 - Metal Fabrications
- .3      Section 06 10 00 - Carpentry
- .4      Section 07 62 00 - Sheet Metal Flashings and Trim
- .5      Section 07 92 00 - Joint Sealants

**1.2            REFERENCES**

- .1      Submit a document issued by a body accredited by the Standards Council of Canada certifying that the proposed waterproofing system meets the requirements of CAN / ULC-S107-M.
- .2      The standards and recommendations contained in the instructions of these associations will be considered as part of this section, unless otherwise stated in this specification. Said recommendations will then become requirements of this specification.
- .3      CGSB-37.56-m 9th version, prefabricated and reinforced modified bituminous membrane for roofing.

**1.3            SUBMITAL PROCEDURES**

- .1      Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Submit data sheets and samples of specified products.
- .3      Illustrate details, materials, finish and thickness of flashings.

**1.4            REQUEST FOR EQUIVALENCE**

- .1      Any request for equivalence concerning the roofing products and systems specified in this section must be submitted to the Departmental Representative in writing at least 5 working days before the closing date and time. These applications must be accompanied by technical sheets demonstrating the equivalence of the products offered and a copy of the Manufacturer's certificate.

**1.5            REFERENCE STANDARDS**

- .1      Submit a document issued by a certified testing laboratory demonstrating that the specified roofing system has been tested to CSA A 123.21-04, Standard Test Method for Dynamic Resistance to Wind Pull-out systems. The test results must demonstrate that the

roof system withstands wind pressures of -1.5 kPa for the current surface, -2.1 kPa at the perimeter and -3 kPa at the corners of the roof.

- .2 Submit a document issued by an organization officially recognized by the Standards Council of Canada which certifies that the proposed waterproofing system meets the requirements of CAN / ULC-S107-03 Fire Resistance Test for Building Materials, Class A.
- .3 CSA B35.3-1962, Tapping and Drive Screws (Slotted and Recessed Head, Threading Forming and Threading Cutting Screws, and Metallic Drive Screws).
- .4 CGSB 37.56-M (9<sup>th</sup> version), Modified bituminous membrane, prefabricated and reinforced for roofing
- .5 CAN4-S102-M83, Standard Method of Testing for Surface Burning Characteristics of Building Materials and Assemblies

## **1.6 QUALIFICATIONS OF THE CONTRACTOR**

- .1 The roofing contractor must, at the time of tenders and during construction, be officially recognized as a roofing contractor authorized by the manufacturer of waterproofing materials, be a member in good standing of the Association des Maîtres Couvresseurs du Québec.
- .2 Only qualified labor, employed by a company with adequate equipment for such work, may perform the work.
- .3 Applicators of weldable membranes must have taken the fire safety course given by the Quebec Fire Prevention Institute, and at least 50% of them must have followed the Safe Welding course developed by the AMCQ.

## **1.7 MATERIALS**

- .1 The materials and work must comply with the relevant requirements contained in the Devis Couvertures manual of the Association des Maîtres Couvresseurs du Québec and the manufacturer of the membrane system.

## **1.8 QUALITY CONTROL OF MATERIALS AND WARRANTIES**

- .1 The inspection of roofing work described in this section and the relevant tests will be performed by the Manufacturer of the membrane system.
- .2 The Manufacturer will have to carry out a preliminary inspection to verify the support to receive the roofing materials, the slopes, the solidity, the cleanliness, the preparation and the approval of the related works such as: walls, parapets, eaves, downspouts, plumbing vents, and any other required work.
- .3 In addition, the supplier must, before the start of the work, check the conformity between the specifications and the manufacturer's minimum requirements in relation to the Soprema "Platinum" warranty, in order to ensure the issuance of the warranty.
- .4 Inspection of the roofing work by the Manufacturer will ensure compliance with the plans and specifications and will include among others the following checks.

- .1 The nature, thickness, weight and number of waterproof membranes.
- .2 Overlap and tightness of member joints.
- .3 Construction of asphalt and metal flashings on walls or control and expansion joints.
- .4 The waterproofness of the base for mechanical, electrical or other equipment on the roofs.
- .5 The flow of rainwater towards the low bridges of the slopes.

## 1.9

### WARRANTY

- .1 After acceptance of the work by the manufacturer of bilayer membranes, the latter will provide a written and signed document guaranteeing that the membranes are free from any manufacturing defects for a period of ten (10) years from the date of membrane installation. This warranty will cover the removal and replacement of defective roof membrane products, including labor. The warranty will be full and complete for the entire warranty period specified. No manufacturer's letter modifying its standard warranty will be accepted, the warranty certificate must reflect these requirements.
  - .1 Such as Soprema's 10 year Platinum warranty.
- .2 This warranty will state that it will repair any leakage in the membrane to restore the roof system to a dry, watertight state to the extent that manufacturing or installation defects have resulted in water infiltration.
- .3 The warranty will cover all repair expenses during the entire warranty period. The warranty must be transferable, at no additional cost, to subsequent purchasers of the building.
- .4 The total warranty period will therefore be ten (10) years, during which time three inspections are scheduled by the Manufacturer and the reports will be sent to the Owner. These inspections will be managed by the Manufacturer and executed in the presence of the Architect.
- .5 Any labor deficiencies noted during these inspections must be corrected at no cost to the Owner. Maintenance remains at the expense of the Owner.
- .6 Provide a written document, signed and issued in the name of the Owner, stating that the sealants in this section is warranted against leakage, cracking, crumbling, loss of adhesion, contraction, loss of consistency and fading of adjacent areas for a period of three (3) years from the date of issue of the Certificate of Work Completion.

## 1.10

### REPRESENTATIVE OF THE MANUFACTURER

- .1 At the beginning of the waterproofing work, a representative of the Manufacturer of waterproofing materials must be present on site.
- .2 The Contractor must allow and facilitate at all times access to the site and on the roofs to any representative of the Manufacturer mentioned above.

**1.11 STORAGE AND HANDLING**

- .1 All materials will be delivered and stored in their original packaging, bearing the manufacturer's name, product name, weight, related standards and any other indication or reference accepted as standard.
- .2 The materials will be properly protected and stored permanently in a dry, ventilated shelter, protected from open flame and welding sparks, and protected from the weather and any harmful substances. Only materials that will be used on the same day will be taken out of this shelter. During the winter, the materials will preferably be stored in a shelter heated to 10° C minimum and taken out as and when they are implemented. If the rolls cannot be stored in a heated shelter, they can be reheated at the time of installation, using a torch.
- .3 Store emulsion adhesives and sealants at a temperature of at least +5° C. Store solvent-based adhesives and sealants at a temperature high enough to provide the malleability required for their application.
- .4 Materials delivered in rolls will be carefully stored upright. Flashings will be stored to prevent wrinkling, twisting, scratching and other damage.
- .5 Avoid the accumulation of materials on roofs, which could, in specific places, compromise the solidity of the structures by imposing to them loads higher than the admissible loads.
- .6 Insulating materials must be protected from daylight, inclement weather and any harmful substances.

**1.12 SITE-SPECIFIC CONDITIONS**

- .1 Do not install roofing materials when the temperature is below -18°C, in the case of a membrane glued by torch welding, or when the temperature is below -10°C, according to the manufacturer's recommendations, in the case of a membrane applied to bitumen with a mop.
- .2 Solvent-based adhesives must be applied at a temperature equal to or greater than -5°C.
- .3 Cover support must be dry, and free of snow and ice. Use only dry materials, and apply them only when weather conditions will not cause moisture penetration into the sealing layers.

**1.13 SITE PROTECTION**

- .1 When transporting roof materials and performing roofing work, protect exposed surfaces of finished walls with canvases to prevent damage. Assume full responsibility for any damage.
- .2 Wherever workers will move or work, and where materials and equipment will be stored, cover the surface of roofs already constructed with 13 mm thick plywood panels. Keep these panels in good condition throughout the work.

**1.14 COMPATIBILITY**

- .1 All materials forming part of the roofing system will be supplied by the same manufacturer and will be compatible with each other. Provide the Architect with a written

statement certifying that the materials and components of the roofing system are compatible with each other.

### **1.15 FIRE SAFETY**

- .1 Observe the safety instructions and applicable local requirements.
- .2 At the end of each working day, use a heat detector gun to detect any fire that may be smoldering. Site organization must allow the presence of the workers at least one hour after the end of the welding work.
- .3 Never solder directly on old dry wood. See the manufacturer's and the AMCQ's fire safety recommendations.
- .4 Care must be taken to ensure the cleanliness of the site and to always have at least one ULC Class A, B and C approved fire extinguisher loaded and in perfect condition throughout the implementation, at least 6 meters from each torch. Observe the safety instructions accompanying the sealant data sheets. Ensure that the location where the torch is placed is not located near flammable or combustible products.

### **1.16 TEMPORARY SEALING**

- .1 Ensure at any break in the work for whatever reason that the roof remains perfectly sealed, both for the protection of roofing materials already installed inside and outside and to prevent any water penetration into the building and any subsequent damage.

## **PARTIE 2 Products**

### **2.1 CARPENTRY**

- .1 See Section 06 10 00 - Rough Carpentry.

### **2.2 SUPPORT FOR VAPOUR RETARDER**

- .1 Support panel with non-combustible fiberglass matt surface, gypsum core treated to withstand moisture, 12.7mm thick, 1220x2440mm.
  - .1 Reference Product: Georgia Pacific Densdeck Panel or Approved Equivalent.

### **2.3 VAPOUR RETARDER**

- .1 Self-adhesive vapour retarder: composed of SBS-modified bitumen and a trilaminar polyethylene woven fabric on the surface with self-adhesive underside, and having the following characteristics:

- .1 Roll format (width x length): 134 " x 3.7 '(4080 mm x 11400 mm)
- .2 Thickness 0.8 mm
- .3 Tensile Strength (ASTM D5147): 54/74 lbf / in (9.5 / 13 Kn / m)
- .4 Elongation at Break (ASTM D5147): 33/25%
- .5 Tear Resistance (ASTM 1970): 95/103 lbf (423/458 N)
- .6 Flexibility Based on Temperature (ASTM D5147) -50°C
- .7 Puncture Resistance (ASTM D5602): 400N (90lbf)
- .8 Air Permeability (ASTM E2178) <0.001 L / S • m<sup>2</sup>
- .9 Permeability to Water Vapor (ASTM E96-B) <0.03 perms
- .10 Reference Product: Soprema Sopravap'R or approved equivalent.

## 2.4 INSULATING MATERIALS

- .1 Polyisocyanurate insulation, in accordance with ASTM C 1289 Type 2, having the following characteristics:
  - .1 Panel Dimensions: 1220x1220mm, straight edges, indicated thickness.
  - .2 Thermal Resistance: RSI of 1.00 for 25mm
  - .3 Reference Products: Soprema Sopra-iso or approved equivalent.

## 2.5 MEMBRANE SUPPORT PANEL

- .1 High performance insulating underlayment panel consisting of an SBS-modified bitumen membrane and a non-woven polyester reinforcement.
  - .1 Total thickness (membrane and panel): 14.9mm
  - .2 Panel size: 915mm x 2440mm
  - .3 Reference product: Soprasmart Iso HD 180 from Soprema or approved equivalent.

## 2.6 MECHANICAL FASTENING OF THE SYSTEM

- .1 Pre-assembled anchors with # 14 self-tapping screws for steel decking and for wood for wood decking, in cadmium steel with flat head, covered with anticorrosive coating with embossed plates of 50mm diameter, galvalume, cal 20, such as approved by FM for the specified system and installed in accordance with ASTM A-123.21
  - .1 Reference Product: Soprema Soprafix System Screws and Inserts or approved equivalent.
- .1 Attachment to metal decking: self-tapping flat head screws, cadmium plated, No. 14, Type A or AB, to CSA B35.3.

## 2.7 MEMBRANES

- .1 Choice of Colors:
  - .1 The granules of the cap membranes will be gray
  - .2 The granules of the base membranes will be gray

- .2 SBS modified bitumen heat-sealing tape 2.5 mm thick and 330 mm (13 ") wide. The upper surface is composed of a composite reinforcement with the film covering its upper surface dissolving during the laying of the cap under the action of the torch and the lower surface thermofusible film.
  - .1 Reference product: Soprema Sopralap tape or approved equivalent.
- .3 Underlayment membrane for curbs and repairs (membrane recovery):
  - .1 Composed of bitumen modified with SBS polymers and a composite reinforcement. The surface is covered with a thermofusible plastic film and the underside is covered with a protective sheet, in accordance with CAN / CGSB 37.56-M 9<sup>th</sup> draft.
  - .2 Reference Product: Sopralene Flam Soprema Stick Equivalent Approved.
- .4 Finishing membrane for the regular part, raised sections and the base membrane:
  - .1 Composed of bitumen modified with SBS polymers and a nonwoven polyester reinforcement. The surface is protected by colored granules and the underside is covered with a heat-sealable plastic film, conforming to CAN / CGSB 37.56-M 9<sup>th</sup> draft.
    - .1 Reference Product: Sopralene Flam 250 Gr of Soprema or approved equivalent.
    - .2 Color: the choice of the Architect among the full range of manufacturers
- .5 Reinforcement membrane for metal flashing and roof periphery:
  - .1 Sheets prefabricated, conforming to CAN / CGSB 37.56-M 9<sup>th</sup> draft, consisting of a non-woven polyester reinforcement and SBS modified bitumen.
  - .2 Reference Product: Sopralene Flam 180 Gr of Soprema or approved equivalent.

## 2.8 OTHER MEMBRANES

- .1 Parapet fascia membrane:
  - .1 Self-adhesive membrane based on SBS modified bitumen for use as underlayment membrane. When required, the LASTOBOND SHIELD HT membrane can be used as an intramural flashing. Its surface, consisting of a complex woven polyethylene, offers excellent anti-slip power.
    - .1 Specified product: Lastobond Shield HT from Soprema or Blueskin PE 200 HT from Henry Bakor or equivalent approved by the Architect

## 2.9 PRIMER FOR SELF-ADHESIVE MEMBRANE AND FOR MEMBRANE LIFTS

- .1 Adhesive primer based on synthetic rubber forming a flame retardant film, having the following characteristics:
  - .1 Solid content ..... ..24% (approx)
  - .2 Density at 20 degrees ..... ..0.79 kg / L
- .2 Reference product: Elastocol stick of Soprema or approved equivalent.

**2.10 FASTENERS**

- .1 Drive screw with 25 mm diameter steel washer head and 3 mm diameter rod. The nails provided by the membrane manufacturer are long enough to sink at least 38 mm into the solid wood supports.

**2.11 SEALING COMPOUND**

- .1 Sealants: SBS modified bitumen, fiber, mineral and solvent based grout sealant in accordance with CAN / CGSB-37.5-M89 and ASTM D4586.
- .2 Reference Product: Sopramastic Soprema or approved equivalent.

**2.12 BULK GRANULES**

- .1 Provide loose granules of the same color as the membranes.

**2.13 FLASHINGS AND METAL TRIM**

- .1 In accordance with Section 07 62 00 - Sheet Metal Flashings and Trim.

**PARTIE 3 Execution****3.1 QUALITY OF EXECUTION**

- .1 Unless otherwise indicated, complete the covering in accordance with the relevant instructions in the "Devis, couvertures" document of the Association des Maîtres Couvresseurs du Québec (AMCQ) and according to the specifications of the factory mutual (FM).

**3.2 EXAMINATION AND SURFACE PREPARATION**

- .1 The examination and preparation of the surfaces must be done according to the instructions contained in the technical documentation of the manufacturer, particularly with regard to fire safety.
- .2 Prior to the commencement of the work, the Owner's Representative and the Roofing Foreman will be responsible for inspecting and approving in particular the condition of the support (if any, slopes and nailing grounds) as well as wall and other construction joints. If applicable, a notice of non-compliance will be provided to the Contractor for correction. The commencement of the work will be considered as an acceptance of the conditions relating to the realization of this work.
- .3 Do not start any part of the work until the surfaces are clean, smooth, dry and free from ice, snow and scrap materials. The use of salts and calcium is prohibited to remove ice or snow.
- .4 Ensure that carpentry and other work has been properly completed.
- .5 Do not place materials in rainy or snowy weather.

**3.3 MODE OF EXECUTION**

- .1 Lay the roofing elements on clean, dry surfaces in accordance with the manufacturer's instructions and recommendations.
- .2 Roofing work must be carried out continuously as surfaces are ready and weather conditions permit.
- .3 Seal all joints of underlayment that are not covered with a finishing membrane on the same day. Under no circumstances should there be moisture trapped in the joints before laying a second membrane.
- .4 In all cases where the membrane is laid with a blowtorch, a bead of continuously melted bitumen of constant thickness must be visible at the front of the rollers during welding.
- .5 Maintain waterproof roofing at all times, including during the work of other trades and as work is performed.

**3.4 SITE PROTECTION**

- .1 When transporting roof materials and performing roofing work, protect exposed surfaces of finished structures with canvases to prevent damage. Make sidewalks in rigid panels on the roofs, over implemented materials, to allow workers to come and go and transport equipment. Assume full responsibility for any damage.

**3.5 CLEANING**

- .1 Regularly clean the site of waste or other materials that may affect work performance and performance.

**3.6 EQUIPMENT FOR THE EXECUTION OF WORK**

- .1 Maintain equipment and tools to perform roofing work in a good condition for use.
- .2 Use the types of torches recommended by the manufacturer.

**3.7 APPLICATION OF PRIMER**

- .1 Apply to the concrete, metal, wood, masonry or gypsum surfaces a layer of synthetic elastomer primer at 330 ft.<sup>2</sup> / gal. All surfaces are free of dust, residue or rust, which is harmful to adhesion.
- .2 Cover surface treated with primer on the same day. Observe the application temperature limits.

**3.8 INSTALLATION OF THE VAPOUR RETARDER**

- .1 The primer should be dry when installing the vapour retarder.
- .2 Start at the low point, moving perpendicular to the slope axis, unroll the vapour barrier, align it, let it relax and then wind it from both ends.

- .3 Unroll the vapour retarder and remove the plastic film covering the self-adhesive tape.
- .4 Overlap the sheets at least 90 mm on the sides, 150 mm at the ends.
- .5 The vapour retarder must not show any swelling or wrinkling.
- .6 Ensure complete continuity of the vapour retarder under control joints, expansion joints, bases or fixtures, and with the vapour retarder of the wall.

### **3.9 FLAT INSULATION INSTALLATION**

- .1 Place the panels in close contact, in parallel rows and without deformations or gaps, and fill joints of more than 5 mm.
- .2 Temporarily fix the insulation.

### **3.10 MEMBRANE SUPPORT PANEL INSTALLATION**

- .1 Fix the composite panels with mechanical fasteners at the rate of 12 per 24 sq. 6 in the center with a reinforcing strip and 6 on the side under the overlap band (18 " spacing).
- .2 Secure the panels against each other without leaving voids and align the joints for the installation of the polytape tape 9" transverse seal.
- .3 Remove the protective film under the overlapping strip and glue it. In cold weather, activate the glue by lightly passing the torch.
- .4 Seal the transverse joints with a heat-sealable elastomeric strip.

### **3.11 INSTALLATION OF MEMBRANES**

- .1 Underlayment on curbs:
  - .1 Unroll the underlayment in strips of one (1) meter width perpendicular to the axis of the parapets, on the vertical and horizontal portions of the curbs.
  - .2 Fold down the underlayment on the outside.
  - .3 Overlap the underlayment of the main section by 100 mm. Overlap the longitudinal joints by 90 mm.
  - .4 Shift these at least 100 mm from those of the underlayment of the main section.
  - .5 Paste this underlayment directly onto the support of the previously prepared curbs. Proceed from top to bottom.
  - .6 Nail the underlayment at the top of the parapet and curbs every 300 mm center to center using nails and washers.
  - .7 Unroll the 9.75" wide heat seal tape to cover the joints in the cross direction of the system panels.
  - .8 Weld a reinforcement strip diagonally one (1) meter by one (1) meter on the underlayment and on the pre-primed collar.
  - .9 Lay the reinforcement and finishing layer to the edge of the opening.
- .2 Application of the cap sheet on the main section:

- .1 Start at the low point, moving perpendicular to the slope axis.
  - .2 Unroll the finishing membrane, align it, and wrap it from both ends.
  - .3 Unroll the finishing membrane and torch it on the underlayment. Avoid burning the membrane or its frame.
  - .4 Overlap the sheets at least 90 mm on the sides and 150 mm at the ends.
  - .5 The joints in the finishing membrane must be offset by at least 300 mm from those in the underlayment.
  - .6 Maintain a distance of 300 mm between the joints of the underlayment and the cap sheet.
  - .7 The finishing membrane must not show any swelling or wrinkling.
- .3 Application of the cap sheet on curbs:
- .1 Unroll the cap sheet in strips of one (1) meter width perpendicular to the curb axis on the vertical and horizontal sections.
  - .2 Overlap the longitudinal joints 90 mm and offset 100 mm from those of the current part.
  - .3 Draw a chalk line at 150 mm on the running portion parallel to the edge of the parapet.
  - .4 Degranulate the surface of the cap sheet of the main section between the chalk line and the membrane curb.
  - .5 From bottom to top, weld this cap sheet. Do not overheat the membrane or create burrs at the joints.
- .4 Application of the cap sheet for membrane recovery:
- .1 Clean the membrane with a mechanical brush and a blower.
  - .2 Degranulate the membrane at least 150mm at the perimeter of the opening.
  - .3 Apply a primer to the entire membrane.
  - .4 Unroll the finishing membrane, align it, and wrap it from both ends.
  - .5 Unroll the finishing membrane and torch it on the underlayment. Avoid burning the membrane or its frame.
  - .6 Overlap the sheets at least 90mm on the sides and 150mm at the ends.
  - .7 The joints of the finishing membrane must be offset by at least 300mm from those of the underlayment.
  - .8 Maintain a distance of 300 mm between the joints of the underlayment and the cap sheet.
  - .9 The finishing membrane must not show any swelling or wrinkling.

### **3.12 SEALING**

- .1 When encountering the membrane and metal fascia or other areas to be apparent, seal with the prescribed sealant and sprinkle loose colored granules of the same color as the membrane.

- .2 In hidden areas, the aluminum pigment sealant may be used.

**3.13 FLASHING, METAL FASCIAS AND SHEET METAL**

- .1 Perform all sheet metal work carefully in accordance with the details, in clearly defined brackets and free of deformation or other deficiencies that may impair appearance in accordance with Section 07 62 00 - Sheet Metal Flashings and Trim.

**3.14 EXECUTION OF SEALING IN VARIOUS DETAILS**

- .1 Install the waterproofing membranes to the various roofing details as indicated in the typical details shown in the drawings, as well as in the manufacturer's and / or AMCQ's manuals.

**END OF SECTION**

## **1 GENERAL**

### **1.01 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A 167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - .2 ASTM A 240/A 240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - .3 ASTM A 606, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
  - .4 ASTM A 653/A 653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .5 ASTM A 792/A 792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
  - .6 ASTM B 32, Standard Specification for Solder Metal.
  - .7 ASTM B 370, Standard Specification for Copper Sheet and Strip for Building Construction.
  - .8 ASTM D 523, Standard Test Method for Specular Gloss.
  - .9 ASTM D 822, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA A123.3, Asphalt Saturated Organic Roofing Felt.
  - .2 CSA B111 1974(R2003), Wire Nails, Spikes and Staples.

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Client's general conditions.
- .2 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Drawings must show profiles, dimensions, types of materials and finishes, thickness of all elements used and must indicate where they will be installed.
- .4 Submit duplicate 300 mm x 300 mm samples of each type of sheet metal material, finishes and colours.

### **1.03 COMPATIBILITY OF MATERIALS**

- .1 Materials must be protected from damaging chemical and electrolytic reactions.

#### **1.04 DELIVERY, STORAGE AND HANDLING**

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

### **2 PRODUCTS**

#### **2.01 SHEET METAL**

- .1 Prepainted enamelled steel sheet: 24 gauge (not less than 0.6 mm thick), unless otherwise indicated on the drawings, in the dimensions indicated on the plans.
  - .1 The thickness prescribed for the sheet applies to the raw metal.
  - .2 Allow two (2) colors to be chosen by the Departmental Representative from Viewest's full color range.

**2.02 GALVANIZED STEEL SHEET**

- .1 Hot-dip Galvanized steel sheet, commercial grade, in accordance with ASTM A526, zinc-plated Z275, 24 gauge and above or as indicated on drawings.
- .1 Flashing and fascia must be made to the prescribed profile with pre-painted enamelled steel sheet of at least 24 gauge thickness (unless otherwise indicated on the drawings) of the dimensions indicated on the plans
- .2 Colors: One (1) color chosen by the Departmental Representative from the entire QC range.

**2.03 ACCESSORIES**

- .1 Fasteners: of same material as sheet metal, to CSA B111, flat head roofing nails of length and thickness suitable for application.
- .2 Wood screws: stainless steel, countersunk head, length required depending on material.
- .3 Bolts, nuts: stainless steel, size shown on drawings.
- .4 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .5 Plastic putty: in accordance with CAN / CGSB-37.5.
- .6 Metal flashing underlay: as specified in Section 07 52 00 - Membrane Sealing.
- .7 Washers: the same material as the sheet or sheet metal used, 1 mm thick, supplied with rubber gaskets.
- .8 Nailing tabs and staples: same material and same hardening as used sheet, minimum width of 100mm of 24 gauge.
- .9 Touch-up paint: as recommended by pre-finished materials manufacturer.

**2.04 CLADDING**

- .1 After taking all necessary measures of the elements to be covered, perform the overlaps as indicated.
- .2 Machine parts of a single length, square, level and accurately to the intended dimensions so that they are free from deformation or other defects that could affect their appearance or effectiveness.

**2.05 FABRICATION**

- .1 Fabricate metal flashings and other sheet metal work in accordance with indications on drawings, and with Canadian Roofing Contractors Association (CRCA) standards.
- .2 Form pieces in 2400 mm maximum lengths.
  - .1 Make allowance for expansion at joints.

- .3 Hem exposed edges on underside 12 mm.
  - .1 Mitre and seal corners with sealant.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .6 Assembly Joints: "S" lock, filled with sealant during installation.

### **3 EXECUTION**

#### **3.01 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: Comply with the manufacturer's written recommendations, including any available technical bulletins, instructions for handling, storage, and installation, and data sheet instructions.

#### **3.02 INSTALLATION**

- .1 Install sheet metal work in accordance with details.
- .2 Use concealed fastenings except where approved by Departmental Representative before installation.
- .3 Install surface mounted reglets true and level, and caulk top of reglet with sealant at 300mm maximum centres.
- .4 Close end joints and seal with sealant.
- .5 Make joints in direction of water flow and make watertight.
- .6 Caulk flashing at with sea.

#### **3.03 SEALANTS**

- .1 Provide and install required sealants around structures in this section.
- .2 Apply sealant in accordance with Section 07 92 00 - Joint Sealants.

#### **3.04 CLEANING**

- .1 Clean according to section 01 74 11 - Cleaning.
- .2 If finished surfaces are soiled as a result of the work in this section, contact the manufacturer of the affected area for cleaning directions.
- .3 Repair or replace finished surfaces that have been altered or otherwise damaged as a result of the work covered by this section
- .4 After completion of implementation and performance monitoring, remove surplus materials and

equipment, waste, tools and equipment from the work site.

- .5 Leave work areas clean, free from grease, finger marks and stains.

**END OF SECTION**



**PARTIE 1. GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Structure documents;
- .2 Section 09 22 16 - Non-structural metal framing

**1.2 REFERENCES**

- .1 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S124-06 - Standard Method of Test for the Evaluation of Thermal Barriers for Foamed Plastic.
  - .2 . CAN/ULC-S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
  - .3 CAN/ULC-S102:2018, Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies.

**1.3 SUBMITTALS PROCEDURES**

- .1 Submit required documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data sheets
  - .1 Submit the required data sheets as well as the manufacturer's specifications and documentation. The data sheets must indicate product characteristics, performance criteria, size, limitations and finish.
- .3 Test reports
  - .1 Submit required data sheets and certified copies of the test reports, and ensure that the fire-retardant coatings applied on substrates installed as part of the work are of a quality that meets or exceeds the requirements in the current specifications.
  - .2 Submit test results in accordance with CAN / ULC-S101 for fire resistance, and in accordance with CAN / ULC-S102 for surface burning characteristics.
  - .3 For any unlisted assemblies which have not undergone the tests, submit proposals based on related applications, fireproofed according to recognized criteria.
- .4 Certificates
  - .1 Submit documents signed by the manufacturer, certifying that the products, materials and equipment meet the requirements for physical characteristics and performance criteria.
  - .2 Provide Approval and Performance Certificates: ULC or UL tested concepts demonstrate compliance with ULC S101. Submit a copy of the selected concept to

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determine fire retardant coating thicknesses based on prescribed fire resistance rating and project specified construction and existing details.

**1.4 ACCEPTABLE MATERIALS OR PRODUCTS**

- .1 Where materials or products are prescribed by their brand, refer to the "Instructions to Bidders" for instructions on how to apply for approval of materials or substitutes.

**1.5 QUALITY ASSURANCE**

- .1 Qualification
  - .1 Installer: company or person specializing in the implementation of flame retardant coatings by spraying.

**1.6 TRANSPORT, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading
  - .1 Transport, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Transport, store and handle materials and equipment in accordance with manufacturer's written instructions.
  - .3 Deliver in original, closed containers bearing the name of the brand and the manufacturer, and ULC certification.
- .2 Storage and protection
  - .1 Store materials in a dry location.
  - .2 Store materials in conditions of temperature and humidity compliant with the manufacturer's recommendations, and protected from bad weather.
  - .3 Opened or damaged containers to be refused.
  - .4 Shelf life must be indicated on the packaging and products must be applied before the expiry date.
  - .5 Carefully isolate work area with temporary partitions to prevent contamination of surrounding air.
  - .6 Protect adjacent surfaces and materials from damage that may be caused by spraying beyond intended limits, dispersion and chalking of fire retardant.

**1.7 SITE-SPECIFIC CONDITIONS**

- .1 When temperature is below 5 degrees Celsius, maintain ambient and substrate temperature at 5 degrees Celsius for the duration of the application and for 24 hours thereafter. Provide natural ventilation during and after application to allow flame retardant to cure properly. If application is performed in an enclosed space with no openings for natural ventilation, take necessary measures to provide indoor air circulation and extraction of stale air to the

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outside.

- .2 Maintain relative humidity within the limits recommended by the fire retardant's manufacturer.
- .3 Provide natural ventilation during and after application to allow flame retardant to cure properly.
- .4 If application is made in a confined space with no openings for natural ventilation, provide at least four (4) air changes per hour through forced air circulation.

**PARTIE 2. PRODUCTS****2.1 MATERIALS**

- .1 Cement Flame Retardant: Spray flame retardant containing no asbestos, free crystalline silica, or mica, in accordance with CAN ULC-S102.2-M88 and CAN4-S114-M80, latest revisions.
- .2 Curing agent: Of the type recommended by the flame retardant manufacturer and approved for use in the specified ULC models. Use a different colour from the flame retardant to facilitate inspection.
- .3 Sealant: Of the type recommended by the manufacturer of the flame retardant and approved for use in the specified ULC models.
- .4 Medium density cementitious flame retardant for the steel structure (beams, columns): the minimum dry density and the cohesion / bond strength of the flame retardant applied by spraying must comply with the following requirements:
  - .1 Flame retardant applied to framing members to be flame retarded, unless otherwise specified or indicated: Minimum dry density of 352 kg/m<sup>3</sup>, conforming to ASTM E-605.
  - .2 Flexural strength: The flame retardant coating shall not crack, spall or delaminate when subjected to loads causing deflection to length of more than 3 m of free span.
  - .3 Minimum compressive strength (10% deformation): 56,240 kg/m<sup>2</sup>.
  - .4 Corrosion: Spray applied flame retardant must not contribute to the corrosion of test panels.
  - .5 Air erosion: Maximum of 0,000 g/m<sup>2</sup>.
  - .6 Fire resistance degree: 2h
  - .7 Reference Product: Grace Monokote Z-106 or equivalent approved during the bidding period as instructed to bidders.
- .5 Provide accessories in accordance with manufacturer's recommendations and to meet fire resistance requirements of the specifications and codes. These accessories include, but are not limited to, bonding agents (adhesive or primer), mechanical fasteners, application

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accessories such as metal lath, scrim or trellis, and accelerator.

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

- .1 Compliance: Comply with manufacturer's written requirements, recommendations, and specifications, including any available technical bulletins, instructions for handling, storing, and installations, and data sheet instructions.

**3.2 PREPERATION**

- .1 Ensure underlying surfaces (supports) are free from substances that may affect adhesion of the fire retardant.
- .2 Ensure painted surfaces are compatible with the fire retardant to be applied, and have the adhesion characteristics required to receive the product.
- .3 Remove incompatible materials from support's surface.
- .4 Before spraying product, ensure that elements intended to penetrate the fire retardant coating have already been installed.
- .5 Ensure that conduits, pipes, equipment or other elements that may interfere with the fire retardant coating are installed after the product's application.

**3.3 APPLICATION**

- .1 Coat substrate with adhesive or primer if recommended by the manufacturer.
- .2 Spray fire retardant on substrate, making as many passes as necessary to obtain a monolithic layer of uniform density, texture and thickness.
- .3 Spray fire retardant to achieve a coating that matching tested elements, or according to recognized design criteria to meet the fire rating requirements in the drawings.

**3.4 RESURFACING**

- .1 Repair fire retardant coating damaged during tests or work done by sub trades, before it is covered, or before final inspection if it is to remain exposed.

**3.5 CLEANING**

- .1 Clean in accordance with section 01 74 00 - Cleaning.
- .2 Clean surfaces that must not receive spray fire retardant within 24 hours of application.
- .3 After completion of implementation and performance monitoring, remove surplus

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materials and equipment, waste, tools and equipment from the work site.

**END OF SECTION**



**1 GENERAL****1.01 RELATED SECTIONS**

- .1 Sealants and caulking.
- .2 Paragraph for completing other sections with provisions regarding sealing or caulking of work.
- .3 When caulking work with sealant materials are shown in cross section or on details, it is understood that the joint(s) must sealed around entire perimeter and/or length of work to be sealed.

**1.02 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CGSB 19-GP-5M, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
  - .2 CAN/CGSB-19.13, Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - .3 CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
  - .4 CAN/CGSB-19.17, One-Component Acrylic Emulsion Base Sealing Compound.
  - .5 CAN/CGSB-19.24, Multi-component, Chemical Curing Sealing Compound.

**1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit required data sheets in accordance with Client's general conditions.
- .2 Manufacturer's data sheets to describe:
  - .1 Caulking compound.
  - .2 Primers.
  - .2 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Submit 2 samples of each type of material and colour.
- .5 Cured samples of exposed sealants for each colour where required to match adjacent material.
- .6 Submit manufacturer's instructions in accordance with 01 33 00 - Submittal Procedures.

**1.04 QUALITY ASSURANCE/COMPETENCE**

- .1 Installer competence: company specialized in performance of work described in this section.
- .2 In addition to manufacturer specifications, ensure that sealing work meets requirements of Applicator Training Manual from the Sealant, Waterproofing & Restoration Institute (SWR Institute).
- .3 Workers on site will need to possess the required competence certificates (CCQ training and cards) to execute work in this section.
- .4 The Departmental representative can reject any worker that does not demonstrate the adequate competence or thoroughness for this type of work.

**1.05 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. Store materials off ground and protect against water, humidity and frost.

**1.06 SITE CONDITIONS**

- .1 Ambient Conditions
  - .1 Proceed with installation of joint sealants only when:
    - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 5 degrees Celsius;
    - .2 Joint substrates are dry.
- .2 Joint-Width Conditions
  - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated or more than 6 mm.
- .3 Joint-Substrate Conditions
  - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

**2 PRODUCTS****2.01 SEALANT MATERIALS - GENERAL**

- .1 Sealant materials for each location must be of same type and from same manufacturer.
- .2 For sealant materials that must be used with primer, use primer recommended by manufacturer.
- .3 Unless otherwise specified, the colour of each sealant material for each location will be chosen

by Departmental Representative from standard manufacturer colours.

- .4 The list of products below is not limitative and does not constitute a list of quantities or a list of single source products. The products are provided as a guide to establish the type, function, quality and finish of required items. All other acceptable product corresponding to same requirements may be approved by Departmental Representative.
- .5 The list is an exhaustive list of sealant materials, verify the application of these products according to instructions on drawings and article 2.4 *Sealant Materials - Location*. Also provide and install any product that is not on this list but is required to complete the work as intended in documents.

## 2.02 SEALANT MATERIALS – DESCRIPTION

- .1 Type 1: Sealant for peripheral joints around frames of steel doors and non-contacting aluminum exterior windows with waterproofing membranes:
  - .1 Single-component, high-performance, medium modulus silicone sealant;
  - .2 Classification according to ASTM-C920: Type S, Grade NS, Class 25, NT, M, A, and O (eg granite)
  - .3 Additional movement capacity of  $\pm 40\%$  compared to the original size of the joint.
  - .4 Color: at the discretion of the Departmental Representative.
  - .5 Manufacturer's warranty: 5 years;
  - .6 Such as DOWSIL™ CWS (Contractors Weatherproofing Sealant) or approved equivalent.
- .2 Type 2: Sealant for joints at the top of concrete block walls (under the existing concrete slab):
  - .1 Silicone sealant with low coefficient of resistance, single-component;
  - .2 Classification according to ASTM-C920: Type S, Grade NS, Class 50, T, NT, M, G, A and O
  - .3 Additional movement capacity of  $\pm 50\%$  compared to the original size of the joint.
  - .4 Color: at the discretion of the Departmental Representative.
  - .5 Manufacturer's warranty: 5 years;
  - .6 Such as DOWSIL™ CCS (Contractors Concrete Sealant) or approved equivalent.

## 2.03 COMPRESSIBLE AND NON-COMPRESSIBLE PREFORMED BACKER RODS

- .1 Backup strips must be compatible with appropriate sealant materials and be the type recommended by manufacturer.
- .2 Foam polyethylene, urethane, neoprene or vinyl elements.
  - .1 Closed-cell extruded foam backer rods.
  - .2 Oversized elements by 30 to 50%.

- .3 Neoprene or butyl rubber elements.
  - .1 Round and full backer rods, Shore A hardness of 70.
- .4 High density foam elements.
  - .1 Elements in extruded closed-cell PVC foam, extruded closed-cell polyethylene foam with Shore A hardness of 20 and with tensile strength of 140 to 200 kPa, in extruded polyolefin foam, density of 32 kg/m<sup>3</sup>, or neoprene, dimensions recommended by manufacturer.
- .5 Anticorrosion tape.
  - .1 Polyethylene tape that does not adhere to sealant materials.

#### **2.04 SEALANT MATERIALS - LOCATION**

- .1 Perimeter of interior steel frames, as indicated and detailed (between new or existing steel frames and concrete or cast concrete blocks): Type 1 product.
- .2 Joints at the top of new non-load-bearing concrete block walls, interior, under cast-in-place concrete elements (existing concrete slab): Type 2 product.
- .3 Around new aluminum windows and steel door, exterior side (contact between aluminum and enamelled steel flashing): type 1 product.
- .4 Selaing joint between enamelled steel flashing and existing concrete wall: type 2 product.

#### **2.05 JOINT CLEANER**

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

### **3 EXECUTION**

#### **3.01 PROTECTION OF WORK**

- .1 Protect installed work performed by third parties against dirt or other forms of contamination.

#### **3.02 SURFACE PREPARATION**

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

### **3.03 PREPARATION OF EXISTING SURFACES**

- .1 Remove each application of sealant materials to full depth.
- .2 Grind with diamond-grinding wheel stone, concrete block masonry, brick masonry, prefabricated concrete, concrete and other hard surfaces to remove traces of sealants and contaminants.
- .3 Do not change profile of joints without notifying Departmental Representative and only if width/depth ratios cannot be respected.

### **3.04 PRIMING**

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

### **3.05 BACKUP MATERIAL**

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

### **3.06 MIXING**

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

### **3.07 APPLICATION**

- .1 Sealant
  - .1 Apply sealant in accordance with manufacturer's written instructions.
  - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
  - .3 Apply sealant in continuous beads.

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- .4 Apply sealant using gun with proper size nozzle.
  - .5 Use sufficient pressure to fill voids and joints solid.
  - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
  - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
  - .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing
- .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.
- .3 Cleaning
- .1 Clean adjacent surfaces immediately and leave work clean and in perfect condition.
  - .2 Remove excess and droppings, using recommended cleaners as work progresses.
  - .3 Remove masking tape after initial set of sealant.
- .4 Ensure that sealant materials installed do not form skins or have poor adhesion and that they do not present any defective work likely to hinder the quality of the work.

**END OF SECTION**

**PART 1 General****1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 07 92 00 - Joint Sealants
- .3 Section 08 71 00 - Door Hardware
- .4 Section 09 91 23 - Interior Painting
- .5 Section 08 80 50 - Glazing

**1.2 REGULATORY REQUIREMENTS**

- .1 Unless otherwise indicated, manufacture and install steel doors and safety frames in accordance with current standards.

**1.3 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 The shop drawings must indicate each type of door, the material used, the thickness of the core, the mortise joints, the reinforcing pieces, the location of visible fasteners, openings, glazing, windows, handcuff counters, the layout of hardware and fire protection, if required.
- .3 The shop drawings must indicate each type of frame, the material used, the thickness of the core, the reinforcing pieces, the glazing beads, the location of anchors and visible fasteners and the types of finishing coatings.
- .4 Include a table where each element is identified with the references and numbers corresponding to the numbers indicated on the drawings and in the door table.

**1.4 SAMPLES**

- .1 Submit required samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit, as mock-up, a 300 mm x 300 mm upper corner on the hinge side for each type of frame proposed.
- .3 Submit, as mock-up, a 300 mm x 300 mm corner for each type of frame proposed. Assembly details, layout of reinforcements and wall anchoring details.

**1.5 TEST REPORT**

- .1 Submit factory test reports certifying that a typical flush holding door, measuring 910 x 2130 x 50 mm, meets the following requirements:
  - .1 Static load: Apply a load of 4309 kg (0.22 kg / cm<sup>2</sup>) to the upper and lower quarters of the door. The maximum bending should not be more than 10 mm. The permanent deformation cannot exceed 0.38 mm once load has been removed.
  - .2 Break test: Concentrate a load of 1905 kg on an unsupported corner of the door. The door must resist and bending cannot exceed 37 mm. Inform the Departmental Representative of the factory test schedule so that they can see the test procedure.
- .2 The supplier must provide the test reports requested for the security doors or demonstrate that the doors he proposes have been successfully subjected to tests equivalent to those specified.

**1.6 OTHER METHODS**

- .1 Methods other than the prescribed reinforcement method for doors and panels may be acceptable.
- .2 Submit for approval the complete drawings, description and test reports certifying that the doors or panels designed by a method other than that prescribed meet the requirements.

**Partie 2 Products****2.1 MATERIALS AND EQUIPMENT**

- .1 Sheet Steel: Commercial Grade, Cold Rolled, ASTM A653M Compliant, Class 1 finish.
- .2 Steel plates, profiles and bars conforming to CSA standard G40.21-M1978, type 230G or 260W.
- .3 Shop applied primer to CGSB 1-GP-40 standard.
- .4 Fastening Devices:
  - .1 Provide security screws, security nuts, rivets, tamperproof screws or other equivalent approved fasteners, for the assembly of the various components.
  - .2 Only use security rivets, screws and nuts where it is necessary to ensure maximum safety against removal of parts.
  - .3 Only use tamperproof screws in places where it is not necessary to remove the items for repair.
  - .4 The security screws and nuts must have an additional head that can be removed by turning when the screw or nut is tightened, so that the main head

- has no holes or slots that allow a tool to be inserted to remove the screw or nut.
- .5 Screws with holes or notches must have holes or notches which require the use of a special screwdriver to remove them.
  - .6 Button head screws are not acceptable except where the material is not thick enough to allow countersinking.
  - .7 Ordinary screws are not acceptable.
- .5 Core of doors: plywood laminated to the surface of the walls with polyurethane based adhesive providing maximum adhesion.
- .6 Frames:
- .1 Steel frames for exterior and interior openings 1200 mm wide or less, not carried over their entire width.
  - .2 Steel frames for exterior and interior openings over 1200 mm wide, not carried over their entire width.
- .7 Supply the other elements of the doors and frames in accordance with the requirements of the CSDFMA.
- .8 Primer: Shop apply in accordance with CGSB Standard 1-GP-40.

## 2.2 FABRICATION

- .1 Unless otherwise specified, steel doors and frames must be manufactured to the details provided and in accordance with the requirements of the "Canadian Manufacturing Specifications for Metal Doors and Frames", a document published by the "Canadian Steel Door and Frame Manufacturers' Association". (CSDFMA). Doors and frames must reinforced to meet the requirements for hardware items prescribed in Section 08 71 00 - Door Hardware.
- .2 Cut, reinforce, drill and tap doors and frames where necessary, to accommodate mortising hardware items. Reinforce doors and frames to accommodate surface mounting hardware.
- .3 Prepare cold-rolled steel sheets in workshop.
- .4 Shop apply a touch-up primer to areas where the zinc coating has been damaged.
- .5 The fixing plates for locks to be supplied by the manufacturer of the frames. See doors hardware specifications.
- .6 Perforations for installing locks must be made in the frames. See doors hardware specifications.

## 2.3 DOORS

- .1 Fabricate the doors in steel and according to the details.

- .2 Doors to have 3 mm side clearance and chamfered edges as needed to ensure smooth operation.
- .3 The two face sheets of the doors are cold rolled, one piece steel sheets, bent at right angles at the edges to meet halfway through the door and to form the corners. Run a continuous bead of weld at butt joints. Welds must be ground polished; fill the depressions with a filler.
  - .1 DOOR - MAXIMUM SECURITY: Steel doors 50 mm thick, with metal U-shaped frame of 3.4 mm thick steel, welded to the surface sheets which will be 1.9 mm thick. The openings will be reinforced by a frame of resistance equivalent to the construction of the assembly.
    - .1 Urethane core for exterior doors: Rigid urethane core, conforming to CAN / ULC S705.1-98 with an RSI factor of 1.22, with 25 mm thickness of 32 kg/m density.
    - .2 Steel doors will be coated with a factory primer, ready to paint.
- .4 Internal frame to be made of a 3.5 mm steel profile, fixed to the outer perimeter of the door and welded to the face plates at points spaced 76 mm apart. The frame must be continuous over the entire height and width.
- .5 The internal reinforcement to consist of cross members forming a full height triangular pattern, the shape of which cannot be changed without altering the length of the sides. Flat tops to be resistance welded and spot welded at 70 mm horizontally and 76 mm vertically.
- .6 Weld an additional 5 mm reinforcement plate on the reinforcement profile where the hinge will be fixed; plate to be shop drilled and tapped to receive the hinge screws.
- .7 The handle reinforcement should be 10 mm thick x 35 x 254 mm.
- .8 The door closer brace should be 2.5 mm thick x 89 x 356 mm.
- .9 Arrange special housing in the door to receive the lock. The holding side of the door must be united and fitted with an internal 3 mm backing plate to protect the lock. Design housing so that it is impossible to remove the lock once the bolt is engaged.
- .10 Install special 3.5 mm thick cleats to support the lock housing inside the door where a mortise type lock is to be installed. The brackets must firmly support the box on both sides in order to prevent it from moving under the impact of repeated shocks on the door.
- .11 Install continuous 2.5 mm deep-drawn steel channels on all four sides of openings, peepholes, air vents, hatches, security shutters and keyholes, if applicable. Glazing beads shall be removable on one side only opposite the holding side and held in place by #10-24 flat head slot screws.
- .12 Install all boxes and conduits necessary to house cables in doors and panels where electrical interlocks or limit switches are required.

- .13 Drill and tap the elements that will receive the hardware parts according to the templates from the hardware supplier.

## 2.4 **FRAMES**

- .1 Frames:
  - .1 **FRAMES - MAXIMUM SAFETY:** 2 mm thick pressed steel frames, securely anchored to adjacent walls and filled with spray urethane. Provide all the necessary reinforcements.
  - .2 Fabricate the stamped steel frames of the steel doors as per details.
  - .3 Use cold rolled sheet steel for the manufacture of the frames.
  - .4 Assemble the miter angles; weld them in a continuous bead and polish them with a grinding wheel.
  - .5 The glazing beads located on the exterior side must be fully integrated into the frame and be manufactured and installed according to the dimensions and indications on the plans.
  - .6 Removable glazing beads located on the interior side must be held in place by 6 mm diameter flat head security screws spaced 203 mm apart. Make glazing beads from cold rolled sheet steel of at least 2.5 mm.
  - .7 For each mortise type hinge, attach a 5 mm thick reinforcement piece, covering the thickness of the upright, spot welded to the frame, drilled edge to edge and tapped.
  - .8 For each hinge fitted on the surface, install a reinforcement piece 10 mm thick x 35 x 254 mm long, welded to the frame, drilled from edge to edge and tapped.
  - .9 Install drilled and tapped reinforcements for all hardware, including door closers. Protect all mortise type hinges by covering them with steel covers.
  - .10 For each electric lock placed on the upright, install a special perimeter housing 2.5 mm thick, fitted with a 5 mm thick reinforcement plate to fix the lock to it.
  - .11 Install all boxes and conduits necessary to house the cables in the frames where electrical locking devices or limit switches are required.
  - .12 Install 1.6 mm steel masonry anchors, spaced approximately 533 mm apart on each stud; each anchor must be 76 mm wide x 305 mm long.
  - .13 Use 2.5 mm thick x 76 mm steel angle brackets to anchor studs to the floor.
  - .14 Weld two steel channels or stiffening angles (cross bracing) to the bottom of the frame posts to temporarily maintain alignment.
  - .15 For each single door, install three (3) stoppers on the upright which is to receive the strike.

**2.5 HARDWARE**

- .1 See Section 08 71 00 - Door Hardware

**2.6 HANDCUFF WINDOW**

- .1 Manufactured in steel to be painted according to the dimensions and indications on the drawings.
- .2 Manufactured to receive the lock provided by the customer. (Model: Folger Adam series 17).
- .3 Hinges: robust, continuous piano type, welded.
- .4 Install on the doors indicated in the drawings.

**Partie 3 Execution****3.1 INSTALLATION OF DOORS**

- .1 Install doors and hardware using the jigs provided, in accordance with the manufacturer's instructions and the requirements of Section 08 71 00 - Door Hardware.
- .2 Provide a uniform spacing between doors and jambs and between doors and the finished floor, as follows:
  - .1 Hinge side: 1.0 mm
  - .2 Lock and lintel side: 1.5 mm
  - .3 Floor and threshold sides 12 mm non-combustible
- .3 Adjust moving parts so that doors operate smoothly.

**3.2 INSTALLATION OF FRAMES**

- .1 Install frames plumb, square, level and at the appropriate height.
- .2 Fix anchoring and connecting elements to the elements adjoining the frame.
- .3 Hold frames with spacers during installation work. Temporarily install wooden spacers, arranged horizontally at thirds of the opening, to keep the width of the frame uniform. When the width of the opening is greater than 1200 mm, support the center of the top cross member with a vertical element. Remove spacers and brackets after frames are fully installed.
- .4 Provide the necessary bending clearances to prevent the loads exerted by the frame from being transmitted to the frames.

**3.3 EXECUTION OF TOUCH-UPS**

- .1 Touch-up galvanized coating damaged during installation with a primer.

END OF SECTION



**Partie 1      General****1.1            RELATED WORK**

- .1      Section 05 50 00 - Metal Fabrications
- .2      Section 06 10 00 - Carpentry
- .3      Section 07 62 00 - Sheet Metal Flashing and Trim
- .4      Section 07 92 10 - Joint Sealants
- .5      Section 08 80 50 - Glazing

**1.2            REFERENCES**

- .1      Unless otherwise indicated, construct and install aluminum windows in accordance with the requirements of A3-B7 and C-5 of CSA-A440-M00.

**1.3            SAMPLES**

- .1      Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Shop drawings must clearly indicate the nature of the materials and show in close detail the jambs and sill and the elevations of the structure.
- .3      Submit color samples prior to fabrication and commissioning.

**1.4            SHOP DRAWINGS**

- .1      Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Shop drawings must clearly illustrate: the nature of the materials; the full-size details, in plan and in section, of the crosshead, uprights and support of each type of frame. Movement joints in the frames and mullions as well as the details provided at the head to absorb the movements of the frame. Glazed tiles with shims and interior and exterior trim. Elements such as caulks and seal bottoms, membranes, insulating caulk. Interaction between frames and wooden elements provided by others. Exposed finishes. Dimensions of the structure, the details of anchors and fixing devices. Location of the Manufacturer's nameplate. Exposed and hidden hardware. Junctions of composite windows, separated by mullions or crosspieces.

**1.5 TEST REPORTS**

- .1 Submit a recent report from an independent and approved testing laboratory certifying that the windows meet the requirements of A3-B7 and C-5 of CSA-A440-M00:
  - .1 Wind Tightness - Category A-3.
  - .2 Watertightness - Category B-7 (Static Differential Pressure (Pa) 700. Wind live load resistance - Category C-5 (static differential pressure across the window (kPa) +2.5).

**1.6 TESTS IN SITU**

- .1 Water penetration resistance tests shall be conducted in accordance with ASTM Standard Test Procedure E-1105 - Standard Test Method for Field Determination of Installed Exterior Windows by Uniform or Cyclic Static Air Pressure Difference.
- .2 Required Performance Level: Category B-5

**1.7 MAINTENANCE DATA**

- .1 Provide instructions for cleaning and maintenance of aluminum windows.

**1.8 GUARANTEE**

- .1 Provide a written document, signed and issued in the name of the Owner, stating that aluminum windows are warranted against defects and leaks under normal conditions of use for a period of five (5) years and twenty years. (20) years for exterior finishes and five (5) years for interior finishes from the date of completion.

**1.9 EQUIVALENCES**

- .1 A proposition of equivalence to the type of window prescribed in this section and therefore to the elements and materials that compose it must be made in writing according to the following procedures so that there may be, if necessary, possibility of substitution.
- .2 Bidders must submit their proposal in writing to the Engineer's Office no later than seven (7) business days prior to the bid closing date with the required samples. **ANY EQUIVALENCE PROPOSAL RECEIVED AFTER THE OPENING OF THE SUBMISSIONS WILL BE SYSTEMATICALLY REFUSED.**
- .3 Proposals must include the following information:
  - .1 The reasons for the proposal.
  - .2 Proof of equivalence in each particular case.
  - .3 The main criteria on which the proposal will be judged are: compliance with aesthetic criteria (the guillotine-style model) and technical performance, achievement or exceeding

of required performance levels, quality of materials, nature of finishes, availability OF replacement parts and materials, maintenance problems and procedures, warranties, experience and skill of Installers and Manufacturers.

- .4 The Architect alone will decide whether or not there is equivalence allowing substitution of elements and materials prescribed in this section.
- .5 The Architect will issue an addendum to all bidders and interested parties prior to the opening of bids to confirm products deemed equivalent.

## **Partie 2 Products**

### **2.1 TYPE OF WINDOWS**

- .1 Fixed or interior opening casement windows with thermal break aluminum frame:
  - .1 All windows must be from the same Manufacturer.
- .2 Acceptable product: model such as Alumico Series 68 STH or approved equivalent.
- .3 Overall assembly of the window frame to have a depth of 114 mm. Refer to drawings and table of windows for location.

### **2.2 TYPE AND CLASSIFICATION OF WINDOWS**

- .1 All windows must be from the same Manufacturer.
- .2 Class and Category of Performance: to AAMA / WDMA / CSA 101 / IS2 / A440.
  - .1 Types of products:
    - .1 SI- Casement windows (opening to the interior)
    - .2 Fixed windows.
  - .2 Main designation
    - .1 Performance Class: AW
    - .2 Performance Class: 25
  - .3 Secondary designation
    - .1 Positive Design Pressure: 1200 Pa.
    - .2 Negative Design Pressure: 1200 Pa.
    - .3 Water infiltration resistance test pressure: 330 Pa.
    - .4 Permissible air infiltration and exfiltration level in Canada: A2.
- .3 Control of condensation

### **2.3 MATERIALS AND HARDWARE PARTS**

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- .1 Window frames: the exterior and interior aluminum profiles of the frame must be crimped with a double thermal barrier consisting of two strips of 6/6 reinforced nylon polyamide extruded mechanically inside and outside the frame aluminum extrusion.
- .2 Shutters: opening to the interior 68 mm deep.
- .3 Glazing: self-sealing pressure for square shutter for 25mm sealed unit such as NC5132 or approved equivalent.
- .4 Openable shutter opening mechanism: reversible window-catch with multipoint strike such as Alumico G01024 series or approved equivalent.
- .5 Hinges: aluminum for flaps with adjustment screws such as model MA7679 from Alumico or equivalent.
- .6 Weatherstripping: Three (3) EPDM extruded weatherstrips by extruded grooves forming part of the section.
- .7 All aluminum elements must be assembled with non-corrosive screws and screw caps, if exposed.
- .8 Glazing: as indicated in Section 08 80 50.
- .9 Low pressure / low expansion foam in accordance with AAMA 540 and GreenGuard approved such as Lepage Quad Foam or equivalent approved by the Architect.
- .10 Self-adhesive membrane such as Henry Bakor's Blueskin SA or approved equivalent.

**2.4 WINDOW FINISH**

- .1 Exterior: Powder applied to AAMA 2605 - 20 year warranty (Duranar)
  - .1 Color: At the discretion of the Departmental Representative
- .2 Interior: Natural anodized no. 100, to AAM12C22A31 standard.
  - .1 Color: natural anodized
- .2 Fit the panels as shown in the drawings. The sheet must be in one piece without joints.

**2.5 CONSTRUCTION**

1. Construct insulated aluminum windows as indicated and in accordance with the requirements of CSA-A440-M00.

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2. Build windows precisely and squarely, with a maximum tolerance of 1.5 mm, plus or minus for windows measuring 1800 mm diagonally, and 3 mm, plus or minus, for windows measuring more than 1,800 mm.
3. The arched parts should be turned without any visible stress to the aluminum.
4. Specified frontal dimensions are the maximum permitted dimensions.
5. Brace frames to maintain rigidity and maintain angles during transportation and installation.
6. Clips and steel reinforcements must be coated with a factory-applied primer coat in accordance with CAN / CGSB-1.40.

**2.6 PROTECTIVE COATING**

- .1 Isolate aluminum elements from the following elements with a protective coating.
  - .1 Elements of different metals, except small elements of stainless steel, zinc or tin bronze.
  - .2 Concrete, mortar and masonry elements.
  - .3 Wood elements.

**2.7 GLAZING**

- .1 Install window glazing in accordance with CAN/ CSA-A440 and as indicated in Section 08 80 50 - Glazing.

**2.8 AIR AND VAPOUR BARRIERS**

- .1 Provide window frames with factory installed air and vapour barrier materials and ensure continuous seal with building air and vapour barriers in the following way.
  - .1 Materials: Identical or compatible with the building's air and vapour barrier materials, and designed to provide the building's outer envelope with the necessary degrees of airtightness and vapour diffusion.
  - .2 Material width: sufficient to provide the building's air and vapour barriers with the necessary degrees of airtightness and vapour diffusion, from the building's interior.

**2.9 REPLACEMENT PARTS**

- .1 Provide ten (10) replacement parts of all types and models of hardware for windows, handles, hinges, glazing beads, weatherstripping.

**Partie 3 Execution****3.1 INSTALLATION OF WINDOWS**

- .1 Install windows in accordance with CAN / CSA-A440.
- .2 Elements of different colors or shades must be arranged so as not to create a violent contrast.
- .3 Install wooden ground as indicated on drawings.
- .4 Fold and install sill overlays and intermediate structural mullions. Apply 2400 mm seams by bending the end of the sheet metal to 13 mm. Seal with butyl tape.
- .5 Raise the spandrel plate to 100 mm on jambs and nail. At the structural mullions, go up behind the vertical cover plate.
- .6 Install windows and hardware level, square and plumb in accordance with Manufacturer's written instructions.
- .7 Adjust hardware parts so shutters work.

**3.2 CAULKING**

- .1 Caulk joints between windows and supports with sealant. Weather basr and joint covers for expansion joints must be embedded in a caulking compound. Caulk the joint between the rising part of the support and the frame of the window.
- .2 Apply sealant in accordance with Section 07 92 00 - Joint Sealants. Conceal the sealant inside the window, except where the Architect allows it to be exposed.
- .3 Before installing caulking compounds, lay insulation materials in a continuous manner in all joints.
- .4 Caulk joints between frame members and other dormant parts with sealant to provide outdoor weathertightness and interior air and vapor tightness.
- .5 Caulk joints between windows and window sills with sealant.
- .6 The caulking must be done with great care and in a continuous way so that there is no infiltration at the perimeter of the windows. All necessary corrections, even after the completion of the work, will have to be performed at the expense of the Contractor.
- .7 Fill with mineral wool, the spaces left around the outer window frames after caulking the outer perimeter with a sealer, all in accordance with the requirements of Section 07 92 00.

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END OF SECTION

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

- .1        Section 08 15 15 – Security steel doors and frames;
- .2        Section 08 80 00 – Glazing;
- .3        Division 26 – Electricity.

**1.2        REFERENCE**

- 1.        CAN / CGSB-69.20-M90 Door Controls (Closers)
- 2.        CNB 2010 - National Building Code
- 3.        The Builders Hardware Manufacturers Association (BHMA)
- 4.        National Fire Protection Association (NFPA 101)
- 5.        Underwriters Laboratories of Canada (ULC 294)
- 6.        Canadian Steel Door Manufacturers Association (CSDMA)
- 7.        American National Standards Institute / Builders Hardware Manufacturers Association (ANSI / BHMA).

**1.3        ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submit required documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .4        Data Sheets
  - .1        Submit data sheets and manufacturer's instructions and documentation for door hardware. Data sheets must indicate product characteristics, performance criteria, size, limitations and finish.
- .5        Samples
  - .1        Submit a sample of each type of hardware item for review and acceptance.
  - .2        Place a label on each sample indicating the corresponding paragraph in the specifications, the identification number and brand name, the finish and the batch number of the hardware.
  - .3        Once samples have been approved, they will be returned to the Contractor, and must be incorporated into the work.
- .6        List of Hardware Items
  - .1        Submit contract hardware list of door hardware using numbering system established by Architect.
  - .2        The list must contain require hardware items and indicate brand, model, material, function and finish, as well as any other relevant information.
  - .3        List to include door and frame information.

- .7 Test Reports: Submit test reports certifying that products and materials comply with physical properties and performance criteria requirements.
- .8 Manufacturer's Instructions: Submit installation instructions provided by the manufacturer.

#### **1.4 CLOSEOUT SUBMITTALS**

- 1. Submit required documents / elements in accordance with Section 01 78 00 - Closeout Submittals.
- 2. Operation and maintenance data: provide instructions for the use and maintenance of door hardware, to be incorporated into the manual.

#### **1.5 REPLACEMENT MATERIALS TO BE DELIVERED**

- .1 Provide replacement materials and equipment required in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide (2) two sets of keys for the maintenance of door closers, locks and accessories for exit doors.

#### **1.6 ACCEPTABLE MATERIALS AND PRODUCTS**

- .1 Where materials or products are prescribed by their brand, refer to the "Instructions to Bidders" for instructions on how to apply for approval of materials or substitutes.

#### **1.7 QUALITY ASSURANCE**

- .1 Regulatory Requirements
  - .1 Door hardware mounted on firewalls must be certified by a Canadian Standards Council accredited certification body.
- .2 Certificates: submit documents signed by the manufacturer, certifying that the products and materials comply with the requirements for physical properties and performance criteria.

#### **1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 53 - Common Product Requirements and the manufacturer's written instructions.
- .2 Delivery and acceptance: deliver materials and equipment to work site in their original packaging, which must bear the name and address of the manufacturer.
- .3 Pack hardware, including fasteners, separately or in groups of similar items, and label each package according to the nature and purpose of the items.
- .4 Storage and Handling
  - .1 Store materials and materials in a clean, dry, well-ventilated area as recommended by the manufacturer.

- .2 Store door hardware so as to protect it from marks and scratches.
- .3 Protect finished surfaces with removable film.
- .4 Replace damaged materials and equipment with new materials and equipment.

## **1.9 WARRANTY**

- .1 Provide a written document, signed and issued to the Owner stating that all hardware items are guaranteed against any defects for a period of one (1) year, ten (10) years for the door closers, seven (7) years for the locks, three (3) years for mechanical panic bar, starting from date of the provisional acceptance inspection.

## **1.10 COMPLEMENTARITY**

- .1 The plans and the door, frame and hardware schedule complement each other and any contradiction or missing item to any of the documents will not be added to the contract unless haven been reported to the Architect prior to bid entry.

## **Part 2 Products**

### **2.1 GENERAL**

- .1 All items of the same type must come from the same manufacturer.

### **2.2 DOOR HARDWARE**

- .1 All hardware items must comply with CAN / CGSB-69.20-M90 and applicable ANSI / BHMA standards.
- .2 Hardware described below corresponds to the standards of the establishment. Any deviation from the descriptions and brands that follow must be the subject of a written request before bid opening. All supporting documents must be provided at the request of the Departmental Representative.
- .3 Refer to the enclosed Hardware Schedule.
- .4 Verify the necessary hardware quantities by consulting drawings, specifications and the doors, frames and hardware table.
- .5 If certain items needed to complete the work were not specifically listed, obtain information and clarifications before bidding, or take responsibility for providing these items at no additional cost to the Owner.
- .6 Provide all spacers and accessories required for the installation of the various hardware parts. Pay particular attention to door closers, weatherstrips and soundproofing.

**2.3 FASTENERS**

- .1 Only use Torks fasteners supplied by the manufacturer. Failure to comply with this requirement may compromise the warranties and invalidate the certification labels, if any.
- .2 Provide screws, bolts, expansion shields and other fasteners necessary for satisfactory fastening and proper operation of hardware.
- .3 Exposed fasteners must have the same finish as the installed hardware item.
- .4 Where there is a pull handle on one side and a push plate on the other side of a door, provide the necessary fasteners and install them so that the handle is secured on both sides. Place the plate so as to conceal the fasteners.
- .5 Fasteners must be compatible with the material they pass through.

**2.4 KEYS**

- .1 All electrified locks and keys will be provided by the customer.
- .2 The installation of electrified locks must be done by the contractor.

**Part 3 Execution****3.1 INSTALLATION**

- .1 Manufacturer's instructions: Comply with the manufacturer's written requirements, recommendations and specifications, including the technical bulletins and installation instructions specified in the product catalogs and on the packing cartons, as well data sheets specifications.
- .2 Provide manufacturers of metal doors and frames with installation templates and complete instructions so as to allow them to prepare their products to receive the hardware items prescribed in this section.
- .3 Provide the manufacturer's installation instructions with each hardware item.
- .4 If a door stop would touch the handle, install the door stop at the bottom the door instead.
- .5 Only use fasteners provided by the manufacturer.
  - .1 Quick-disconnect fasteners, unless specifically supplied by the manufacturer, will not be accepted.

**3.2 INSTALLATION OF ELECTRIFIED HARDWARE**

- .1 Installation of electrified hardware must be performed by a specialized firm accredited by electrified hardware's manufacturer. This firm must hold all required licenses and permits.

- .2 Coordinate the work of this section with related trades and provide electrical diagrams and all required information to the various stakeholders.
- .3 Provide and install all low voltage wiring between various hardware items.
- .4 Consult the Engineer's documents for the coordination of the power supply, empty conduits, electrical boxes and any other item relevant to the connections of the electrified hardware described in this section.
- .5 Supply and install all required transformers and relays for the electrified hardware.
- .6 Start up the electrified hardware and explain operations in detail to the Departmental Representative.

### **3.3 SETTINGS**

- .1 Adjust hardware, operating and control devices, and door closers to ensure smooth operation, safety, and tightness of closing.
- .2 Lubricate hardware, operating and control devices and all moving parts.
- .3 Adjust door hardware to ensure proper door-to-door contact.

### **3.4 CLEANING**

- .1 Progress cleaning: carry out cleaning in accordance with Section 01 74 10 - Cleaning.
  - .1 Leave site clean at the end of each work day.
  - .2 Clean hardware with damp cloth and non-abrasive cleaner and polish according to manufacturer's instructions.
  - .3 Remove protective film covering hardware, if applicable.
  - .4 Final Cleaning: remove surplus materials, rubbish, tools and equipment from site in accordance with Section 01 74 10 - Cleaning.
- .2 Waste Management: sort waste for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
  - .1 Remove bins and recycling bins from site and dispose of materials at appropriate facilities.

### **3.5 PROTECTION**

- .1 Protect installed equipment and elements from any damage during work.
- .2 Repair damage caused by door hardware installation to adjacent materials and equipment.

### **3.6 LIST OF HARDWARE ITEMS**

- .1 The hardware groups below are not restrictive and therefore do not constitute quantity lists. These groups are given as a guide to establish the type, function, quality and finish of the

## DOORS HARDWARE

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required items. Check these groups in conjunction with the drawings and the table of doors and frames and provide any additional hardware items not included in these groups but required to complete the work according to the intent of the documents.

## .2 Hardware Groups:

**Door S142.2, S1423****Group 01**

3	Hinges	4-1/2-FM-ICS 114 x 114 x Tork fasteners	630	F/A
1	Lock	Recovered from existing door S142.2 to install		
1	Mortise Cylinder	Recovered, to install		
1	Dead lock	*9017-1-_-M	630	RRBrink
1	Turn knob	3905	626	Hager
1	Robust bumper	420	Black	F/A
1	Door bottom			
1	Handle No.2 (Extérieur side of the room only)			

\*Note: the dead lock 9017 will be installed in the door to engage in the handcuff door.

Handcuff door

2	Hinges	4-1/2-FM-ICS 114 x 114 x Tork fasteners	630	F/A
1	Recessed handle	GSH921	630	GSH
1	Neoprene	1/8 x 3/8 x perim	Noir	UA
1	Bumper	240	626	GSH

Note: Coordinate the lock model with the frame and door.

**Door 146.1****GROUP 02**

3	Hinges	4-1/2-FM-ICS	630	F/A
2	Lock #56M (recovered from existing exterior fences)			
2	Pull handle	GSH920	630	GSH

**Door s146.2****GROUP 03**

3	Hinges	SF 205FS	USP	Southern Folger
1	Lock #56M (recovered from existing exterior fences)			
1	Door monitoring Adam 534 (recovered from existing exterior fences)			
2	Pull handle	GSH920	630	GSH
1	Door shutter	4210 Cush x 72M	689	LCN
1	Cold gasket	326AA x Perim.	AL	Zero
1	Door bottom	8198 x L.R.	AL	Zero
1	Aluminium threshold	AB_ABBT x AB_x L.R.	AL	UA

**END OF SECTION**

**PARTIE 1. GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 07 92 00 - Joint Sealants
- .2 Section 08 11 15 - Security Steel Doors and Frames
- .3 Section 08 50 00 - Aluminum Windows

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA)/CSA International
  - .1 CAN2-12.3, Flat, Clear Float Glass
  - .2 CAN/CGSB 12.11-M90, Wired Safety Glass
  - .3 CAN/CGSB - 19.18-M87, Sealing Compound, One Component, Silicone Base, Solvent Curing
  - .4 CSA-A440-00 / A440.1-00, A440-00, Windows / Special Publication A440.1-00, User Selection Guide to CSA Standard A440-00, Windows
- .2 Laminators Safety Glass Association (LSGA)
  - .1 LSGA Laminated Glass Design Guide 2000

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .3 Submit product data sheets for all proposed products in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Provide two (2) samples measuring 300 x 300 mm each of the specified glass units.
- .5 Provide maintenance data and glazing cleaning instructions, and attach them to the manual referred to in section 01 78 00 - Closeout Submittals

**1.4 CLOSEOUT SUBMITTALS**

- .1 Submit the required documents / elements in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Submit use and maintenance data for incorporation into the maintenance manual.

**1.5 QUALITY ASSURANCE**

- .1 Certificates: Submit Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.6 TRANSPORT, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
- .2 Delivery and Acceptance: Deliver materials and equipment 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, components, and equipment off of ground, in a dry, clean, well ventilated, indoor location, in accordance with the manufacturer's recommendation.
  - .2 Store glazings to protect them from marks and scratches.
  - .3 Replace damaged or defective materials and equipment with new materials and equipment.

## **1.7 DESIGN REQUIREMENTS**

- .1 Maximum inflection of glazing must not exceed 1/200 of bending strength of the glass, and this deformation must not in any way alter the physical properties of glass materials.
- .2 Dimensions of glazing must be such that they withstand dead loads, live loads due to wind and pressure and suction forces acting perpendicularly to the glazing plane, to a nominal pressure compliant with ASTM E330.
- .3 Comply with the 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.

## **1.8 GUARANTEE**

- .6 Provide a written document, signed and issued in the name of the Owner, stipulating that all glass prescribed in this section is guaranteed against any defect that could impair vision for a period of ten (10) years from the date of issuance of the certificate of substantial completion.

## **1.9 AMBIENT CONDITIONS**

- .1 Glazing sealants must comply with winter performance requirements.

## **PARTIE 2. PRODUCTS**

### **2.1 MATERIALS AND EQUIPMENT**

- .1 Polished or float glass (VC): Compliant with CAN/CGSB-12.3, glass quality, 6 mm thick.
- .2 Wired glass (VA): Compliant with CAN / CGSB-12.11 with 12 x 12 mm square style wire mesh, 6 mm thick transparent film will be applied on both sides, Protect 3 Safety Glass by Glassopolis or equivalent which protects against impacts, as indicated in the drawings.

- .3 Tempered glass (VT): Compliant to CAN/CGSB-12.13, category 2
  - .1 Thicknesses: 6 mm
- .4 Polycarbonate panel: extruded as a double-walled sheet with honeycomb structure
  - .1 Thicknesses: 12.7 mm
- .5 Glazing type **V1** (Doors to interview room):
  - .1 6 mm thick tempered clear glass
  - .2 Black stainless steel spacer
  - .3 12.7 mm thick polycarbonate
  - .4 Welded square mesh 6 mm wired glass
- .6 Insulating glazing type **V2** (exterior door):
  - .1 Exterior panel: clear tempered glass, 6 mm
  - .2 Coating applied to the panel: low emissivity (Low-E), surface #2
  - .3 Air knife: 13 mm thick, argon filled, black stainless steel spacer
  - .4 Exterior panel: clear tempered glass, 6 mm
- .7 Insulating glazing **V3** (tower windows), according to CAN/CGSB-12.8, with three panels, 44 mm overall thickness (approximate), having the following characteristics:
  - .1 Exterior panel: clear tempered glass, 6 mm
  - .2 Coating applied to the panel: low emissivity (Low-E), surface #2
  - .3 Air knife: 9.5 mm thick, argon filled, black stainless steel spacer
  - .4 3.2 mm clear RAC (heat strengthened) +1.27 spacer
  - .5 Central panel: 12 mm polycarbonate (laminated to 3.2 mm glasses)
  - .6 3.2 mm clear RAC (heat strengthened) +1.27 spacer
  - .7 Air knife: 9.5 mm thick, argon filled, black stainless steel spacer
  - .8 Interior panel: 6 mm gray tempered glass Coating applied to the glass: one way viewing film with #5 side.
- .8 Sealing compound: One-component silicone solvent-based sealant, solvent-evaporation polymerized to CAN/CGSB-19.18-M87, colour consistent with frame.

## 2.2 ACCESSORIES

- .1 Setting blocks: Neoprene, with 80 to 90 Shore A durometer hardness to ASTM D2240, width appropriate for glass thickness, to suit glazing method, weight of glass panel and surface area.
- .2 Spacer shims: Neoprene, 50 to 60 Shore A durometer hardness to ASTM D2240, self-adhesive on one face, 75 mm long x half the height of glazing beads x thickness to suit application.
- .3 Preformed Glazing Adhesive Tapes: Premixed butyl compound with integrated spacer, resilient and tubular, with Shore A hardness of 10 to 15, durometer tested to ASTM D2240, coiled on backing paper, 3 mm x 10 mm, black.

- .4 Sealer and cleaning products: according to glass manufacturer's specifications.

### **PARTIE 3. EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of conditions: Ensure that the conditions of surfaces / substrates implemented under other sections or contracts are acceptable for glazing installation in accordance with the manufacturer's written instructions, prior to installation of products.
- .1 Verify that openings for glazing are correctly sized and within tolerance.
  - .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
  - .3 Visually inspect surfaces / substrates in the presence of the Departmental Representative.
  - .4 Inform the Departmental Representative of any unacceptable conditions immediately upon discovery.
  - .5 Start installation work only after unacceptable conditions have been corrected and the Departmental Representative's written approval received.

#### **3.2 PREPERATION**

- .1 Clean the contact surfaces with solvent and dry with cloth.
- .2 Seal glazing channels and other porous recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

#### **3.3 GENERAL**

- .1 The glass must be cut with precision so that the free clearances appropriate and necessary for its installation are provided. The glazing beads of the openings to be glazed must be fixed in place with good alignment and must ensure a good fit of the glass in the openings.
- .2 Clamp marks from tempering must be affixed to concealed surfaces. No visible marks will be accepted.
- .3 Installation of glazing must be rigid; it must prevent any contact between glass and metal. Glazing splines must be flush with the face of glazing bead. The glazing beads must be installed to be removable to allow a possible replacement of the glass.
- .4 Each sheet of glass must clearly bear a removable label, issued by the manufacturer, identifying the latter, the type, and the quality of the glass. Such labels can be removed only with the written permission of the Departmental Representative.
- .5 Remove protective coatings, clean contact surfaces with solvent and dry.
- .6 Do not cut or grind tempered, fireproof, heat treated or coated glass.

**3.4 EXTERIOR GLAZING - MIXED ASSEMBLIES (ADHESIVE TAPE / SEALANT)**

- .1 Perform work in accordance with GANA Glazing Manual specifications and GANA Laminated Glazing Reference Manual specifications for glazing assembly methods.
- .2 Cut adhesive strips to the appropriate length and press them against the permanent glazing beads, so that they extend up to 6 mm above sight line. Seal the corners by abutting the strips and covering them with a 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 the perimeter of the glazing.
- .4 Place setting blocks at intervals corresponding to one third the width of glazing, so that the end blocks are at most 150 mm from the corners of the latter.
- .5 Rest glazing on setting blocks and push against tape and shaped sealant bead at the base of the glazing with sufficient pressure for full contact on entire perimeter of unit.
- .6 Install removable glazing beads, with peripheral wedges between them and the glazing, at 6 mm below sight line.
- .7 Fill void between glazing and the glazing beads with sealant to a depth equal to the glazing channel, but no more than 9 mm below sight line.
- .8 Shape a bead of uniform sealant at the top of the glazing, along the gap between the glazing and the glazing beads, and flush with sight line. Smooth the surface of the sealing bead with a cloth or a suitable tool.

**3.5 INTERIOR GLAZING - MIXED ASSEMBLIES (ADHESIVE TAPE / SEALANT)**

- .1 Cut the self-adhesive strip to the appropriate length and place against the permanent glazing beads 1.5 mm above sight line.
- .2 Fill the joint, between the glass and the glazing beads in place, with required sealant, to a depth equal to the height of the frame on the glass so as to form a uniform and level bead.
- .3 Cut the self-adhesive strip at the sight line.

**3.6 CLEANING**

- .1 Nettoyage en cours de travaux : effectuer les travaux de nettoyage conformément à la section 01 74 00 - Cleaning.
- .2 Remove sealant and any material used for installing the glazing from finished surfaces.
- .3 Remove all labels when the work is complete.
- .4 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.
- .5 Any glass scratched, broken or damaged in any way whatsoever must be replaced without delay at no additional cost to the Departmental Representative.
- .6 Waste Management: sort waste for recycling in accordance with Section 01 74 21 - Construction / Demolition Waste Management and Disposal.

- .1 Remove bins and recycling bins from site and dispose of materials at appropriate facilities.

**3.7**

**PROTECTION**

- .1 Protect equipment and installed elements from damage during work.
- .2 Repair damage caused by glazing installation to adjacent materials and equipment.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED SECTIONS**

- .1 Section 06 10 00 –Carpentry
- .2 Section 07 21 16 – Blanket Insulation
- .3 Section 07 52 00 – Modified bituminous membrane roofing
- .4 Section 07 92 00 – Joint Sealants

### **1.02 REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
  - .1 ASTM C645-08A, Standard Specification for Non-structural Steel Framing Members.
  - .2 ASTM C754-07, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
  - .3 ASTM A568/A568M-07a - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
  - .4 ASTM A525-94, Specification for General Requirements for Steel Sheet, Zinc-coated (Galvanised) by the Hot-Dip Process
- .2 Canadian Standards Association (CSA Group)
  - .1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
  - .2 CAN/CSA S136-07, North American Specification for the Design of Cold-Formed Steel Structural.

### **1.03 QUALITY ASSURANCE**

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

### **1.04 WASTE MANAGEMENT AND DISPOSAL**

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene or corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .3 Divert unused metal materials from landfill to metal recycling facility approved by the ministry representative.

- .4 Divert unused gypsum materials from landfill to recycling reuse composting facility approved by the ministry representative.

## 1.05 CALCULATION CRITERIA

- .1 Although thicknesses are mentioned, all wall elements shall be designed to withstand pressures for a uniform lateral load of 240 Pa with a maximum deflection of L/360.
- .2 The dimensions and thickness of the shapes shall be such as to obtain a maximum deflection of L/720 for brick walls and L/360 for other walls, for a wind load of 1 KPa for once in 30 years .

## 2 PRODUCTS

### 2.01 MATERIALS

- .1 Non-load bearing channel stud framing: stud size to ASTM C 645, hot dipped galvanized steel sheet, for screw attachment of gypsum board and equipped with knock-out service holes at 460 mm centres for the passage of service pipes; dimensions and spacing of posts as indicated.
  - .1 Exterior walls : 20 gauge
  - .2 Interior partitions (ceilings) : 25 gauge
- .2 Floor and ceiling tracks: to ASTM C 645, in widths to suit stud sizes, 32 mm flange height.
  - .1 The tracks will be the same gauge as the studs used
- .3 U shaped metal channel stiffener: 13 mm x 38mm size, 1.2 mm thick cold rolled steel, coated with rust inhibitive coating.
- .4 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .5 Insulating strip: polyethylene foam strip with open and closed cells, 3 mm thick for interior partitions x width and length.
- .6 Metal fasteners for insulating or thermal insulation wool mats: galvanized steel plates measuring 64 x 304 mm with precut threaded folding rods.
- .7 Metallic furring (U-profiles, suspension rods, fixing wires, inserts and anchors), galvanized.
- .8 "Ω" type furring: Zinc-coated sheet steel, Z275 compliant with ASTM A526 / A526M, allowing screw fixing of various panels, gauge 26 for gypsum ceilings.

## 3 EXECUTION

### 3.01 ERECTION

- .1 Align partition tracks at floor and ceiling and secure at indicated spacing.
- .2 Install a water repellent membrane under the partition floor tracks resting on floor slabs.
- .3 Place studs vertically, space as indicated on drawings and not more than 50 mm from abutting

walls, and at each side of openings and corners. Position and fasten studs in tracks at floor and ceiling. Cross brace studs as required to provide rigid installation of any partition higher than 2400 mm by means of metal stiffeners every 1200 mm in height according to the manufacturer's instructions.

- .4 Erect metal studding to tolerance of 1:1000.
- .5 Attach studs to bottom and top track using screws.
  1. Vertical posts must be attached to both sides of the top and bottom track.
- .6 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .7 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .9 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .10 Install frames around all four sides of building openings, built-in hardware, cabinets and access panels. Extend the frames. Check required clearances from equipment suppliers.
- .11 Secure 40 mm studs or furring sections between main posts to allow fixing of sanitary fixtures and accessories such as washbasins, toilets, bathroom accessories and other items, including grab bars and towel rails, to steel post framed partitions.
- .12 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .13 Extend partitions to ceiling height except where noted otherwise on drawings.
- .14 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.
  - .1 Use 50 mm leg ceiling tracks. Use double track slip joint as indicated.
- .15 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .16 Install two continuous beads of sealant for sound insulation below studs and tracks at the perimeter of soundproofing partitions.

### **3.03 CLEANING**

- .1 Upon completion remove surplus materials, rubbish, tools and barriers used to protect the equipment.

END OF SECTION



## **1 GENERAL**

### **1.01 SUMMARY**

- .1 Related Requirements
  - .1 Mechanical documents.

### **1.02 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C 423-02a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
  - .2 ASTM E 1264-98, Standard Classification for Acoustical Ceiling Products.
  - .3 ASTM E 1477-98a (2003), Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-51.34-M86, Polyethylene sheet vapour barrier, for buildings, incorporating amendment number 1 1988.
  - .2 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units
- .3 Canadian Standards Association (CSA)/CSA International
  - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples
- .4 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act (CEPA), (1999), c. 33.
  - .2 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102- [2003], Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

### **1.03 SUBMITTALS PROCEDURES**

- .1 Submit required samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data Sheets: Submit the Material Safety Data Sheets required under the Workplace Hazardous Materials Information System (WHMIS), which must comply with this system, as per section 02 81 01 - Hazardous Materials.
- .3 Submit two full-size samples of each type of acoustic element.

### **1.04 TRANSPORT, STORAGE AND HANDLING**

- .1 Protect absorbent materials used or stored on site against damage caused by humidity.

- .2 Store replacement materials / equipment at the location designated by the Departmental Representative.
- .3 Waste Management and Disposal
  - .1 Sort waste for recycling in accordance with Section 01 74 21 - Construction / Demolition Waste Management and Disposal.
  - .2 Remove all packaging materials from the site and forward to appropriate recycling facilities.
  - .3 Recover and sort the packaging and place it in the appropriate bins arranged on site for recycling, in accordance with the waste management plan.
  - .4 Place in designated containers substances that meet the definition of toxic or hazardous waste in accordance with Section 01 35 43 - Environmental Protection.
  - .5 Handle and dispose of hazardous materials in accordance with the Canadian Environmental Protection Act, the Transportation of Dangerous Goods Act, and regional and municipal regulations.
  - .6 Ensure empty containers are sealed and stored properly in accordance with Section 01 35 43 - Environmental Protection.

## **1.05 MATERIALS / REPLACEMENT MATERIALS**

- .1 Provide replacement acoustic items in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide an additional quantity of acoustic elements equivalent to 2% of the gross ceiling area, for each type and model of acoustic elements used in the context of this work.
- .3 Ensure that the replacement materials / materials are from the same production lots as the materials / materials used for the work.
- .4 Clearly identify each type of acoustic element, also indicating color and texture.
- .5 Deliver replacement materials / materials to the Departmental Representative upon completion of the work provided for under this section.

## **GUARANTEE**

- .1 Ceiling panel: Submit a written warranty executed by the manufacturer for the repair or replacement of panels which fail during the warranty period. Failures include, but are not limited to:
  1. Ceiling panels: Sagging and warping
  2. Suspension system: Rust and manufacturing defects
- .2 Warranty period: Ceiling panels: One (1) year from the date of substantial completion.
- .3 Suspension: Ten (10) years from the date of substantial completion. The warranty must not deprive the owner of other rights he may have under other provisions of the contract documents. It will be a complement and will apply concurrently with the other guarantees offered by the contractor under the requirements of the contract documents.

## **2 PRODUCTS**

### **2.01 MATERIALS / MATERIALS**

- .1 Tamper-proof screwed ceiling system, (tiles):

- .1 Surface texture: Smooth
  - .2 Composition: 16 gauge galvanized steel with powder coated painted finish after production
  - .3 Colour: White
  - .4 Dimensions: Widths of 610 mm x lengths of 610 mm.
  - .5 Perforation options: Perforated (P5)
  - .6 With mineral fiber backing.
  - .7 Edge channel: Concealed locking screw (tested to withstand 960 to 3,100 lbs of force)
  - 8 Coefficient de réduction du bruit (CRB) : ASTM C 423;
  - .9 Flame Spread Rating: ASTM E 1264; category A (FM)
  - .10 Light reflection: ASTM E 1477: 0.61
  - .11 Dimensional stability: Standard
  - .12 Acceptable Product: MetalWorks SecureLock Plus, as manufactured by Armstrong or approved equivalent.
- .2 Fastening system:
    - .1 C-channel perimeter, galvanized steel, 14 gauge, capable of supporting a load of 3000 lbs upwards.
    - .2 Mid span spacer: telescopic steel tube, recommended by manufacturer.
    - .3 18 gauge steel suspension wire.
    - .4 Retaining clips according to manufacturer's recommendations.
    - .5 14 gauge Z ties.
    - .6 Screws and fasteners according to manufacturer's recommendations.
  - .3 Exit board and access hatch. See mechanical documents for position and quantity.

### **3 EXECUTION**

#### **3.01 INSPECTION**

- .1 It is forbidden to install the metal panels before the Departmental Representative has inspected the installations which will be concealed by the ceiling.

#### **3.02 PREPERATION**

- .1 Measure each ceiling area and determine the layout of the panels to balance the width of the borders on the opposite sides of each ceiling. Avoid using less than half the width of a curb unit, and follow reflected ceiling plans. Coordinate the layout of the panels with the mechanical and electrical components.

#### **3.03 INSTALLATION**

- .1 Install splines at perimeter using fasteners recommended by manufacturer. Fastener spacing at 305

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mm c/c maximum. At the corners assemble the miter splines or butt them.

- .2 Hang the spacers according to the manufacturer's instructions. For the number, spacings and caliber. Minimum caliber 9 to at most 1220 mm spacing.
- .3 Install the retaining clips and metal panels according to the manufacturer's recommendations.
- .4 Install the exit boards and access hatches as indicated on the plans.

**3.04 COORDINATION OF WORK**

- .1 Coordinate ceiling mounting work with sections for lighting fixtures, diffusers, speakers and sprinkler heads intended for mounting in the acoustic ceiling.

**3.05 CLEANING**

- .1 Clean visible surfaces of ceiling panels, including trim, border moldings and hangers. Follow manufacturer's instructions for cleaning and touching up minor damage to the finish. Remove and replace items that cannot be properly cleaned or repaired in order to completely eliminate the appearance of damage.

**END OF SECTION**

**PART 1      General****1.1      RELATED SECTIONS**

- .1      Division 1      General requirements

**1.2      REFERENCES**

- .1      ASTM: Common standard for determining the moisture acceptability of concrete floor slabs in order to receive a moisture-sensitive coating.
- .2      ASTM D4263 Indication of the presence of moisture in concrete by the polyethylene film method.
- .3      ASTM F1869 Measure the water vapor emission rate for a concrete substrate using anhydrous calcium chloride.
- .4      ASTM C1583 Standard test method for tensile strength of concrete surfaces and bonding resistance or tensile strength of repaired concrete and direct pull tape overlay materials (Flanging Method)
- .5      ICRI Guideline number 03732 Selection and specification of concrete surface preparation for sealants, coatings and polymeric coatings.

**1.3      QUALITY ASSURANCE**

- .1      Work associated with this section should be performed by an company with a minimum of five (5) years experience in the application of such flooring. The installer must be an "authorized applicator" of the Materials Manufacturer.
- .2      Before starting the application, arrange a site meeting with the Contractor, the Materials Manufacturer and the Consultant assigned to the project. Discuss the scope of the project, application methods, details, inspect the substrates, test them and study the ambient conditions.
- .3      Prior to the start of the work, alternative installation procedures and recommendations must be submitted in writing and approved by the Departmental Representative.
- .4      Conduct a random inspection, determined by the Departmental Representative, of the thickness of the flooring system after maturing. Fill the areas that have been checked until they are flush with the rest of the soil.

**1.4      ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Send a letter from the Manufacturer certifying that the Installer is still an "authorized applicator" and fully trained in the installation of specified materials.
- .2      Before application, send the most recent versions of the manufacturer's data sheets and installation details for the materials to be used.
- .3      Prior to application, send a 150 mm x 150 mm specimen of the specified finish and colour chosen for approval to the Departmental Representative.

**1.3      CLOSEOUT SUBMITTALS**

- .1      The maintenance specifications must indicate the methods to be adopted, recommendations for materials, equipment and frequency of cleaning, according to the manufacturer's recommendations.

**1.5 DELIVERY AND STORAGE**

- .1 The materials must be delivered to the site in unopened containers, bear the name of the manufacturer, the product and indicate the color. The applicator should note the lot numbers of all materials used and retain them as needed for reference.
- .2 Store materials indoors, in their original and undamaged packaging, in a dry place and at a temperature ranging from 16°C to 30°C.

**1.6 ON-SITE CONDITIONS**

- .1 Install appropriate barriers and legible signage at the entrances, to prevent general and trades circulation on-site during application and curing of the floor covering.
- .2 Maintain an ambient temperature of 20°C during installation, 48 hours before and 48 hours after, or until complete curing.
- .3 At the time of application, make sure to keep the minimum substrate temperature above 10°C and always maintain it at 3°C above dew point.

**1.7 GUARANTEE**

- .1 Provide a written guarantee, issued on behalf of the Owner, certifying that the work associated with this section is free from defects in materials and workmanship for a period of one year from the date of completion of the work.

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

- .1 Resin Flooring: Two-component glossy epoxy finish, solid color, high solids, silicone free, thixotropic viscosity, 'orange peel' texture, with the following properties:
  - .2 Primer:
    - .1 Compression resistance : 56 MPa (8 122 il/po<sup>2</sup>), in accordance with ASTM D638.
    - .2 Flexural strength: 7.4 MPa (1073 psi), in accordance with ASTM D638
    - .3 Pull-out strength: > 2 MPa (290 psi), in accordance with ASTM D4541
    - .4 Hardness: 76 Shore D, in accordance with ASTM D2240
    - .5 VOC content: ≤ 50 g/L, in accordance with ASTM D2369
    - .6 Impact resistance: 5.88 joules, in accordance with ASTM D2794
    - .7 Abrasion Resistance: 0.11g loss, in accordance with ASTM D4060 (CS17/1000 cycles/1000 g).
    - .8 Application thicknesses: 2 coats of 12 mils each.
    - .9 Product (design basis): Sika Canada inc., Sikafloor® 261<sup>CA</sup> Thixo or approved equivalent.
  - .3 Finish:
    - .1 Semi-gloss topcoat: semi-gloss topcoat in two-component acrylic-aliphatic polyurethane, low odor, VOC compliant, non-yellowing and in aqueous form, with the following properties:
    - .2 VOC content: ≤ 350 g/L, in accordance with ASTM D2369
    - .3 Abrasion Resistance: 0.73 g loss, in accordance with ASTM D4060 (CS17/1000 cycles/1000 g).
    - .4 Application thickness: 1 coat of 12 mils.

- .5 Product (design basis): Sika Canada inc., Sikafloor® 318 or approved equivalent.

## 2.2 COLOUR

- .1 Provide one (1) color of the Ministerial Representative's choice.

## 2.3 ADDITIONAL MATERIALS

- .1 Fill all joints, recesses, cracks, and other roughness in the surface with additional materials recommended by the Manufacturer of the specified product.

## Partie 3 Execution

### 3.1 INSPECTION

- .1 Examine the surfaces on which the flooring system will be installed. Submit a written notice to the Departmental Representative if the surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected. Do not apply the flooring system over substrate treatments for mold, repair or upgrade that are not produced by the same manufacturer.
- .2 The surface must be clean, solid and dry.
- .3 Preliminary tests:
  - .1 Substrate humidity:
    - .1 Measure and confirm acceptable test results for substrate moisture content, relative ambient humidity, substrate and ambient temperature, and dew point.
    - .2 Confirm and record the above results at least once (1) every three (3) hours during implementation or more frequently when conditions change (e.g. increasing or decreasing ambient temperature, increasing or decreasing relative humidity, etc.).
    - .3 The compressive strength of the substrate must be at least 25 MPa (3625 psi) at 28 days and the tensile strength a minimum of 1.5 MPa (218 psi) at the time of application. Implementation.
  - .4 Ensure that the concrete substrate meets the minimum requirements stipulated by the flooring manufacturer.
  - .5 Do not apply the flooring system over sand-cement-type laying beds. Strip sand-cement beds to the structural concrete substrate. Level or restore slope to achieve slope and / or drainage in accordance with manufacturer's minimum requirements.
  - .6 Do not apply the flooring system over asphalt (or bitumen), softwood, aluminum, copper or vinyl / polyester ester composites reinforced with glass fibers.
  - .7 Apply to vitrified or varnished bricks or tiles, structural framing and steel only with the manufacturer's written recommendation regarding the proper methods of surface preparation.

**3.2 PREPARATION OF THE SURFACE**

- .1 Prepare the surface on which the flooring systems will be installed according to the manufacturer's written instructions.
- .2 Remove all traces of dirt, oil, grease, wax, laitance, curing agents, aqueous concrete hardeners and any other surface contaminants.
- .3 Remove all traces of sealant, finish and paint.
- .4 All roughness, rough areas, etc. must be treated in order to obtain a flat surface before proceeding with the installation.
- .5 Remove any part of the concrete in poor condition (degraded) using appropriate mechanical means.
- .6 Concrete: Clean and prepare by shot blasting or by any other equivalent mechanical means in order to obtain a textured surface, free of all traces of laitance and contaminants. Provide a level of CSP in accordance with ICRI Guideline #310-2R and manufacturer's written recommendations.
- .7 Chemical surface preparation: Chemical surface preparation (acid etching) is prohibited and will void the manufacturer's warranty.
- .8 Control joints and cracks: Repair and treat control joints and surface cracks using standard products from the manufacturer's range and in accordance with their instructions for use.

**3.3 INSTALLATION**

- .1 Mix and apply material according to manufacturer's written instructions and implementation procedures. Apply at manufacturer's recommended coverage rates unless heavier coverage is specified in this section.
- .2 Follow manufacturer's written recommendations for ends and connections to walls, drains, door sills, columns, and floor-to-floor transitions.
- .3 Do not apply when temperatures (ambient and of substrate) increase.
- .4 Carefully apply the resin-based flooring to avoid any overlap, voids, streaks or irregularities that may remain visible in the end. Apply in order to obtain a uniform result, whether in terms of color, shine and texture, within the limits imposed by the materials and the area in question.
- .5 Match the colours and textures to those of the samples accepted by the Ministerial Representative.
- .6 Form the 100 mm coved tile according to the manufacturer's written directions. Make the coved tile with a minimum thickness of 3 mm.
- .7 Primer:
  - .1 Apply an even first coat of primer with a brush, roller or squeegee without puddling.
  - .2 Apply a second coat of primer when the first coat is no longer sticky. Apply with a squeegee or roller and make several passes to obtain uniform

coverage. If the time between applications exceeds 48 hours at 22 °C, abrade surfaces and wipe with a clean, solvent-soaked cloth.

- .8 Finish :
  - .1 Apply topcoat by brush, short nap roller or sprayer.
  - .2 Apply evenly, avoiding the formation of puddles or edges.
  - .3 Be careful to keep a wet edge during application to minimize the possibility of overlap lines.
  - .4 For proper adhesion between coats, subsequent coats should be applied within 24 hours of applying the previous coat at 20 ° C (68 ° F). If the wait time between coats is not respected, mechanically sand the surface of the existing topcoat, vacuum and wipe with a lint-free cloth dampened with solvent.
- .9 During application check the material w.f.t. in accordance with ASTM D4414 to measure the thickness of the wet film using notched gauges.
- .10 The work, once completed, should match the approved samples, have a uniform thickness, gloss, colour and texture. The finished surface must be free from defects that may affect the appearance and performance of the product.
- .11 Provide adequate protection until complete curing of the floor covering.

### **3.4 CLEANING**

- .1 Remove ribbons and overlays used to protect adjacent surfaces.
- .2 Remove surplus materials and construction debris and dispose of them in accordance with local regulations. Leave work site clean.

### **3.5 PROTECTION**

- .1 If necessary protect the ground by appropriate means from the damage that may be caused by the passage of trades.
- .2 Avoid any contact with the water during ripening for approximately 24 hours at 20°C.
- .3 Protect the soil when finished chemicals until complete curing, for about 7 days at 20°C.

**END OF SECTION**



**PARTIE 1. GENERAL****1.1 RELATED REQUIREMENTS**

- .1 All sections requiring painting and as indicated on the drawings.

**1.2 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-85.100-93, Painting
  - .2 CAN/CGSB 1.100-99, Interior Flat Latex Paint
  - .3 CAN/CGSB-1.119-2000, Interior Latex Primer-Sealer
- .2 Master Painters Institute (MPI)
- .1 MPI Architectural Painting Specifications Manual, 2004
  - .2 The Master Painters Institute (MPI) Maintenance Repainting Manual 2004, including component identification, assessment of substrates, paint systems, preparatory work and repair the list of approved products.
- .3 Environmental Protection Agency (EPA)
- .1 EPA Test Method for Measuring Total Volatile Organic Content of Consumer Products, Method 24 (for Surface Coatings).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).
- .5 Society for Protective Coatings (SSPC)
- .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual
- .6 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act (CEPA), (1999), c. 33
- .7 National Fire Code of Canada - 1995.
- .8 Transport Canada (TC)
- .1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit the required technical data sheets and the manufacturer's instructions regarding the implementation or application of each paint product and each coating in accordance with section 01 33 00 - Submittal Procedures.
- .2 Submit manufacturer's MSDSs on each paint and coating product. The sheets must include:
  - .1 Product characteristics
  - .2 Instructions and recommendations for surface preparation
  - .3 Primer requirements and specifications for the finish
  - .4 Storage and handling requirements and recommendations
  - .5 Methods of application
  - .6 Cleaning information
- .3 Submit required samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit samples of all colours offered for review and selection, and specify when colour range is limited.
  - .2 Submit the required Workplace Hazardous Materials Information System (WHMIS) material safety data sheets for paint products and coatings used.
- .4 Closeout Submittals
  - .1 Provide the required maintenance sheets and attach them to the manual mentioned in section 01 78 00 - Closeout Submittals.
  - .2 Submit a file for all products used. Indicate all the products that make up each system, specifying the following information for each.
    - .1 The name, type and use of the product (i.e. materials and where they are applied).
    - .2 Product number of the Manufacturer.
    - .3 Colour code numbers.
    - .4 Product grade according to the MPI Environmental Choice program classification.
    - .5 Manufacturer's Material Safety Data Sheets (MSDS) for each product.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Transport, store and handle paint products in accordance with section 01 61 00 - General Product Requirements as well as the following prescriptions:
  - .1 Transport and store paint products in their original containers, sealed and with labels intact.
  - .2 Labels must indicate:
    - .1 Name and address of the Manufacturer
    - .2 Type of paint or coating
    - .3 Compliance with relevant standards and requirements

- .4 Colour number, according to the list of colours specified
  - .3 Remove degraded, open or rejected products from the site.
  - .4 Handle and store products according to the manufacturer's recommendations.
  - .5 Store products and materials in a well-ventilated area with temperatures between 7 and 30 degrees Celsius. Store products away from heat sources, and store heat-sensitive products at a temperature above the minimum temperature recommended by the manufacturer.
  - .6 Maintain clean and tidy, to the satisfaction of the Departmental Representative, the areas used for storage, cleaning and preparation, in order to prevent any contamination or damage to the coatings. Once the work is completed, return these areas to their initial state of cleanliness, to the satisfaction of the Departmental Representative.
  - .7 Remove from the storage area only the quantities of products that will be used on the same day.
  - .8 Comply with WHMIS requirements for the use, storage, handling and disposal of hazardous materials.
  - .9 Fire safety requirements
    - .1 Provide one (1) 9 kg chemical powder fire extinguisher and place near storage area.
    - .2 Place oily rags, waste materials, empty containers, and materials subject to spontaneous combustion in ULC-certified containers and remove these containers from the work site daily.
    - .3 Handle, store, use and dispose of flammable and combustible products and materials in accordance with the requirements of the National Fire Code of Canada.
- .2 Waste Management and Disposal
- .1 Sort waste for recycling in accordance with section 01 74 19 - Waste Management and Disposal.
  - .2 Paints, stains, wood preservatives and other related products (thinners and solvents) must be treated as hazardous materials, the disposal of which is subject to various regulations. Information on relevant legislative provisions can be obtained from provincial departments responsible for the environment and government agencies in the region.
  - .3 Products that cannot be reused should be treated as hazardous waste and disposed of properly.
  - .4 Place materials and products designated as hazardous or toxic, including used tubes and containers of adhesive and sealant, in areas or containers intended to receive hazardous waste.
  - .5 To reduce contamination of soil or waterways and sanitary and storm sewer systems, strictly adhere to the following guidelines.
    - .1 Store the water used for washing paints and other water-based products so as to allow the collection by filtration of deposited materials. The

- materials used must never be cleaned without collecting the washing water.
- .2 Store cleaning products, thinners, solvents and excess paint in designated containers and dispose of them properly.
  - .3 Keep rags soaked in oil and solvent during painting for the recovery of contaminants and proper disposal or cleaning, as appropriate.
  - .4 Arrange for the disposal of contaminants in accordance with the regulations for hazardous waste.
  - .5 Allow empty paint containers to dry before disposal or recycling (in areas with suitable facilities).
  - .6 Tightly close and seal containers of partially used paint products, including adhesive and sealant containers, and store them at a moderate temperature in a well-ventilated, fireproof area.
- .6 Where there is a paint recycling service, collect surplus paint, classify it by type of product and arrange for it to be sent to a collection or recycling facility.

## 1.5 SITE-SPECIFIC CONDITIONS

- .1 Heating, ventilation and lighting
- .1 Before starting the painting work, check whether adequate and continuous ventilation can be ensured on the one hand and, on the other hand, whether suitable heating installations allow the temperatures of the ambient air and of the substrate to be raised to more of 10 degrees Celsius 24 hours before the start of work and to maintain these temperatures throughout the installation and after the completion of the work, until the paint is sufficiently hardened.
  - .2 Ventilate confined spaces. If necessary, provide continuous ventilation for seven (7) days following completion of the work.
  - .3 Coordinate the use of the existing ventilation system with the Departmental Representative and, if necessary, make the necessary arrangements for its operation during and after the execution of the work.
  - .4 Supply and temporarily install the necessary heating and ventilation equipment if the permanent systems cannot be used; if the building's permanent systems do not meet the minimum requirements, supply and install the additional equipment required to meet them. It is forbidden to use gas appliances for this purpose.
  - .5 Before the start of painting, check whether the lighting level of the surfaces to be painted is at least 323 lux.
- .2 Ambient temperature, relative humidity and moisture content of the substrate
- .1 Unless a specific authorization has been given in advance by the contractual authority responsible for the estimate, by the paint work inspection body and by the manufacturer of the product applied, do not carry out repainting work in the presence of following conditions:

- .1 Temperature of the ambient air and that of the substrate are less than 10 degrees Celsius
- .2 Temperature of the substrate is above 32 degrees Celsius, unless the paint to be applied is specifically formulated for use at elevated temperature
- .3 Relative humidity in the work area is greater than 85%
- .2 Using a properly calibrated electronic moisture meter, perform the tests to determine the moisture content of the substrates, except in the case of concrete floors already coated with paint, the moisture content of which must be assessed by covering power.
- .3 Do not refurbish paint coatings if the maximum moisture content of the substrate is greater than the following values:
  - .1 12% for plasterboard and plaster
- .4 Perform tests on painted plaster, concrete and masonry surfaces to determine their alkalinity.

### .3 Surface condition

- .1 Carry out painting work in areas where the ambient air is free from airborne particules generated by construction work or dust blown by the ventilation system and, therefore, likely to alter the finished surfaces.
- .2 Apply paint to properly prepared surfaces with moisture content within the range specified in this section.
- .3 Apply the paint when the previous coat is dry or sufficiently hardened, unless other indications previously approved by the manufacturer of the paint or coating used.
- .4 In occupied buildings, all painting work should be done after closing hours, in unused rooms or areas. The work schedule must be approved by the Departmental Representative and must provide for sufficient drying and curing time before the occupants return.

## 1.6 MAINTENANCE

- .1 Provide the required replacement / spare materials / materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit one (1) container of one (1) of each type and colour of finishing product. Identify the colour and type of product according to specified color list and paint system.

## PARTIE 2. PRODUCTS

### 2.1 MATERIALS

- .1 Acceptable manufacturers:
  - .1 Sherwin-Williams
  - .2 Benjamin-Moore
  - .3 PPG
  - .4 Sico
- .2 Paint products on the latest edition of MPI's List of Approved Products may be used in this job.
- .3 Only approved products having obtained the Environmental Choice MPI E3 mention may be used in the context of this work.
- .4 The paints, coatings, adhesives, solvents, cleaning products, lubricants and other products used must have the following characteristics:
  - .1 Products not containing dichloromethane (methylene chloride), chlorinated hydrocarbons, toxic metallic pigments
  - .2 Products made without any compounds contributing to the depletion of ozone in the upper atmosphere
  - .3 Products made without any compounds that promote smog formation in the lower atmosphere
  - .4 Products manufactured so that materials capable of generating biochemical oxygen demand (BOD) in the undiluted effluent of a production plant, discharged into a natural watercourse or into a wastewater treatment facility where no treatment secondary is expected, do not exceed a concentration of 15 mg/L
  - .5 Products manufactured so that the total suspended solids (TSS) in the undiluted effluent of a production plant, discharged to a natural watercourse or to a wastewater treatment facility where no secondary treatment is is expected, does not exceed a concentration of 15 mg/L
- .5 Paint products and coatings must not contain formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or any of their compounds.
- .6 Primers: When the manufacturer offers choices of primers for a particular substrate, use the one rated as best by the manufacturer.

## **2.2 ACCESSORIES**

- .1 Accessories for coating application:
  - .1 Provide all required primers, sealants, cleaning agents, cleaning cloths, sanding and cleaning materials according to manufacturer's specifications.

## **2.3 COLOURS**

- .1 The Departmental Representative will provide a colour list after contract award.
- .2 Provide five (5) colours of paint.

- .3 The colours will be chosen from the full range of colours and tints offered by the manufacturers.
- .4 For the refurbishment of two (2) coat paint systems, the first coat should be a slightly lighter shade than the topcoat to facilitate visual identification of each coat.

## **2.4 MIXING AND TINTING**

- .1 Perform colour tinting operations prior to delivery of paint to site.
- .2 Add, if necessary, an amount of thinner that does not exceed that recommended by the manufacturer. Kerosene or any other organic solvent of the same type should not be used to thin water-based paints.
- .3 Thin the paint to be applied by spraying according to the manufacturer's instructions. If the necessary instructions are not on the container, obtain the manufacturer's written instructions and send a copy to the Departmental Representative.
- .4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

## **2.5 PAINT SYSTEMS**

- .1 Cleaning of existing concrete block surfaces:
  - .1 Thoroughly clean and degrease existing concrete block surfaces with a solution of trisodium phosphate (TSP)
  - .2 Rinse well with clear water (under pressure)
  - .3 Lightly sandblast all existing surfaces to be painted by mechanical or manual sandblasting
- .2 Cleaning of surfaces to be painted:
  - .1 Unless otherwise specified, use an all-purpose cleaner with active oxygen, phosphate and bleach free, to clean dust and dirt from all surfaces to be painted. Make sure that the cleaning product is compatible with the materials and finishes of the existing surfaces.
- .3 System N°1: For new sets of steel doors and frames
  - .1 Doors and frames must be clean, dry and free of dirt, dust and other foreign matter; Surface preparation according to the manufacturer's recommendations.
  - .2 Carry out surface preparation to SSPC-SP10 standard.
  - .3 Apply one (1) coats of epoxy primer, VOC < 100 g/L.
  - .4 Apply two (2) coats of epoxy polyurethane, VOC <100 g/l.
- .4 System N°2: For existing concrete walls or concrete blocks (already painted)
  - .1 The existing concrete or concrete block must be clean, dry and free of dirt, dust and other foreign matter. Surface preparation according to the manufacturer's

recommendations.

- .2 Apply one (1) coat of interior / exterior high-hiding primer, VOC < 50 g/l
- .3 Apply two (2) coats of acrylic epoxy, semi-gloss finish (55-65 units @ 60 °), VOC < 50 g/l.

.5 System N°3: For new concrete walls or concrete blocks:

- .1 The existing concrete or concrete block must be clean, dry and free of dirt, dust and other foreign matter. Surface preparation according to the manufacturer's recommendations.
- .2 Apply one (1) coat of primer recommended by the manufacturer.
- .3 Apply two (2) coats of acrylic epoxy, semi-gloss finish (55-65 units @ 60 °)

.6 System N°4: For painting the new exposed steel structure.

- .1 Metals must be clean, dry and free of dirt, dust and other foreign matter; Surface preparation according to the manufacturer's recommendations.
- .2 Apply one (1) coat of epoxy primer, VOC < 100 g/L.
- .3 Apply two (2) coats of epoxy polyurethane, VOC <100 g/l.

## **2.6 OUTDOOR PAINTING SYSTEMS**

.1 Galvanized Steel Cleaning:

- .1 Remove the film of oil or soap with a detergent or emulsion cleaner.
- .2 Abrasive sandblasting with fine abrasive, according to SSPC SP-16 to obtain a profile of 40-75µm. When sandblasting is not possible, galvanizing can be treated with a suitable zinc phosphate conversion coating.

.2 System N°5: For the new outer shell of the galvanized steel turret.

- .1 Metals must be clean, dry and free of dirt, dust and other foreign matter; Surface preparation according to the manufacturer's recommendations.
- .2 Apply one (1) coat of two component solid polyamine epoxy primer, PPG Amerlock400 or approved equivalent.
- .3 Apply two (2) coats of Glossy Aliphatic Polyurethane 450 Series, Amercoat 450H from PPG or approved equivalent.

## **PARTIE 3. EXECUTION**

### **3.1 GENERAL**

- .1 Compliance: Comply with the manufacturer's written recommendations and specifications, including any available technical bulletins, instructions for handling, storage, and installation, and data sheet instructions.
- .2 Unless otherwise specified, prepare interior surfaces and perform painting work in accordance with the requirements of the MPI Architectural Painting Specifications

Manual and the MPI - Maintenance Repainting Manual.

### 3.2 INSPECTION

- .1 Inspect existing substrates to see if their condition could compromise the proper preparation of surfaces to be coated with paint or plaster. Report to the Departmental Representative any damage, defect or unsatisfactory or unfavourable condition detected, before proceeding with work.
- .2 Perform tests to verify the moisture content of surfaces to be painted using a properly calibrated electronic moisture meter; however, the moisture content of concrete floors must be evaluated by covering power on reference surface. Do not begin work until the condition of the substrates is deemed acceptable, within the range of values recommended by the Manufacturer.

### 3.3 PREPARATORY WORK

- .1 Protection of existing structures:
  - .1 Protect building surfaces and adjacent structures not to be coated with paint or plaster against speckles, marks and other damage using non-fouling covers or blankets. If the surfaces in question are damaged, clean and restore them according to the instructions of the Departmental Representative.
  - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
  - .3 Protect factory finished products and equipment.
- .2 Surface preparation:
  - .1 Remove cover plates from electrical appliances, lighting fixtures, overlay hardware on doors, bathroom fixtures and other hardware, as well as surface mounted fasteners and fittings before beginning any painting work. Identify all deposited items and store them in a safe place; refit them when the paint coating is complete.
  - .2 If necessary, cover or move furniture and transportable materials to facilitate painting. Replace as painting operations progress.
  - .3 Post "FRESH PAINT" signs in occupied areas while the work is being carried out. The signs must be accepted by the Departmental Representative.
  - .4 Clean and prepare interior surfaces in accordance with the requirements set out in the MPI - Architectural Painting Specification Manual and the MPI - Maintenance Repainting Manual and the product manufacturer's recommendations.
  - .5 Before applying primer or sealer and between subsequent coats, prevent cleaned surfaces from being contaminated by salts, acids, alkalis, corrosive chemicals, grease, oil and solvents. Apply primer or sealer, paint, or other pretreatment product as soon as possible after cleaning, before surface is re-contaminated.
  - .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
  - .7 Clean metal surfaces to be painted by removing rust, rolling flakes, welding slag, dirt, oil, grease and other foreign matter in accordance with the requirements of the MPI.
  - .8 Touch up surfaces with shop applied primer/sealer coat with appropriate sealer, as indicated.

**3.4 APPLICATION**

- .1 Apply paint to prepared surfaces only after they have been accepted by the Departmental Representative.
- .2 The method of application used must be accepted by the Departmental Representative.
  - .1 Apply product according to the manufacturer's recommendations.
- .3 Apply each coat of paint to obtain a continuous film of uniform thickness.
  - .1 Rework surfaces that are bare or covered with a film that is too thin before applying the next layer.
- .4 Allow surfaces to dry and cure properly after cleaning and between each successive coat, waiting for the minimum time recommended by the manufacturer.
- .5 Rub down and dust off surfaces between each layer to eliminate visible defects.
- .6 Finish surfaces above and below sight lines in accordance with the prescriptions applicable to neighboring surfaces, including the tops of cabinets and storage and projecting elements.
- .7 Finish the top, bottom, edges and openings of doors in accordance with the requirements for the facing surfaces of doors, after these have been adjusted.
- .8 Electrical and mechanical equipment
  - .1 Unless otherwise indicated, apply paint product to piping, electrical conduits, ventilation ducts, supports / suspensions as well as other visible interior electrical and mechanical elements so that the colour and finish of the painted surfaces harmonize with those of adjoining surfaces.

**3.5 CLEANING**

- .1 Cleaning during work: Clean according to section 01 74 11 - Cleaning.
  - .1 Leave work site clean at the end of each day.
- .2 Final Cleaning: upon completion, remove surplus materials, rubbish, tools, and equipment from work site in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: sort waste for recycling in accordance with Section 01 74 21 - Construction / Demolition Waste Management and Disposal.
  - .1 Remove bins and recycling bins from site and dispose of materials at appropriate facilities.
- .4 Store paints and primer paints, including product tubes and containers, in designated containers or locations, that meet the definition of toxic or hazardous waste.

**END OF SECTION**

**Part 1            General**

**1.1            GENERAL**

This section deals with common topics related to all sections dealing with mechanical and electrical work.

General and specifications, appendices, workforce regulations, owner's documents, Departmental Representative's general and conditions as well as other documents found in the bid form an integral part of this section and govern the work.

**1.2            REFERENCE STANDARDS**

The entire work must be carried out in compliance with the current edition of the National Building Code of Canada, with all revisions imposed by decree in this document as well as all standards listed in this document.

In some cases, when stated in the particular sections of the specifications, a more recent standard is cited, this edition of the standard shall be applied.

**1.3            ASSIGNMENT OF SPECIALIZED WORKS IN ELECTROMECHANICS BY SPECIALTY**

Various specialized electromechanical works are performed by "specialties".

The company in charge of the so-called "specialty" must ensure that it has all the qualifications required to meet all responsibilities assigned to it. In the event that the company does not hold all these qualifications, it will have to call on one or more companies with required qualifications in order to fulfill all of its obligations.

**1.4            DEFINITION**

- .1            The Contractor is the organization that signs a contract with the owner to perform all work shown in the plans and specifications. The Contractor must supply, erect, install and commission all the elements described herein.
- .2            The term " General Contractor " is also used to refer to the Contractor.
- .3            The Contractor has recourse to specialties (subcontractors) to perform certain work as defined in paragraph 1.3. These operate under responsibility and supervision of the Contractor as if they were part of his organization. The Contractor is therefore the only party authorized to have communications, requests, etc., with the owner or his professionals.

**1.5            OBLIGATIONS AND ROLE OF CONTRACTOR CONCERNING SPECIALTIE OF MECHANIC AND ELECTRICITY**

- .1            The Contractor is, by reason of his contract with the owner or agent, responsible for carrying out the construction of the project. This includes all specialties of mechanic and electricity.
- .2            Thus, he must see to the execution of works according to plans and specifications.
- .3            This includes all the coordination required between all specialties in order to integrate each element stipulated in his contract. This is as much mechanical and electrical elements as architectural and structural elements.
- .4            Administrative as well as technical management are part of is mandate and it is his responsibility to take all decisions and measures required to arrive at the desired result.

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- .5 The Departmental Representative may, if necessary, be requested during site meetings to validate Contractor's actions provided that the foregoing does not exceed obligations provided for in his contract binding him to the owner
- .6 The Contractor is responsible for making for yardage, on-site installation of equipment, arrangement of pipes, conduits and ducts in accordance with drawings issued for construction, standards and according to rules. For visible elements, the Contractor will coordinate the positioning with professionals concerned (architect, designer, owner, etc.).
  - .1 A set of plans outlining all necessary major devices and equipment accompany these specifications.
  - .2 The bid or construction plans indicate, in a general and approximate fashion, the location of the equipment and where will the pipes conduits and ducts pass., installed under this contract. Only dimensions given on the plans will prevail during the installation of the mechanical and electrical works. No other plans or installation drawings will be provided to the Contractor by the Departmental Representative.
  - .3 Where conduits, etc., are shown on plans only in a diagram form, they shall be installed in such a way as to preserve free space and to minimize use of space in which they will pass.
  - .4 Before submitting his bid, the Contractor shall therefore ask Departmental Representative, all required clarifications. In addition, he must warn the Departmental Representative of any inconsistency that may exist between plans and specifications of the Departmental Representative if applicable.
  - .5 Specifications do not necessarily mention all materials and equipment indicated on the plans and vice versa. However, it is understood that the Contractor agrees to supply and install all these materials, as if they were both mentioned on specifications and on plans.
  - .6 In cases where two descriptions of equipment or materials do not agree, either on plans or specifications, the Contractor shall include in his bid the most demanding description of both.
  - .7 When installing equipment, the Contractor shall provide the required clearances for maintenance. These clearances will have to be coordinated with the other subcontractors in order not to handicap these spaces by other installations.
- .7 The Contractor must consult all available project documents and ensure that interdisciplinary coordination has been done and respected before requesting a change or a directive.
- .8 The Contractor may question professionals for items or subjects for which he does not find a response to documents or for which there is a doubt in his mind.
- .9 If the Contractor, in the course of work, sees a potential for improvement to be made at the same cost, he will be welcome to propose it to the Departmental Representative.
- .10 Specialty Manager
  - .1 For each specialty, a specialty manager will be identified and will be the person responsible of specialty. This individual will be part of the Contractor's staff or his subcontractor. He is the one who places orders for materials and equipment from manufacturers.
  - .2 He must ensure that he provided each of his suppliers with all information, details and requirements that apply to the supplies that this supplier will have to satisfy.
  - .3 Where specifications or plans indicate that one or more accessory items must be provided with an equipment, it is not acceptable that such items or accessories are provided by others. This is to ensure compatibility, appearance, performance, etc. of the whole assembly.
- .11 Specialist Foreman

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- .1 Each specialty will be represented on the site by a foreman. He will be responsible for execution of work as specified within plans and specifications.

## 1.6 ACCEPTABLE PRODUCTS

### .1 General

Acceptable products are usually identified in plans and / or specifications. All acceptable products will be supplied and installed in new condition. This identification takes three forms:

#### .1 Reference Product

This product is named at the top of the list. This product is accompanied by a name or product number, equipment number, etc., a model or catalog number, or other specific designation. This product is the reference product and is the one with which the project plans and specifications have been prepared.

#### .2 Equivalent Product

- .1 Names of manufacturers, suppliers, etc., named after the reference product are deemed to be recognized suppliers and, if their products meet physical characteristics, performance, efficiency, appearance, etc., they may be submitted in equivalence (see " Equivalent " clause) and must be submitted thirty (30) days after contract award.

#### .3 Substitute Product

- .1 A substitute product is a product whose name was not mentioned in specification where equipment are described, but the mention " or equivalent " has been written.
- .2 When the mention " or approved equivalent " has not been written down at the description of equipment, the Contractor shall be required to provide the equipment whose manufacturer names are named in the description of the product.
- .3 An equivalence **request** must be submitted for alternate product within thirty (30) days of contract award. In this request, the Contractor must justify its procedure with serious and verifiable arguments.
- .4 In his equivalence **request**, the Contractor shall demonstrate quality, reliability and provenance of the proposed product.
- .5 Once the equivalence **request** has been received, the Departmental Representative, in consultation with the owner, will study it and will pronounce its decision, favorable or not, in writing and the decision will be final.
- .6 If the **request** is accepted, the Contractor may undertake the " Equivalent " procedure.

### .2 Equivalent procedure

- .1 The product is manufactured, supplied, etc., by one of manufacturer, supplier, etc., named in plans and / or specifications following the reference product.
- .2 The Contractor's bid must be based on the reference product.
- .3 The Contractor's bid may be based on equivalent product desired by the Contractor. However, the Contractor who uses an equivalent product to establish his bid assumes the risks, and in case of refusal, will not receive any financial compensation, delay or other. On the other hand, if the equivalent is accepted, no credit or other compensation will be required.
- .4 The Contractor is responsible for all impacts on other specialties or other participants as well as impacts on his own installation. He will incur all costs including modifications to calculations, plans, various connections, control or operation sequences, operating protocols, etc. Acceptance of an equivalence request or substitution does not relieve the Contractor of his responsibility to provide a product meeting the requirements of the contractual documents in every respect.

- .5 The equivalent must be presented with all necessary elements for the Departmental Representative to assess the relevance. For equivalents with more technical content, a comparison table between reference product and proposed equivalent product must accompany the presentation. This table will highlight all dimensional elements, arrangement, installation and connection, consumption, clearances, etc. For elements having an impact on appearance, provide, for Departmental Representative, all the necessary elements to make the analysis and base a judgment. In case of products that have an impact on the aesthetics of the building such as fixtures, plumbing fixtures, heaters, grilles and diffusers, etc. It is possible that the proposed equivalent may be refused for reasons of integration and respect of architectural design.
- .6 Submit to study for acceptance only one equivalent per product and only once. In case of refusal, the Contractor must provide the reference product.
- .7 The Departmental Representative will be the sole judge of the equivalent and his decision will be final and without appeal.
- .8 « Approved equivalent applies at the end of each list of manufacturers and / or products specified in these specifications and drawings.

## **1.7 DESIGN, IMPLEMENTATION AND CERTIFICATION OF SEISMIC MEASURES**

- .1 All mechanical and electrical work must meet requirements of the latest version in force of the National Building Code of Canada concerning earthquake protection. In this regard, each specialty must obtain services of a specialist, to perform calculations, specify the supports and their arrangement as well as supervise execution of the entire work to ensure its compliance with the National Building Code of Canada.
- .2 On completion of work, for each specialty where this is applicable, a report certifying conformity of the entire work will be produced by the specialist Engineer, then delivered to the owner through the Engineer. This report should, at a minimum, contain the following details:
  - .1 A complete identification of the project:
    - Title of the project
    - Location of the works: address, floor, sector, name of department concerned, etc.
    - Certification that all the works, systems, supports and other components installed by the Contractor.
    - Operations and maintenance manual should also include equipment and accessories that have been added as a change order
  - .3 In order to establish its specifications, the specialist Engineer must make sure to consider the correct risk category to which the specific project installations must conform. As complementary information, the following information can be used as inputs:
    - .1 Affected building is a civil protection building within which components and systems must remain in place AND in operation during and after an earthquake without major repairs.

## **1.8 REVIEW OF DRAWINGS AND SITE**

- .1 Properly review drawings and site of proposed work to fully understand all local conditions that may affect performance of the contract.
- .2 No compensation or supplement will be granted to cover the errors, omissions or interference that could have been detected before the start of work by a serious examination of drawings and existing conditions at the scene.

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- .3 Before submitting a bid, the Contractor shall examine the location, where the work is to be carried out, what is the location of existing buildings and will study the local conditions that affect the work of this contract. No additional compensation will be awarded for the consequences of his negligence in making this examination.
- .4 The Contractor will carefully study the structural drawings and architectural drawings to ensure that the work of this project can be satisfactorily performed without changes to the building, as indicated on the plans. Also, before commencing work, he will review the work of other trades and report to the Departmental Representative any defect or impediment to the performance of the work described in these specifications or under the required warranty.

## **1.9 ADDITIONAL WORK TO THE CONTRACT**

- .1 The owner, through his professionals, may authorize changes to the Contractor's contract.
- .2 These changes may affect the value of the contract more or less.
- .3 These changes will only take effect on the issuance of a change ordered by the owner and no work can be undertaken before this issuance.
- .4 In extreme cases, it may be authorized by the owner or his professionals to proceed immediately, pending confirmation by order of subsequent change.
- .5 Value of any change to the contract is determined based on an actual cost according to a detailed estimate that lists quantities, actual unit cost, time of handwork according to recognized scales and, equipment costs (taxes, customs, transport, etc.). These additional costs will be reduced by the costs avoided including labor.

For any change, a supervision cost (foreman) may be considered only on the basis of time difference allocated in the general construction schedule for execution of the work involved.

For work where integration or fabrication drawings have been prepared, submitted and verified by the Departmental Representative, an amount for review time of these drawings will be allocated. A maximum amount corresponding to 10 % of cost for basic equipment modified by this revision will be authorized (such as pipes, fabricated sheet, etc.). Additional equipment costs, more or less, are not part of the basic equipments.

Applicable markup following the definition of cost for work performed by a subcontractor under the Contractor's supervision will be 15 % for this subcontractor and 10 % for the Contractor. For work performed by the Contractor, increase will be 15 %.

In some very special cases where a specialty has to have the work performed by subspecialty itself, increase applicable to true costs of this one will be 15 %, 10 % for the specialty and 10 % for the Contractor.

Real costs attributable to change are:

- .1 wages and social benefits paid to workers in accordance with an applicable collective agreement; similarly, wages and social benefits paid to the foreman and, where applicable, to the superintendent who supervises employees on the work site, to the extent that the work of the latter is carried out outside worksite hours provided for in the contract documents;
- .2 travel and accommodation expenses for additional required employees;
- .3 cost of all materials, products and supplies, including materials incorporated into the work due to a change in work, including transportation, storage and handling fees, all in accordance with lowest price awarded to the Contractor and subcontractors;
- .4 taxes and other charges imposed on the labor by any competent authority, materials and equipment required and to which the Contractor is subject to.

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- .5 cost of transportation and use of additional equipment and tools required, other than those used by employees;
  - .6 additional cost of quality control for work related to changes by the quality enabler or superintendent;
  - .7 applicable royalties and patent rights;
  - .8 additional premiums for bonding and insurance that the Contractor must pay as a result of increase in the price of his contract;
  - .9 energy and heating costs directly attributable to the change;
  - .10 cost of removal and disposal of garbage and debris attributable to the change;
  - .11 protections, temporary installations and additional security-related work needed;
  - .12 any other cost of labor, materials and additional required equipment, not specified in the foregoing paragraphs, attributable to execution of the change and which can not be assimilated to overheads and costs of administration.
- .6 Markup percentage applicable to real costs includes :
- .1 general, administrative and profits;
  - .2 fees for communication equipment;
  - .3 cost of using means of transportation or rentals other than those specifically required for materials;
  - .4 fees incurred for estimations , administration, etc. for staff other than those at the site;
  - .5 power tools and manuals of common use in its specialty.

When there is a mismatch with the markups set out in general conditions, those of general conditions will prevail.

#### **1.10 COORDINATION BETWEEN SPECIALTIES**

- .1 To ensure full cooperation with all trades involved in this work, each specialty in building mechanics will have to verify the plans of other specialties and coordinate its work to ensure that its equipment does not conflict with those of other trades before starting work. No addition to contract will be granted for a breach of this term.
- .2 The " ventilation " specialty has priority over other Contractors to pass conduits. However, the Departmental Representative will have the right to intervene if it is judged that it delays the work.
- .3 The coordination and verifications mentioned above will be made by the Contractor and his subcontractors before ordering each equipment, as well as before starting to perform any work. If a difficulty arises, he must present the case to the Departmental Representative s before starting work. If this verification is not done by the specialty and a difficulty arises and the specialty must incur additional costs to overcome it, the subcontractor will undertake these costs.
- .4 Unless otherwise specified, necessary accessories must be provided to complete on-site installation of the items he has manufactured.
- .5 No compensation is granted for moving conduits, boxes, equipment, etc. affecting proper performance of other work or general appearance.
- .6 . Each specialty will coordinate its openings, anchors, supports and other provisions required for installation of the mentioned works and will obtain information required in time not to delay the execution of the work.

## 1.11 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Technical sheets must be submitted as follows:
  - .1 Materials technical sheets having an impact on aesthetics and identified in plans and / or specifications as such will be presented to the Departmental Representative first. The Contractor must ensure that this procedure is followed so as not to create a delay in his work.

When there is a choice of finish and color, for all apparent equipment, this choice will be made by the Departmental Representative among the standard colors of the manufacturer unless otherwise indicated in plans and specifications of the Departmental Representative. The Contractor must therefore verify with the Departmental Representative the choice of finish and color desired by the latter according to its architectural concept

Once the data sheets are reviewed and annotated as "accepted" or "compliant" by the Departmental Representative from an aesthetic point of view, the sheets will be returned to the Contractor and he will send them to us for the technical verification of the product.
  - .2 Prepare and transmit for each product, a description form attached as Appendix " A " and entitled " Data Sheet and Drawing - Product Identification and Details "
  - .3 Submit to the Departmental Representative for conformity verification detailed data sheets of each piece of equipment to be supplied, with all the characteristics mentioned in the specifications, as well as the name of the project. **Each shop drawings will be submitted in one hard copy or PDF, which will be returned to the issuer in " PDF " format by email. This e-mail copy will be replicated by the Contractor in sufficient number for preparation of maintenance requirements given to the owner. Each equipment or equivalent must be presented by an individual PDF file. In addition, the Contractor must update the shop drawing listings provided by the Departmental Representative on each transmission.**
  - .4 . Data sheets must be customized to the project and include a space free of any drawing or writing of 60 mm x 60 mm for their approval.
  - .5 . Each sheet submitted for verification must be identified by means of markers highlighting the proposed equipment and their components. Sheets without such evidence will be returned without verification to the Contractor for resubmission in accordance with this requirement and the Contractor will be responsible for any delays.
  - .6 Provide samples upon request.
  - .7 The production of the equipment must not begin before verification of the technical sheets by the Departmental Representative.
  - .8 Data verification relates only to arrangement and the general construction of equipment and does not constitute a validation of all construction details, nor a quantity validation, dimensions, etc., of which verification remains the responsibility of the subcontractor. This verification does not relieve the subcontractor of responsibility for errors, information, dimensions, quantities, etc. shown on these drawings and to modifications to the drawings and specifications which were not reported in writing to the Departmental Representative. The subcontractor is therefore responsible for ensuring that his installation meets performance requirements indicated in the plans and specifications.
  - .9 For each submitted data sheet or shop drawing, the Contractor must complete the shop drawings tracking sheet issued by the Departmental Representative. This tracking sheet must be kept up-to-date by the Contractor in order to clearly visualize the dates of acceptance or rejection of shop drawings or data sheets.
- .2 Operations Manual
  - .1 Presentation

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The preliminary document for verification and the final document will be given to the Departmental Representative in the following form:

1. 1 hard copy
  2. 1 " PDF " electronic copy
- .2 Operations and maintenance manual must be submitted and verified by the Departmental Representative prior to provisional acceptance and will include the following sections:
1. Technical manual
  2. Maintenance data
  3. Performance sheets
- .3 Technical Manual

The manual will be edited by chapter and a table of contents will be prepared. This manual will include :

- .1 A description of each system and its control / regulation / safety equipments.
  - .2 The circuit diagram of the control / regulation of each system.
  - .3 A description of operations of each system under various loads or season with procedure display, monitoring and set points changes.
  4. The instructions of operations for each system and component.
  5. A description of mesures to be taken in case of equipment/system failure.
  6. A table of valves, referenced on a flow diagram
  7. The color code.
- .4 Technical sheets verified by the Departmental Representative grouped in logical order and assembled with numbered separators.
- .5 Maintenance data should include the following:
- .1 Instructions for maintenance, repair, operation and troubleshooting of each component;
  - .2 A maintenance schedule specifying the frequency and duration of the tasks, as well as the tools necessary for their execution.
- .6 Performance data should include the following:
- .1 Performance data provided by the equipment's / equipment's manufacturer, specifying the operating point of each, recorded after commissioning is complete;
  - .2 Performance test results of equipment / materials;
  - .3 All other performance data specified elsewhere in the contract documents;
  - .4 The testing, regulating and balancing reports, as requested in **23 05 93** section.
- .7 Verification
- .1 For verification purpose, submit to the Departmental Representative a preliminary version of operations, maintenance and performance manual. Unless otherwise directed by the Departmental Representative, technical sheets must not be submitted individually.
  - .2 If necessary, make required changes to the operations and maintenance manual and submit to the Departmental Representative again.
- .8 Additional information
- .1 Prepare additional information data and attach them to operations and maintenance manual if, during the training sessions mentioned above, it is realized that such data are needed.

### **1.12 DOCUMENTS TO BE KEPT ON SITE**

- .1 The Departmental Representative will provide, at the beginning and during the course of construction, one (1) electronic copy of the plans and specifications " issued for construction " or " revised ". Provide the number of copies required for each phase of the work and indicate, as and when, all changes made during execution of the work to the mechanical and electrical equipment and equipments, to control / regulation systems, to low voltage control wiring, etc
- .2 Report each week the information noted on individual copies on a master copy so that they show the mechanical systems and devices as they are actually installed.
- .3 Use an indelible ink pen of different colors for each system.
- .4 Keep these drawings on site and make them available to the persons concerned for reference and verification purposes.
- .5 Post- execution drawings
  - .1 Before proceeding to TAB operations (testing, adjusting and balancing for HVAC), complete "as-built" drawings.
  - .2 Identify each drawing in the lower right corner, in letters of at least 12 mm high, as follows "AS-BUILT" DRAWINGS: THIS DRAWING HAS BEEN REVIEWED AND SHOWS MECHANICAL AND ELECTRICAL SYSTEMS / EQUIPMENTS AS "THEY ARE ACTUALLY INSTALLED" (Signature of the Contractor) (Date).
  - .3 Submit drawings to Departmental Representative for approval and make corrections as directed.
  - .4 Submit electronic copy of "as-built" drawings complete with operations and maintenance manual.

### **1.13 OPERATING AND MAINTENANCE PERSONNEL'S TRAINING**

- .1 Provide qualified instructors to train operating personnel on the operation of mechanical and electrical equipment. Provide maintenance specialists to train operating personnel on maintenance and adjustment of mechanical equipment and any changes or modifications to equipments under the warranty.
- .2 Teach personnel designated by the owner or his operators, how to operate and proceed to maintenance of the facility. Establish a schedule of training sessions and have the staff sign following these sessions. Obtain the list of designated personnel from the owner.
- .3 Instructions must be given during normal working hours, before systems have been accepted and handed over to operating personnel.
- .4 Operations and maintenance manual shall be used for personnel training. Prior to the start of training, hand over a copy of the manual to the Chief Operating Officer, and remaining manuals to the owner.

### **1.14 KEEPING MATERIALS CLEAN**

- .1 Using appropriate elements, prevent dust, dirt and other foreign matter from entering openings of facilities and equipment.
- .2 Provide protection of all materials against weather.
- .3 Ensure that throughout the course of construction, all conduits, pipes, ducts, etc. are kept hooded throughout their erection, so that no foreign material piles up in them.

**1.15 WORKS IN EXISTING BUILDING OR SYSTEM**

- .1 When specified on plans and specifications in a general or detailed fashion, perform the required work with reference to the following:
  - .1 When work is to be carried out in an existing building, each specialty will have to do all work on existing systems concerning its specialty. Work on existing systems includes among others, to remove all or partly, to change, to relocate the existing equipment, to put them in good condition, to reconnect them in whole or partly, to the modify, relocate existing equipment, restore it to good working order, reconnect all or part of it to new systems, so as to carry out the new work shown on drawings and specifications, in accordance with laws and regulations in force.
  - .2 Also, note that no additional specific drawings and specifications for existing systems will be transmitted. Take a tour of the premises, study carefully and become familiar with existing systems, as no additional fees will be granted to perform work on existing systems.
  - .3 All systems to be so removed or modified, must be so as not to affect operating parts of the existing building that will continue to be used during the work according to the needs of the owner.
  - .4 Agree with the owner for periods of time available to make modifications and connection of new systems on existing systems.
  - .5 Include in the total bid all temporary work required to complete the new work described on drawings and specifications even if not described or shown in these drawings and specifications.
  - .6 Move all existing materials and equipment from the various systems belonging to its specialty that prevent or obstruct the work of other trades. All the elements used for the extension due to the displacement of the existing materials or equipment will have to be identical to those existing.
  - .7 Execute work in existing building in a clean and neat manner, to avoid damage to walls, ceilings and floors. Restart of walls, restart of paint, butchering holes, etc., following the removal of existing appliances or other accessories, are carried out by the construction manager.
  - .8 Materials from existing systems to be removed for new work shown on drawings shall not be reused unless otherwise indicated on drawings. Non-reused materials will be offered to the owner and those not retained will become the property of the Contractor who will have to dispose of them outside the premises.

**1.16 CLEANING THE PREMISES**

- .1 Upon completion of installation and performance review, remove surplus materials, waste, tools and equipment from site.

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**APPENDIX A**

**DATA SHEET AND PRODUCT IDENTIFICATION AND DETAILS**

PROJECT:
PROJECT N° <span style="float: right;">PHASE :</span>

OWNER :
---------

**SPECIALTY OR SUBCONTRACTOR**

<b>CONTRACTOR :</b> Address :
Contact: Telephone : ( )                      Fax: ( ) Email:

**SUBMITTED TO : (please check)**

<input type="checkbox"/>	<b>ARCHITECT</b>

<input type="checkbox"/>	<b>STRUCTURAL ENGINEER</b>

<b>SUPPLIER :</b> Adress :
Contact: Telephone : ( )                      Fax: ( ) Email:

<input type="checkbox"/>	<b>MECHANICAL/ELECTRICAL ENGINEERS</b>

SPECIALTY (field) :	
Datasheet or drawing n° :	
Delivery time (after approval)	
<b>DESCRIPTION :</b>	
<b>SUBMITTED PRODUCT</b>	<b>DRAWING ISSUED FOR :</b>
AS IS: <input type="checkbox"/>	VERIFICATION : <input type="checkbox"/>
EQUIVALENT : <input type="checkbox"/>	INFORMATION : <input type="checkbox"/>
SUBSTITUTION : <input type="checkbox"/>	COORDINATION : <input type="checkbox"/>
	OTHER :

<input type="checkbox"/>	

<b>CONTRACTOR :</b> Address :
Contact: Telephone : ( )                      Fax: ( ) Email:

<b>PROFESSIONAL VERIFICATION : (stamp)</b>

<b>REFERENCE TO PLAN :</b>
<b>REFERENCE TO SPECIFICATIONS:</b>
Section :                                      Article :
<b>NOTES :</b>
<b>REV. DATE OF ISSUE :</b>

**APPENDIX B**

**DOCUMENT TRANSMISSION JOURNAL**

**PRESSURE TEST REPORT**

Fire protection system Date of transmission: \_\_\_\_\_

**DOCUMENT TRANSMISSION FOR SPARE PARTS**

Specify: Date of transmission: \_\_\_\_\_

Specify: Date of transmission: \_\_\_\_\_

Specify: Date of transmission: \_\_\_\_\_

**LETTER OF CONFORMITY OF PARASISMOQUIES SYSTEMS**

Fire protection Date of transmission: \_\_\_\_\_

Ventilation / Air Conditioning Date of transmission: \_\_\_\_\_

Electrical / Lighting Date of transmission: \_\_\_\_\_

**TEST AND BALANCING REPORT**

Ventilation system Date of transmission: \_\_\_\_\_

**OPERATION AND MAINTENANCE MANUAL (including DDC items)**

Heating Date of transmission: \_\_\_\_\_

Fire protection Date of transmission: \_\_\_\_\_

Electricity Date of transmission: \_\_\_\_\_

Ventilation / air conditioning Date of transmission: \_\_\_\_\_

**GUARANTEE LETTER**

Plumbing / Heating / Cooling Date of transmission: \_\_\_\_\_

Ventilation Date of transmission: \_\_\_\_\_

Fire protection Date of transmission: \_\_\_\_\_

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**PLANS AS BUILT**

- |  |                             |
|--|-----------------------------|
| <input type="checkbox"/> Heating         | Date of transmission: _____ |
| <input type="checkbox"/> Fire protection | Date of transmission: _____ |
| <input type="checkbox"/> Ventilation     | Date of transmission: _____ |
| <input type="checkbox"/> Regulation      | Date of transmission: _____ |
| <input type="checkbox"/> Electricity     | Date of transmission: _____ |
| <input type="checkbox"/> Specify: _____  | Date of transmission: _____ |

**END OF SECTION**

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**Part 1            Products**

**1.1            PRODUCTS**

- .1            Refer to particular sections that deals with them individually.

**Part 2            Execution**

**2.1            CONNECTIONS TO EQUIPMENT**

- .1            In accordance with manufacturer's instructions unless otherwise indicated.
- .2            Use unions or flange connections on piping to separate equipment from the network and to ease the cleaning and dismantling processes of each components.
- .3            Use plastic-lined flexible conduits and connectors suitable for electrical connection or control of motors or other equipment that may vibrate or move.

**2.2            CLEARANCES**

- .1            Provide clearances prescribed by standards in force.
- .2            Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer
- .3            Provide space for disassembly, removal of equipment and components without interrupting operation of other systems, equipment or components. Space must be of dimensioned in accordance with drawings or the manufacturer's recommendations, whichever is higher
- .4            Each Contractor will be responsible for ensuring that required clearances are respected by him and other Contractors. These spaces will have to be coordinated towards the work site and in case of non-respect of clearances the Contractor at fault having encroached the space will have to relocate his installation at his expenses.

**2.3            ELECTRICAL CONDUIT INSTALLATION**

- .1            Refer to particular sections dealing with them individually.

**2.4            ACCESS PANELS**

- .1            Provide access panels in ceiling or walls whether it is shown or not on the drawings, so it is possible to maintain the electrical boxes material and accessories or inspect security devices for fire protection.
- .2            Access panels for mechanical equipment will be provided by the specific trade, but installed by the trade installing the ceiling, the wall or the floor. Where multiple access panels are necessary, their location will be submitted to the Departmental Representative for approval.
- .3            Except when indicated otherwise, access panels must be installed flush to the surfaces and have 600 mm x 600 mm for full body access and 300 mm x 300 mm for hand access. They must open 180° degrees and have smooth angles. They must have hidden hinges and be lockable by key. Steel must be covered by a protective layer and the panels must be provided by a known provider and technical specs.

## **2.5 ROSETTES**

- .1 Provide and install rosettes on visible side, where piping and conduits run through walls, shafts, ceilings and floors, where it is required to complete the work in a clean and proper way. Specific location where rosettes are required will be decided on site by the Departmental Representative in regards of the work quality.
- .2 Internal diameter must be the same as the external diameter of the piping, including the insulation. External diameter must be superior to the opening and the flange.
- .3 If the flange goes over the finish floor, rosettes must go around the apparent flange.
- .4 Fixed them to the pipes or the finish surfaces, but not to the insulation.

## **2.6 PRESSURE TESTING OF COMPONENTS AND PIPING NETWORK**

- .1 Advise the owner before pressure testing. Time delay for the advise will be decided by the owner.
- .2 Test the piping network as in regards of sections 21, 22 and 23.
- .3 Insulate or cover the network only after approval and certification of the tests by the Departmental Representative.
- .4 Provide a report once the tests are done and mention the technic used, time and other necessary details. Identify people on site during the tests.

## **2.7 EXISTING NETWORK**

- .1 Connect the new piping to the existing network at the moment approved by the Departmental Representative or the owner.
- .2 Ask for written approval at least ten (10) days before starting the work.
- .3 The contractor is responsible for any damages on the existing network happening because of the work.
- .4 Clean the sites regularly.
- .5 Coordinate with the owner all work implying existing networks when there is a possibility of affecting the operating systems in the building.

**END OF SECTION**

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**Part 1            General**

**1.1        GENERAL**

- .1        This section deals with common subjects applicable to all sections relating to mechanical and electrical work.
- .2        The general and specific specifications, annexes, labor regulations, owner's documents, Departmental Representative 's general and special conditions and other tender documents form an integral part of this section and govern its work.

**1.2        OPENING AND DRILLING**

- .1        All openings of 150 mm and less necessary for the passage of piping and conduits through walls, partitions, floors, beams, etc., except those specifically indicated in the structural drawings, will be made by the specialized contractor concerned. All openings greater than 150mm will be provided by the division responsible for the construction of walls, partitions, floors, beams, etc., but must be coordinated by the sections of this division.
- .2        In walls, partitions, floors, foundations, etc., existing or in which it was not advisable to leave an opening, drill the openings, using a dry rotary drill of the appropriate diameter or any other equipment approved by the Departmental Representative.
- .3        No opening will be made in a beam, joist, column or any other structural element without the prior authorization of the Departmental Representative.
- .4        The openings will be the size required for the installation of the sleeves. These sleeves will be sized taking into account the elements passing through it, the required insulation and the fire stop system.

**1.3        SLEEVES**

- .1        Places where fire resistance is prescribed
  - .1        Masonry, concrete or drywall work
    - .1        Through floors, use sleeves made of 10 or higher series black steel pipe. Weld a 19 wide locating flange so that resting on the floor, the sleeve protrudes 50 from the floor.
    - .2        Install sleeves at wall penetrations or masonry and concrete partitions as well as in other places indicated. Use sleeves made from 10 or greater series black steel pipe. These sleeves will be flush with finished surfaces.
    - .3        For electrical work, through internal partitions with fire resistance, only provide sleeves for armored bars, channels and cable trays. However, ensure the fire seal. (See sealing clause).
- .2        Places where no fire resistance is prescribed
  - .1        On foundation walls, use sleeves made from 10 or higher series black steel pipe. A 50 mm annular water seal will be welded at mid-length.
  - .2        Through floors, use sleeves made of 10 or higher series black steel pipe. Weld 19-wide marker angles so that, resting on the floor, the sleeve protrudes 50 above the floor.

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- .3 Install sleeves at crossings of masonry and concrete walls or partitions as well as at other locations indicated. Use sleeves made from 10 or greater series black steel pipe. These sleeves will be flush with finished surfaces
  - .4 Drywall material should have been carefully laid and the annular space should not exceed 6mm.
  - .5 For electrical work, through interior partitions without fire resistance, only provide sleeves for armored bars, channels and cable trays. Plan to adequately seal free spaces where the interior partition must provide soundproofing.
- .3 Free space
- .1 Leave an annular free space of 6 mm between the sleeve and the pipes or between the sleeve and the insulation.
- .4 Caution
- .1 The fact that an element has been installed without a sleeve having been provided will not be considered as sufficient reason, said element will have to be removed in order to install the sleeve.

**END OF SECTION**

**Part 1            General**

**1.1        GENERAL**

This section deals of topics affecting all sections in regards of mechanical and electrical work.

**1.2        RÉFÉRENCES**

- .1        American Society of Mechanical Engineer.
  - .1        ASME A13.1 - 2007 Scheme for the Identification of Piping Systems
- .2        National Fire Protection Association (NFPA)
  - .1        NFPA 13, Standard for the Installation of Sprinkler Systems.
  - .2        NFPA 14, Standard for the Installation of Standpipe and Hose Systems.
- .3        Canadian General Standards Board (CGSB).
  - .1        CAN/CGSB-24.3 Identification of Piping Systems.
- .4        Canadian Standards Association CAN/CSA B149.1
  - .1        Natural and propane gas code.

**1.3        ACTION AND INFORMATION SUBMITTALS**

- .1        Submit required technical data sheets as well as specifications and manufacturer's literature regarding products in conformity with the "Action and information submittals" clause in Section 20 05 01. These sheets must indicate the product characteristics, the performance criteria and the limitations.

**1.4        QUALITY ASSURANCE**

- .1        Quality assurance: submit the required documents in conformity with the "Action and information submittals" clause in Section 20 05 01.

**Part 2            Products**

**2.1        MANUFACTURER'S NAME PLATES**

- .1        Metallic or laminated plastic name plates will be mechanically fastened by the manufacturer to material pieces.
- .2        Inscriptions (letters and numbers) must be in relief or engraved.
- .3        The following information, according to each case, must be indicated on the name plates.
  - .1        Device: Manufacturer's name, model, dimensions, serial number, power, flow.

**2.2        IDENTIFICATION OF EQUIPMENT LOCATION HIDDEN IN CEILINGS.**

- .1        Identify equipment location when any maintenance is required.

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- .2 Use a Lamicoid or engraved plate of 13 mm with, white or black, with 9 mm size inscriptions.
- .3 Identification will be applied on access panels and will be installed with screws on each end. Screws must be Torx type.
- .4 Inscription will be the same as for the equipment identification on drawings or as requested by the owner or the Departmental Representative.
- .5 Approve the wording prior to identify.

**2.3 AIR DUCTS**

- .1 Label air conduits with a stencil, black letters, 50 mm height, with arrows indicating the flow direction.
- .2 Spacing in-between each labeling must not go over 15 meters.
- .3 Label venting conduits on each side of walls or dividing enclosure and close to each access panel.
- .4 Label only once the protective layer has been applied.

**2.4 INSCRIPTIONS UNILINGUAL/BILINGUAL**

- .1 Inscriptions for identification of systems and elements must be prepared in French/English.

**2.5 PIPING IDENTIFICATION**

- .1 The fluid conveyed in the pipes must be identified by background color markings, by pictograms (if necessary) and / or by legends; the direction of flow must be indicated by arrows. Unless otherwise specified, piping must be identified in accordance with CAN / CGSB 24.3
- .2 Pictograms, legends, size of letters, color and materials must be the same as existing.

Fluid	Color		Text on piping
	Background	Text	
Cold Water	Same as existing	Same as existing	Same as existing
Hot Water	Same as existing	Same as existing	Same as existing
Sanitary Waste	Same as existing	Same as existing	Same as existing
Vent	Same as existing	Same as existing	Same as existing

**Part 3            Execution**

**3.1            MANUFACTURER'S INSTRUCTIONS**

- .1            Conformity: conform to the manufacturer's written requirements, recommendations and specifications, including any available technical bulletins, instructions relative to maintenance, storage and installation of products, and to indications on technical sheets.

**3.2            TIMING**

- .1            Do not begin systems and equipment identification before painting is completed.

**3.3            INSTALLATION**

- .1            Unless otherwise indicated, identify systems and equipment in conformity with the CAN/CGSB-24.3 standard.
- .2            Supply ULC and CSA listing plates required by each respective organization.

**3.4            IDENTIFICATION PLATES**

- .1            Location
  - .1            Plates must clearly identify the equipment and/or the piping systems and they must be installed in locations where they will be in full view and easily identifiable from the work floor.
- .2            Protection
  - .1            Do not apply paint, insulation or any coating on identification plates

**END OF SECTION**



**Part 1 General****1.1 REFERENCES**

- .1 Refer to section 20 05 01 paragraph "Codes and standards".
- .2 All products used must comply with the following standards:
  - .1 American Society for Testing Materials
    - .1 ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation
    - .2 ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
    - .3 ASTM E814 - Standard Test Method for Fires Tests of Penetration Firestop Systems
    - .4 ASTM E2174 - Standard Practice for On-site Inspection of Installed Fire Stops
  - .2 International Firestop Council
    - .1 Guidelines for Evaluating Firestop Systems Engineering Judgments
  - .3 Underwriters Laboratories
    - .1 UL 1479 - Fire Tests of Through-Penetration Firestops
  - .4 Underwriters Laboratories of Canada
    - .1 CAN / ULC-S102 - Standard Method of Test, Surface Burning Characteristics of Construction Materials and Assemblies
    - .2 CAN / ULC-S115 - Standard Method of Fire Tests of Firestop Systems

**1.2 SHOP DRAWINGS AND TECHNICAL SHEETS TO BE SUBMITTED FOR VERIFICATION / INFORMATION**

- .1 Submit the required documents in accordance with the requirements of section 20 05 01 paragraph "Documents and samples to be submitted".
- .2 Submit drawings of the following items for verification:
  - .1 Sealants and sealants collars.
  - .2 Filling and sealing material.

**1.3 DEFINITIONS**

- .1 Fire compartmentalization: material or combination of materials used to maintain the integrity of a fire resistant component by providing an effective barrier against the spread of flames, smoke, water, and hot gases and heat through penetrations into functional elements of fire-resistant walls and floors.

**1.4 GENERAL DESCRIPTION OF THE WORK IN THIS SECTION**

- .1 Retain the services of a specialist to select the fire stop systems and specify the products required to ensure this compliance.

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- .2 Use fire protection systems approved, according to the Canadian standard CAN / ULC-S115k in the following elements:
  - .1 Full or partial piercings of a fire separation for the passage of pipes and other technical installations. These piercings through fire separations are found in vertical elements (walls and partitions), in horizontal elements (floor and ceiling assemblies) and in the walls and partitions of vertical service ducts.
- .3 Refer to the architectural plans to know the types of fire partitions.

## **1.5 QUALITY ASSURANCE**

- .1 Engage an experienced installer who is licensed, certified or otherwise qualified by the firestop supplier as having received the required training to install their products in accordance with the requirements. The latter will install and / or supervise the installation of the fire compartmentalization products. The fact that a supplier agrees to sell its fire protection products to the subcontractor or to a subcontractor hired by it does not confer on the buyer the required qualifications.

## **Part 2 Products**

### **2.1 GENERAL**

- .1 Ensure the fireproof compartmentalization using elements compatible with each other, with the substrates forming the penetrations and, where applicable, with the elements penetrating the fireproof element under conditions of service and use such as demonstrated by the product supplier and based on field testing and experience.
- .2 Provide for each fire stop the elements necessary to install the filling material. Use only components specified by the firestop supplier and approved by the qualified testing agency for the designated firestop components.
- .3 Use only firestop products that have undergone ULC or cUL tests for specific fire resistant construction conditions.
- .4 Provide products with a flame spread rate less than 25 and a smoke release rate less than 50 according to CAN / ULC-S102.
- .5 Provide products tested in the laboratory and in accordance with UL 1479, ASTM E814 and CAN / ULC-S115.
- .6 Provide products with an F rating at least equal to the degree of fire resistance required for fire separation, when tested to CAN / ULC-S115 with gauge pressure on the exposed side of at least 50 Pa greater than that of the unexposed side.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Examine the work areas and the conditions under which the work will be carried out and identify any condition that could hinder execution according to the manufacturer's recommendations.
- .2 Check that the penetrations have the required dimensions and that their condition allows the application of materials.

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- .3 Make sure that the surfaces to which the material will be applied are free from dirt, grease, oil, rust, laitance, release agent, water repellents or any other substance that could affect its good adhesion.
- .4 Provide temporary protection to prevent materials from soiling adjacent surfaces.
- .5 Observe the supplier's recommendations regarding temperature and humidity conditions before, during and after installation.
- .6 Do not proceed with work until all unsuitable conditions have been corrected.

### **3.2 INSTALLATION**

- .1 Install firestop materials in accordance with the "ULC Fire Resistance Directory" and "UL Products Certified for Canada (cUL) Directory".
- .2 Follow the manufacturer's instructions for the installation of piercing protection materials.
- .3 Caulk holes and cavities resulting from penetrations to ensure an airtight and watertight seal.
- .4 Protect materials installed on surfaces where there is traffic.

### **3.3 SEALING WHERE RESISTANCE IS PRESCRIBED**

- .1 Places where fire resistance is prescribed
  - .1 In walls or floors for which a degree of fire resistance is required, the free space left between the steel sleeve and the pipes and conduits, as well as between the sheath and the fire separation must be closed by fire-retardant materials which must remain in place and prevent the passage of flames and fumes when subjected to fire exposure, as described in the CNB standard It is a sealant approved for this use or another approved technique.
  - .2 When the pipe or duct passing through the floor is made of materials that do not retain its shape, when subjected to intense heat (plastic for example), install an approved fire stop assembly following the prescribed procedure. Such an assembly will be installed at the location prescribed by the approval.
  - .3 When the pipe or duct passing through the wall or partition, with or without a sleeve, is made of materials which do not retain its shape when subjected to intense heat (plastic for example), install a fire stop assembly approved according to the prescribed procedure. Such an assembly will be installed on both sides of the wall or partition.
  - .4 For electrical installations, install appropriate firestop fillings.
  - .5 For conduits, use the same method as for the pipes described above. For armored bars, use a section incorporating a fire barrier and the perimeter will be sealed with mastic approved for this use. For the cable trays, use a removable material such as approved brick.
  - .6 These fire-resistant materials must be installed according to assemblies approved by U.L.C. and identified by S.P. (Number) "Service Penetration Assemblies".
  - .7 The Contractor shall require from his supplier of the fire-resistant materials the technical bulletins corresponding to the fire-resistant materials to be used with the U.L.C. and the "SP" number corresponding to the assembly to be carried out on the site.
- .2 Places where no fire resistance is prescribed
  - .1 Fill the annulus between pipes, ducts and sheaths and a sleeve with glass wool compressed in place and covered on each side with a suitable elastomeric sealant compliant.

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- .2 Fill the annulus between the pipes, ducts and drywall material with a suitable elastomeric sealant that is compliant.

### **3.4 OTHER PLACES**

- .1 Fill annulus between pipes, conduits and ducts with glass wool compressed in place and covered on each side with a suitable elastomeric sealant compliant.

### **3.5 TEMPORARY MEASURE**

- .1 Temporarily close all openings made during the work while waiting for the passage of pipes, conduits and ducts.

### **3.6 SITE QUALITY CONTROL**

- .1 A manufacturer's representative must be on site during the initial installation of the fire stop system to train personnel in the selection and installation procedures. This will be done in accordance with the supplier's written recommendations published in the documentation and detailed drawings.
- .2 At the end of the work, provide a letter of conformity from the manufacturer's representative attesting that he has visually inspected the fire stop systems and that they comply with the latter's requirements. This letter is a prerequisite for the provisional acceptance of the works.
- .3 Comply with the installation requirements for fire protection systems, tested according to CAN / ULCS115, to ensure a compliant degree of fire resistance.
- .4 Before hiding or covering an element, examine the caulking of the penetrations to ensure the correct installation.
- .5 Perform fire breakthrough inspection in accordance with ASTM E2174.
- .6 At this stage, carry out repair and repair work on firebreaks damaged by cutting or penetration by other trades of firebreak elements already in place.

**END OF SECTION**

**Part 1            GENERAL**

**1.1            REQUIREMENTS**

- .1            General requirements
  - .1            Refer to Section 20 05 01 " General Requirements for Mechanical and Electrical Specializations"

**1.2            REFERENCE STANDARDS**

- .1            Refer to Section 20 05 01, paragraph " Reference standards ".
- .2            Various components and fire protection systems of this project shall meet the requirements prescribed in latest edition of different NFPA standards especially NFPA-10, 13, 14, 291.

**1.3            SEISMIC MEASURES**

- .1            Refer to Section 20 05 01.

**1.4            COORDINATION BETWEEN SPECIALTIES**

- .1            Refer to Section 20 05 01 " Coordination between specialties ".
- .2            Participate actively in the above and provide any required information and follow arrangements between specialties.
- .3            Be responsible for any displacement required as a result of a lack of the above.

**1.5            ACTION AND INFORMATION SUBMITTALS**

- .1            Submit required documents and samples conforming to Section 20 05 01.

**1.6            FIRE PROTECTION SYSTEMS SPECIAL FEATURES AND COMISSIONNING**

- .1            Install fire protection systems in accordance with approved erection drawings and in accordance with NFPA Standards 13 and 14.
- .2            Install all equipment, accessories, alarm and monitoring devices in accordance with manufacturers' instructions.
- .3            Take into account the expansion and contraction of the piping when installing the hangers.

**1.7            SLEEVES**

- .1            Refer to Section 20 05 01 " General Requirements for Mechanical and Electrical specialties".

**1.8            INSPECTION**

- .1            It is forbidden to embed, paint or conceal pipes, accessories, or work before they have been inspected or approved by the Departmental Representative.

## **1.9 WORK IN EXISTING BUILDING OR SYSTEM**

- .1 Refer to Section 20 05 01.
- .2 When an existing building or part of a building is used during the work period, the protection system must be kept active at all times for the sections used. To do this, any temporary work required will have to be included and executed. In order to carry out this work, interruptions of short durations during a shift will be tolerated provided that the system is operational at all other times. The foregoing shall be provided and included by the Contractor.
- .3 Existing slabs scanning before proceeding with the coring work is to be include in contractor's price.

## **1.10 ANCHOR AND EXPANSION OF FIRE PROTECTION NETWORK**

- .1 Piping must be installed so it is free to expand or contract without excessive restrains or deterioration on the visible piping or the insulation and in a way that there is no restrains on equipment and fittings.
- .2 Anchor the piping at each location identified and/or required with approved anchors, well fixed to the piping and the building structural elements, so the piping is well fixed at that location. Building structural elements must not be damaged by the anchors.

## **1.11 PROTECTION AND CLEANLINESS REGARDING FIRE PROTECTION WORKS**

- .1 Using appropriate methods, prevent dust, dirt and other foreign materials from getting into openings in equipments, materials and systems.
- .2 The fire protection speciality must take all necessary measures so that the inside of all equipment, components and piping be free from debris after their installation.
- .3 During installation, the seals at each end of the conduits should be left in place by the Contractor until the next joint is made.
- .4 The Contractor will be responsible for taking all necessary steps in order to protect the piping systems from all substances likely to contaminate the interior or the accessories.
- .5 According to the Departmental Representative's judgement, any activity susceptible of generating dust and/or dirt and/or contaminants, which could harm the project environment, must be done outside the perimeter of the building.

## **1.12 TESTING**

- .1 Requirements listed below are to be added to those of listed tests
  - .1 Provide a notice of twenty-four (24) hours before the testing date.
  - .2 Do not conceal work before it has been tested and approved. Follow the work calendar and make the required preparations for the tests.
  - .3 Perform testing in presence of the Departmental Representative.
  - .4 Cover all costs, including those of new testing and those of repair.
  - .5 Piping service pressure:
    - .1 Perform a hydrostatic test of all fire protection systems at a pressure equal to one time (1) the operating pressure of the systems or at a minimum pressure of 1300 kPa.

- .2 Unless otherwise noted, pressurize the system and make sure there are no leaks for a period of two (2) hours.
- .2 Hydrostatic tests for aboveground piping
  - .1 All above-ground piping of the whole installation will be subjected to a hydrostatic pressure test of 350 kPa above the maximum pressure to which the system may be subjected, but not less than 1400 kPa. The test shall last at least two (2) hours and no pressure drop or leakage shall be observed. Any leaks must be repaired and the test repeated until a perfect seal is achieved.
  - .2 In addition to 1400 kPa hydrostatic tests for two (2) hours, an airtightness test shall be performed on the piping system at a pressure of 275 kPa for a period of one (1) hour. Any air leak allowing a loss of pressure will be corrected.
- .3 Testing of alarms and monitoring devices
  - .1 Test mechanical and electrical alarms, including electrical monitoring devices to ensure they are in perfect working order. Verification of the installation of equipment connected to the fire alarm system will be carried out in accordance with NFPA-72, chapter 7 and CAN / ULC-S537.

### **1.13 FINAL ACCEPTANCE AND TESTS PRIOR TO ACCEPTANCE**

- .1 Inspection and acceptance testing
  - .1 After installation and testing prior to acceptance completed , an inspection report (like those for annual inspections of automatic sprinkler systems) and an inspection certificate will be provided to the Departmental Representative at end of the project. Results of all tests duly recorded in a booklet will be attached to the inspection report, including the operating pressures of all equipment.
- .2 Contractor's Materials and Testing Certificate
  - .1 Perform all pre-tests specified below in accordance with NFPA Standards 13, 14 and 24. Contractor's Material and Test Certificate signed by the Contractor will be issued in accordance with NFPA Standard No. 13, Section 1-12.
  - .2 A flow test through the fully open test valve will be performed to ensure that there is no pressure build-up in the drainage network which would affect the proper functioning of the system.

**END OF SECTION**



**Part 1 GENERAL**

**1.1 DEFINITIONS**

- .1 Dismantling work
  - .1 Dismantling work includes all removal work, recuperation work and storing of existing fire protection material that must be reused and/or given back to the owner.
- .2 Demolition work
  - .1 Demolition work includes all removal work and evacuation of fire protection equipment and/or material from site that are not reused and/or given back to the owner.

**1.2 COORDINATION**

- .1 Coordinate network shutdowns with the owner and if required, building security and firefighters.
- .2 All work must be done without interrupting the normal operation of the owner.

**Part 2 Products**

**2.1 EXISTING MATERIAL REINSTALLED**

- .1 Before proceeding with the installation an existing fire protection equipment reused, proceed to its clean-up, verification and put it back in good conditions. Replace all missing pieces and/or malfunctioning.
- .2 Replace existing sprinklers with new ones.

**Part 3 Execution**

**3.1 DISMANTLING WORK**

- .1 All dismantling work of the existing fire protection equipment that need to be reused must be done by the fire protection contractor and coordinated with other trades under the general contractor supervision.
- .2 Prior to dismantling, existing fire protection equipment needing to be reused, the fire protection contractor is responsible to inspect the equipment and mention by writing to the owner representant any damages and/or defects observed. In order of not doing so, all equipment are considered as in perfect shape and any damages or defects observed afterward must be repaired by the fire protection contractor without any compensation.
- .3 Fire protection equipment reused must be stored temporary by the fire protection contractor, who will be taking full responsibility for it. No additional cost will be approved for replacing a damaged and/or missing equipment during its storing.
- .4 While reinstalling an existing fire protection equipment reused, fire protection contractor must provide all supports and mounting accessories required to fully install it and make it functional.

**3.2 DEMOLITION WORK**

- .1 Work prior to demolition

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- .1 Prior proceeding to the existing fire protection equipment demolition, fire protection contractor must execute these following tasks.
  - .1 Coordinate the shutdown of all alarms on the fire protection network.
  - .2 Drain the fire protection network.
  - .3 Proceed with the dismantling work of the reused and/or kept equipment.
  
- .2 Demolition work
  - .1 All demolition work will be completed by the fire protection contractor in coordination with other trades under the general contractor supervision.
  - .2 In general, all existing fire protection devices removed and not to be reused become section 21 propriety and must be removed from site. However, give back to the owner all existing devices marked to be kept.
  - .3 Plan sealing all openings left open in existing walls and/or floors kept in place during demolition and /or dismantling. In fire proofed wall and/or floors, use a fireproof sealing coat.

**EN OF SECTION**

**Part 1 EXECUTION**

**1.1 CONNECTING THE PIPING TO THE EQUIPMENT**

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

**1.2 CLEARANCES**

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer
- .2 Provide space for disassembly, removal of equipment and components without interrupting operation of other systems, equipment or components. The space must be dimensioned in accordance with the drawings or the manufacturer's recommendations, whichever is the higher

**1.3 SUSPENSION HANGERS**

- .1 Conform to NFPA 13 standard, covering automatic sprinkler systems, NFPA 14, covering fire piping systems and to Division 21.
- .2 Supports, braces and restraints listed by ULC and FM for utilisation in a fire protection system.
- .3 Refer to the latest versions.

**END OF SECTION**



**Part 1 General**

**1.1 REFERENCES STANDARDS**

- .1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA)
  - .1 ANSI/NFPA 13, Installation of Sprinkler Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**Part 2 Products**

**2.1 PIPING ABOVE GROUND**

- .1 Pipes:
  - .1 Automatic sprinkler and fire piping will be continuous welded black pipe or Electric Resistance Weld, conforming to the A53 or A795, ASTM standard.
  - .2 Piping of ND 2 and under shall be schedule 40 and shall be joined by means of screwed connections or by means of mechanical coupling sleeves for grooved pipes.  
  
Piping ND 2½ and larger shall be Series 10 wall (ASTM A795) and be assembled by welding or using mechanical coupling sleeves for roll grooved end pipe.
- .3 Seals
  - .1 The joints on the steel piping above ground shall be screwed, flanged or made using mechanical coupling sleeves for pipe with grooved ends. Mechanical connections will be Victaulic Style 75 or equivalent approved of Anvil and Gruvlock. Screw joints will be assembled by coating the male end with approved joint compound. The flanged joints will be assembled with 1.6 mm thick rubber gaskets. Victaulic type flanges must be in cast iron.
- .4 Fittings:
  - .1 Threaded fittings on above-ground piping will be standard weight cast iron, 860 kPa, according to ASTM A-26 and ANSI B16.4 standards, or standard weight malleable cast iron, 1000kPa, according to ASTM A-47 and ANSI B-16.3 standards.
  - .2 Flanges will be threaded type, standard weight cast iron, 860 kPa, meeting ASA B16.1, ASA B2.1 and ASTM A126 standards.
  - .3 The mechanical coupling fittings will be prefabricated type, with malleable iron grooves or shoulders, according to ASTM A47 or in ductile cast iron, according to ASTM A536.
  - .4 Mechanical fittings on ductile cast iron pipe for potable water and steel fire piping :
  - .5 Transition mechanical fittings for joining AWWA ductile cast iron pipe with steel pipe (valves, elbows, check valves) for fire protection. The segments (body) are assembled at an angle to verify the alignment of the grooves of different types of pipe. The segments (body) are of ductile cast iron conforming to ASTM A- 536, Grade 65-45-12. Molded seal for Style 307 fittings, FlushSeal grade M.  
  
Acceptable product: Victaulic Style 307.
- .5 Piping slope:

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- .1 All sprinkler piping and fire mains will be installed so that it may be completely drained. If possible, arrange the piping so this draining is done by the main drain valve.

## **2.2 AUTOMATC SPRINKLERS**

- .1 The sprinklers must be quick response type, making sure the water pulse is uniform and total. Use of old models is forbidden. Sprinklers must be aligned. Everything as by model Tyco or equivalent approved by the Departmental Representative.
- .2 Fusion temperature must be in accordance with the location or the application, as required by NFPA-13 and the current document. The temperature value and the inlet must be in accordance with NFPA-13.
- .3 Sprinklers fuses color will be in accordance with NFPA-13 for the temperature category temperature.
- .4 Except when indicated otherwise on drawings, sprinklers must have an inlet of DN½ with a male fitting of DN½.
- .5 Sprinklers must be model projecting on top, at the bottom, hidden at the bottom or on wall horizontally, as shown on the drawings. Every sprinkler must be ULC and FM approved.

## **Part 3 Execution**

### **3.1 INSTALLATION**

### **3.2 PIPING INSTALLATION**

- .1 Install piping level and square, so that it rests uniformly on supports and hangers. Do not fasten hangers to a plaster ceiling.
- .2 Make sure that the interior and the extremities of new and existing piping is free from water and foreign materials.
- .3 During installation, and at the end of each work period, close open ends of piping, using plugs or another appropriate method, to prevent introduction of foreign material.
- .4 Inspect piping before its installation.

### **3.3 MANUFACTURER'S INSTRUCTIONS**

- .1 Conformity: conform to the Manufacturer's requirements, recommendations and to his written specifications, including any available technical bulletins, to handling, storage, and product installation instructions, and to technical data sheets.

### **3.4 SPECIFIC REQUIREMENTS**

- .1 Notify the owner in advance of the sequence of the areas affected by work, as the work progresses.

### **3.5 ELECTRICAL CONNECTIONS**

- .1 Electrical work related to the work covered by this section must be carried out under the terms of division 26 "Electricity" and 28 concerning the results of the work.

### **3.6 QUALITY CONTROL DURING EXECUTION**

- .1 On-site tests/inspections:
  - .1 Perform tests and required inspections and approve piping before it is concealed.
  - .2 Preliminary tests:
    - .1 Proceed with a hydrostatic test of each system at a pressure of 1400 kPa, for a period of two (2) hours, during which time there must be no leaks or pressure
    - .2 Perform the required tests and approve the piping installed in ceiling spaces, before the ceiling installation.
  - .3 Final inspections and tests:
    - .1 Do not request final tests and inspections before the completion of preliminary tests and any required corrections.
    - .2 Submit the request for final inspections at least fifteen (15) days before the desired inspection date.
  - .4 Repeat the required tests according to the directions.
    - .1 Correct anomalies and perform additional tests until the systems conform to the contract requirements.
  - .5 Supply the apparatus, instruments, connection equipment and the manpower required for the testing.

### **3.7 ADJUSTMENT**

- .1 Do final adjustment of the equipment so it will operate to the satisfaction of the Departmental Representative and competent authorities.

### **3.8 FINAL APPROVAL AND TESTS PRIOR TO ACCEPTANCE**

- .1 Inspection and acceptance tests:
  - .1 Once installation and pre-acceptance tests have been completed, systems shall be subject to inspection and system operation tests will be done. An Inspection report (like those of annual inspections of automatic sprinklers), and an inspection certification will be supplied to the Departmental Representative at the end of the project. All the test results, assembled in a booklet, will be attached to the inspection report, including operation pressures of all equipment.
  - .2 Certificate of materials and tests by the Contractor:
    - .1 Prior to acceptance, perform all pre-requisite tests, specified hereafter, according to the standards of NFPA 13 and 14. A certificate of materials and tests by the Contractor will be prepared and signed by the Contractor and the Departmental Representative. This certificate will be presented according to Chapter 24 of the NFPA 13 standard.
- .3 Hydrostatic tests of above-ground piping:
  - .1 All above-ground piping of the complete installation will be subjected to a hydrostatic pressure test at 350 kPa above the maximum pressure to which the system may be subjected, but not less than 1400 kPa. The test must last at least two (2) hours and no pressure drop, or leak may be observed. Any leaks will be repaired, and the test repeated until a complete seal is obtained.

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- .2 In addition to the hydrostatic tests (200 lbs for 2 hours), an air seal test will be done on the piping system at a pressure of 275 kPa (40 psi) for one hour. Any air leak allowing a pressure loss will be corrected.

**END OF SECTION**

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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 20 05 01.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate on drawings:
    - .1 Mounting arrangements.
    - .2 Operating and maintenance clearances.
  - .2 Shop drawings and product data accompanied by:
    - .1 Detailed drawings of bases, supports, and anchor bolts.
    - .2 Acoustical sound power data, where applicable.
    - .3 Points of operation on performance curves.
    - .4 Manufacturer to certify current model production.
    - .5 Certification of compliance to applicable codes.

**1.2 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 20 05 01.
- .2 Operation and Maintenance Data: submit operation and maintenance data.
  - .1 Operation data to include:
    - .1 Control schematics for systems including environmental controls.
    - .2 Description of systems and their controls.
    - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4 Operation instruction for systems and component.
    - .5 Description of actions to be taken in event of equipment failure.
    - .6 Valves schedule and flow diagram.
  - .2 Maintenance data to include:
    - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .3 Performance data to include:
    - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2 Equipment performance verification test results.
    - .3 Special performance data as specified.
    - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
  - .4 As-built drawings:
    - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

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- .2 Submit to Departmental Representative for approval and make corrections as directed.
- .3 Perform testing, adjusting and balancing for HVAC using as-built drawings.
- .4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .5 Submit copies of as-built drawings for inclusion in final TAB report.

### **1.3 DELIVERY, STORAGE AND HANDLING**

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

## **Part 2 Execution**

### **2.1 EXAMINATION**

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

### **2.2 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 20 05 01.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

### **2.3 SYSTEM CLEANING**

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

### **2.4 DEMONSTRATION**

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Instruction duration time requirements as specified in appropriate sections.

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**END OF SECTION**



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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Action Submittals: Provide the following in accordance with Section 20 05 01 before starting work of this Section:

**1.2 SALVAGE AND DEBRIS MATERIALS**

- .1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Owner's property.
- .2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials in accordance with Section 20 05 01.

**Part 2 Products**

**2.1 MATERIAL**

- .1 HVAC Repair Materials: Use only new materials required for completion or repair matching materials damaged during performance of work of this Section; new materials are required to meet assembly or system characteristics as existing systems indicated to remain.
- .2 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

**3.2 PREPARATION**

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
  - .1 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
  - .2 Protect mechanical systems that must remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the users is minimized and as follows:
  - .1 Prevent debris from endangering the safe access to and egress from occupied buildings.
  - .2 Notify Departmental Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

**3.3 EXECUTION**

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.1 Demolition: Coordinate requirements of this Section with information contained in section 20 05 01 and as follows:

- .1 Erect and maintain dust proof and weather tight partitions to prevent the spread of dust and fumes to occupied building areas; remove partitions when complete.
- .2 At end of each day's work, leave worksite in safe condition.
- .3 Perform demolition work in a neat and workmanlike manner:
  - .1 Remove any tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
  - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.

**END OF SECTION**

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**Part 1            General**

**1.1            ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Provide submittals in accordance with Section 20 05 01.
- .2            Product Data:
  - .1            Provide manufacturer's printed product literature, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish and limitations.

**Part 2            Products**

**2.1            MATERIAL**

- .1            Sealants: in accordance with Section 20 05 17.
- .2            Fire Stopping: in accordance with Section 20 84 00.

**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            CONNECTIONS TO EQUIPMENT**

- .1            In accordance with manufacturer's instructions unless otherwise indicated.
- .2            Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3            Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

**3.3            DRAINS**

- .1            Install piping with grade in direction of flow except as indicated.
- .2            Install drain valve at low points in piping systems, at equipment and at section isolating valves.
- .3            Pipe each drain valve discharge separately to above floor drain.
  - .1            Discharge to be visible.
- .4            Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

**3.4            AIR VENTS**

- .1            Install automatic air vents in piping systems.
- .2            Install isolating valve at each automatic air valve.
- .3            Install drain piping to approved location and terminate where discharge is visible.

**3.5            DIELECTRIC COUPLINGS**

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- .1 General: compatible with system, to suit pressure rating of system.
- .2 Locations: where dissimilar metals are joined.
- .3 NPS 2 and under: isolating unions or bronze valves.
- .4 Over NPS 2: isolating flanges.

**3.6 PIPEWORK INSTALLATION**

- .1 Install pipework to CSA B139.
- .2 Screwed fittings jointed with Teflon tape.
- .3 Protect openings against entry of foreign material.
- .4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .5 Assemble piping using fittings manufactured to ANSI standards
- .6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
  - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
- .7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.
- .9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .10 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .11 Group piping wherever possible
- .12 Ream pipes, remove scale and other foreign material before assembly.
- .13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .14 Provide for thermal expansion as indicated.
- .15 Valves:
  - .1 Install in accessible locations.
  - .2 Remove interior parts before soldering.
  - .3 Install with stems above horizontal position unless indicated.
  - .4 Valves accessible for maintenance without removing adjacent piping.
  - .5 Install globe valves in bypass around control valves.
  - .6 Use ballvalves at branch take-offs for isolating purposes except where specified.
  - .7 Install butterfly valves between weld neck flanges to ensure full compression of liner.

**3.7 SLEEVES**

- .1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.
- .2 Material: schedule 40 black steel pipe.
- .3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.
- .4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

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- .5 Installation:
  - .1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
  - .2 Other floors: terminate 25 mm above finished floor.
  - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .6 Sealing:
  - .1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
  - .2 Elsewhere:
    - .1 Provide space for fire stopping.
    - .2 Maintain the fire-resistance rating integrity of the fire separation.
  - .3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
  - .4 Ensure no contact between copper pipe or tube and sleeve.

### **3.8 ESCUTCHEONS**

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: one piece type with set screws.
  - .1 Chrome or nickel plated brass or type 302 stainless steel..
- .3 Sizes: outside diameter to cover opening or sleeve.
  - .1 Inside diameter to fit around pipe or outside of insulation if so provided.

### **3.9 PREPARATION FOR FIRE STOPPING**

- .1 Coordinate the installation of fire stopping around pipes, insulation and adjacent fire separation in accordance with Section 20 84 00.
- .2 Pipes subject to movement: conform to fire stop system design listing to ensure pipe movement without damaging fire stopping material or installation.
- .3 Insulated pipes: ensure integrity of insulation and vapour barriers.

### **3.10 FLUSHING OUT OF PIPING SYSTEMS**

- .1 Flush system in accordance with Section 23 08 16 - Cleaning and Start-Up of HVAC Piping Systems.

### **3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK**

- .1 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.
- .2 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
- .3 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- .4 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.
- .5 Insulate or conceal work only after approval and certification of tests by Departmental Representative.

### **3.12 EXISTING SYSTEMS**

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- .1 Connect into existing piping systems at times approved by Departmental Representative.
- .2 Be responsible for damage to existing plant by this work.

**END OF SECTION**

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**Part 1            General**

**1.1                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Provide submittals in accordance with Section 20 05 01.
- .2            Product Data:
  - .1            Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
    - .1            Manufacturer, model number, line contents, pressure and temperature rating.
    - .2            Movement handled, axial, lateral, angular and the amounts of each.
    - .3            Nominal size and dimensions including details of construction and assembly.

**Part 2            Products**

**2.1                SLIP TYPE EXPANSION JOINTS**

- .1            Application: for axial pipe movement, as indicated.
- .2            Repacking: under full line pressure.
- .3            Body and packing housings: Class 150, 1MPa carbon steel pipe to ASTM A53/A53M, Grade B. Wall thickness to match pipe with raised face flanges to match pipe .
- .4            Slip or traverse sleeves: carbon steel pipe to ASTM A53/A53M, Grade B.
- .5            Anchor base: construction steel, welded to body.
- .6            Guides (internal and external): embody into packing housing with concentric alignment of slip or traverse sleeve with packing housing.
- .7            Extension limit stop: stainless steel, to prevent over-extension with accessible and removable pins.
- .8            Lubricating fittings: pet cocks with grease nipple.
- .9            Plunger body and plunger:
  - .1            Plunger body: heavy wall carbon steel welded to body.
  - .2            Plunger: carbon steel with hex head for use with socket wrench.
- .10           .

**2.2                ANCHORS AND GUIDES**

- .1            Anchors:
  - .1            Provide as indicated.
- .2            Alignment guides:
  - .1            By conduit manufacturer.
  - .2            To accommodate specified thickness of insulation.
  - .3            Vapour barriers, jackets to remain uninterrupted.

**Part 3            Execution**

**3.1                APPLICATION**

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- .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 expansion joints and flexible connections in accordance with manufacturer's instructions.
- .2 Install pipe anchors and guides as indicated. Anchors to withstand 150 % of axial thrust.
- .3 Do welding in accordance with section 23 05 17 - Pipe Welding.

**END OF SECTION**

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

- .1 Provide submittals in accordance with Section 20 05 01.

**Part 2 Products****2.1 MATERIALS**

- .1 Valves:
  - .1 Except for specialty valves, to be single manufacturer.
  - .2 Products to have CRN registration numbers.
- .2 End Connections:
  - .1 Connection into adjacent piping/tubing:
    - .1 Steel pipe systems: screwed ends to ANSI/ASME B1.20.1.
    - .2 Copper tube systems: solder ends or grooved ends to ANSI/ASME B16.18.
- .3 Gate Valves:
  - .1 Requirements common to gate valves, unless specified otherwise:
    - .1 Standard specification: MSS SP-80.
    - .2 Bonnet: union with hexagonal shoulders.
    - .3 Connections: screwed with hexagonal shoulders.
    - .4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic
    - .5 Packing: non-asbestos.
    - .6 Handwheel: non-ferrous.
    - .7 Handwheel Nut: bronze to ASTM B62.
- .4 Globe Valves:
  - .1 Requirements common to globe valves, unless specified otherwise:
    - .1 Standard specification: MSS SP-80.
    - .2 Bonnet: union with hexagonal shoulders.
    - .3 Connections: screwed with hexagonal shoulders.
    - .4 Pressure testing: to MSS SP-80. Tests to be hydrostatic
    - .5 Stuffing box: threaded to bonnet with gland follower, packing nut, high grade non-asbestos packing.
    - .6 Handwheel: non-ferrous.
    - .7 Handwheel Nut: bronze to ASTM B62.
- .5 Check Valves:
  - .1 Requirements common to check valves, unless specified otherwise:
    - .1 Standard specification: MSS SP-80.
    - .2 Connections: screwed with hexagonal shoulders.
  - .2 NPS 2 and under, swing type, bronze disc, Class 125:
    - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

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- .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
- .3
- .6 Ball Valves:
  - .1 NPS 2 and under:
    - .1 Body and cap: cast high tensile bronze to ASTM B62.
    - .2 Pressure rating: Class 125 2760-kPa CWP.
    - .3 Connections: screwed ends to ANSI B1.20.1 and with hexagonal shoulders or solder ends to ANSI.
    - .4 Stem: tamperproof ball drive.
    - .5 Stem packing nut: external to body.
    - .6 Ball and seat: replaceable stainless steel solid ball and Teflon seats.
    - .7 Stem seal: TFE with external packing nut.
    - .8 Operator: removable lever handle.

**Part 3 Execution****3.1 INSTALLATION**

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Remove internal parts before soldering.
- .3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

**END OF SECTION**

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**Part 1            General**

**1.1                ACTION AND INFORMATIONAL SUBMITTALS**

- .1                Provide submittals in accordance with Section 20 50 01.

**Part 2            Products**

**2.1                SYSTEM DESCRIPTION**

- .1                Design Requirements:
  - .1                Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
  - .2                Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
  - .3                Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
  - .4                Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
  - .5                Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

**2.2                GENERAL**

- .1                Fabricate hangers, supports and sway braces in accordance with MSS SP58 and ANSI B31.1.
- .2                Use components for intended design purpose only. Do not use for rigging or erection purposes.

**2.3                PIPE HANGERS**

- .1                Finishes:
  - .1                Pipe hangers and supports: galvanized after manufacture.
  - .2                Ensure steel hangers in contact with copper piping are epoxy coated.
- .2                Upper attachment to concrete:
  - .1                Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
- .3                Hanger rods: threaded rod material to MSS SP58:
  - .1                Ensure that hanger rods are subject to tensile loading only.
  - .2                Provide linkages where lateral or axial movement of pipework is anticipated.
  - .3                Do not use 22 mm or 28 mm rod.
- .4                Pipe attachments: material to MSS SP58:
  - .1                Attachments for steel piping: carbon steel black.
  - .2                Attachments for copper piping: copper plated black steel.
  - .3                Use insulation shields for hot pipework.
  - .4                Oversize pipe hangers and supports.

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**2.4 RISER CLAMPS**

- .1 Steel or cast iron pipe: black carbon steel to MSS SP58, type 42, UL listed.
- .2 Copper pipe: carbon steel copper plated to MSS SP58, type 42

**2.5 INSULATION PROTECTION SHIELDS**

- .1 Insulated hot piping:
  - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

**2.6 EQUIPMENT ANCHOR BOLTS AND TEMPLATES**

- .1 Provide templates to ensure accurate location of 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 datasheet.

**3.2 INSTALLATION**

- .1 Install in accordance with:
  - .1 Manufacturer's instructions and recommendations.
- .2 Clamps on riser piping:
  - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
  - .2 Bolt-tightening torques to industry standards.
  - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
  - .4 Cast iron pipes: install below joint.
- .3 Clevis plates:
  - .1 Attach to concrete with [4] minimum concrete inserts, [one] at each corner.
- .4 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

**3.3 HANGER SPACING**

- .1 Plumbing piping: to National Plumbing Code of Canada (NPC).
- .2 Copper piping: up to NPS 1/2: every 1.5 m.
- .3 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- .4 Within [300] mm of each elbow.

**3.4 HANGER INSTALLATION**

- .1 Install hanger so that rod is vertical under operating conditions.

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- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

**3.5 HORIZONTAL MOVEMENT**

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

**3.6 FINAL ADJUSTMENT**

- .1 Adjust hangers and supports:
  - .1 Ensure that rod is vertical under operating conditions.
  - .2 Equalize loads.
- .2 Adjustable clevis:
  - .1 Tighten hanger load nut securely to ensure proper hanger performance.
  - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
  - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
  - .1 Hammer jaw firmly against underside of beam.

**END OF SECTION**



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**Part 1 Products**

**1.1 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.

**1.2 SYSTEM NAMEPLATES**

- .1 Colours:
  - .1 Hazardous: black letters, white background.
- .2 Construction:
  - .1 3 mm thick laminated plastic , 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 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.

**1.3 EXISTING IDENTIFICATION SYSTEMS**

- .1 Apply existing identification system to new work.
- .2 Where existing identification system does not cover for new work, use identification system specified this section.
- .3 Before starting work, obtain written approval of identification system from Departmental Representative.

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**1.4 IDENTIFICATION OF PIPING SYSTEMS**

- .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 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:

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<b>Contents</b>	<b>Background colour marking</b>	<b>Legend</b>
Raw water	Green	RAW WATER
River water	Green	RIVER WATER
Sea water	Green	SEA WATER
City water	Green	CITY WATER
Treated water	Green	TREATED WATER
Brine	Green	BRINE
Condenser water supply	Green	COND. WTR. SUPPLY
Condenser water return	Green	COND. WTR. RETURN
Chilled water supply	Green	CH. WTR. SUPPLY
Chilled water return	Green	CH. WTR. RETURN
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
High temp HW Htg. supply	Yellow	HTHW HTG. SUPPLY++
High temp HW Htg. return	Yellow	HTHW HTG. RETURN++
Make-up water	Yellow	MAKE-UP WTR
Boiler feed water	Yellow	BLR. FEED WTR
Steam [ ]kPa	Yellow	[ ] kPa STEAM
Steam condensate (gravity)	Yellow	ST.COND.RET (GRAVITY)
Steam condensate (pumped)	Yellow	ST.COND.RET (PUMPED)
Safety valve vent	Yellow	STEAM VENT
Intermittent blow-off	Yellow	INT. BLOW-OFF
Continuous blow-off	Yellow	CONT. BLOW-OFF
Chilled drinking water	Green	CH. DRINK WTR
Drinking water return	Green	CH. DRINK WTR. CIRC
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Waste water	Green	WASTE WATER
Contaminated lab waste	Yellow	CONT. LAB WASTE
Acid waste	Yellow	ACID WASTE (add source)
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
No. [ ] fuel oil suction	Yellow	# [ ] FUEL OIL
No. [ ] fuel oil return	Yellow	# [ ] FUEL OIL
Engine exhaust	Yellow	ENGINE EXHAUST
Lubricating oil	Yellow	LUB. OIL
Hydraulic oil	Yellow	HYDRAULIC OIL
Gasoline	Yellow	GASOLINE
Natural gas	to Codes	
Propane	to Codes	
Gas regulator vents	to Codes	
Distilled water	Green	DISTILL. WTR
Demineralized water	Green	DEMIN. WATER
Chlorine	Yellow	CHLORINE
Nitrogen	Yellow	NITROGEN
Oxygen	Yellow	OXYGEN
Compressed air (&lt;700kPa)	Green	COMP. AIR [ ] kPa
Compressed air (&gt;700kPa)	Yellow	COMP. AIR [ ] kPa

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Vacuum	Green	VACUUM
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS
Carbon dioxide	Red	CO2
Instrument air	Green	INSTRUMENT AIR

**1.5 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.

**1.6 VALVES, CONTROLLERS**

- .1 Brass tags with 12 mm stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

**1.7 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.

**1.8 LANGUAGE**

- .1 Identification in English and French.

**Part 2 Execution**

**2.1 MANUFACTURER'S INSTRUCTIONS**

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

**2.2 INSTALLATION**

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise

**2.3 NAMEPLATES**

- .1 Locations:
  - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
  - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection:
  - .1 Do not paint, insulate or cover.

**2.4 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.

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- .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.

**END OF SECTION**



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**Part 1            General**

**1.1                QUALIFICATIONS OF TAB PERSONNEL**

- .1            Provide documentation confirming qualifications, successful experience.
- .2            TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
- .3            Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .4            Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .5            Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .6            Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .7            TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
  - .1            For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
  - .2            Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used , requirements and recommendations contained in these procedures and requirements are mandatory.

**1.2                PURPOSE OF TAB**

- .1            Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads
- .2            Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3            Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

**1.3                EXCEPTIONS**

- .1            TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

**1.4                CO-ORDINATION**

- .1            Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
- .2            Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

**1.5                PRE-TAB REVIEW**

- .1            During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

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**1.6 START-UP**

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

**1.7 START OF TAB**

- .1 Start TAB when building is essentially completed, including:
- .2 Installation of ceilings, doors, windows, other construction affecting TAB.
- .3 Application of weatherstripping, sealing, and caulking.
- .4 Pressure, leakage, other tests specified elsewhere Division 23.
- .5 Provisions for TAB installed and operational.
- .6 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
  - .1 Proper thermal overload protection in place for electrical equipment.
  - .2 Air systems:
    - .1 Filters in place, clean.
    - .2 Duct systems clean.
    - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
    - .4 Correct fan rotation.
    - .5 Fire, smoke, volume control dampers installed and open.
    - .6 Coil fins combed, clean.
    - .7 Access doors, installed, closed.
    - .8 Outlets installed, volume control dampers open.
  - .3 Liquid systems:
    - .1 Flushed, filled, vented.
    - .2 Correct pump rotation.
    - .3 Strainers in place, baskets clean.
    - .4 Isolating and balancing valves installed, open.
    - .5 Calibrated balancing valves installed, at factory settings.
    - .6 Chemical treatment systems complete, operational.

**1.8 APPLICATION TOLERANCES**

- .1 Do TAB to following tolerances of design values:

**1.9 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

**1.10 PRELIMINARY TAB REPORT**

- .1 Submit for checking and approval of Departmental Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
  - .1 Details of instruments used.
  - .2 Details of TAB procedures employed.

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- .3 Calculations procedures.
- .4 Summaries.

**1.11 TAB REPORT**

- .1 Format in accordance with referenced standard.
- .2 TAB report to show results in SI units and to include:
  - .1 Project record drawings.
  - .2 System schematics.
- .3 Submit a copie of TAB Report to Departmental Representative for verification and approval, in both official languages.

**1.12 VERIFICATION**

- .1 Reported results subject to verification by Departmental Representative.
- .2 Pay costs to repeat TAB as required to satisfaction of Departmental Representative.

**1.13 SETTINGS**

- .1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

**1.14 COMPLETION OF TAB**

- .1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

**1.15 AIR SYSTEMS**

- .1 Do TAB of systems, equipment, components, controls specified Division 23. Qualifications: personnel performing TAB qualified to standards of AABC or NEBB.
- .2 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .3 Locations of equipment measurements: to include as appropriate:
  - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
  - .2 At controllers, controlled device.
- .4 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

**END OF SECTION**



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

- .1 Provide submittals in accordance with Section 20 05 01.

**1.2 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project.

**Part 2 Products****2.1 SUSTAINABLE REQUIREMENTS**

- .1 Materials and products in accordance with Section [01 47 15 Sustainable Requirements: Construction].

**2.2 FIRE AND SMOKE RATING**

- .1 To CAN/ULC-S102:
  - .1 Maximum flame spread rating: 25.
  - .2 Maximum smoke developed rating: 50.

**2.3 INSULATION**

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with [ASTM C335](#)
- .3 C-1: Rigid mineral fibre board to ASTM C612, without factory applied vapour retarder jacket to CGSB 51-GP-52 (as scheduled in PART 3 of this Section)
- .4 C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52 (as scheduled in PART 3 of this section)
  - .1 Mineral fibre: to ASTM C553
  - .2 Jacket: to CGSB 51-GP-52
  - .3 Maximum "k" factor: to ASTM C553

**2.4 JACKETS**

- .1 Canvas:
  - .1 220 gm/m<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921
- .2 Aluminum:
  - .1 To ASTM B209 with moisture barrier as scheduled in PART 3 of this section.

**2.5 ACCESSORIES**

- .1 Vapour retarder lap adhesive:

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- .1 Water based, fire retardant type, compatible with insulation.
- .2 Indoor Vapour Retarder Finish:
  - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 ULC Listed Canvas Jacket:
- .4 Outdoor Vapour Retarder Mastic:
  - .1 Vinyl emulsion type acrylic, compatible with insulation.
  - .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m<sup>2</sup>.
- .5 Tape: self-adhesive, aluminum..
- .6 Contact adhesive: quick-setting
- .7 Canvas adhesive: washable.
- .8 Tie wire: 1.5 mm stainless steel.
- .9 Banding: 12mm wide, 0.5 mm thick stainless steel.
- .10 Fasteners: 4 mm diameter pins with 35 mm diameter square clips, length to suit thickness of insulation.

**Part 3 Execution****3.1 APPLICATION**

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

**3.2 PRE-INSTALLATION REQUIREMENTS**

- .1 Pressure test ductwork systems complete, witness and certify.
- .2 Ensure surfaces are clean, dry, free from foreign material.

**3.3 INSTALLATION**

- .1 Install in accordance with TIAC National Standards
- .2 Apply materials in accordance with manufacturers instructions and as indicated.
- .3 Use [2] layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
  - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
  - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum [2] rows each side.

**3.4 DUCTWORK INSULATION SCHEDULE**

- .1 Insulation types and thicknesses: conform to following table:
- .2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

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.1 Use TIAC code C-1 insulation, scored to suit diameter of duct

.1 Finishes: conform to following table:

	<b>&lt;stdref xmlns="NMS"&gt;TIAC&lt;/stdref&gt; Code</b>	
	<b>Rectangular</b>	<b>Round</b>
Indoor, concealed	none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

**END OF SECTION**



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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 20 05 01.

**1.2 QUALITY ASSURANCE**

- .1 Qualifications:
- .2 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards TIAC.

**Part 2 Products**

**2.1 FIRE AND SMOKE RATING**

- .1 In accordance with CAN/ULC-S102
  - .1 Maximum flame spread rating: 25.
  - .2 Maximum smoke developed rating: 50.

**2.2 INSULATION**

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335
- .3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
  - .1 Mineral fibre: to CAN/ULC-S702</stdref>].
  - .2 Maximum "k" factor: to CAN/ULC-S702

**2.3 VAPOUR RETARDER LAP ADHESIVE**

- .1 Water based, fire retardant type, compatible with insulation.

**2.4 INDOOR VAPOUR RETARDER FINISH**

- .1 Vinyl emulsion type acrylic, compatible with insulation.

**2.5 JACKETS**

- .1 Polyvinyl Chloride (PVC):
  - .1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required
  - .2 Minimum service temperatures: -20 degrees C.
  - .3 Maximum service temperature: 65 degrees C.
  - .4 Moisture vapour transmission: 0.02 perm.
  - .5 Fastenings:
    - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
    - .2 Tacks.
    - .3 Pressure sensitive vinyl tape of matching colour.

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.2 Canvas:

- .1 220 and 120 gm/m<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921
- .2 Lagging adhesive: compatible with insulation.

**Part 3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 PRE-INSTALLATION REQUIREMENT**

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

**3.3 INSTALLATION**

- .1 Install in accordance with TIAC National Standards
- .2 Apply materials in accordance with manufacturers instructions and this specification.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
  - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
  - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

**3.4 PIPING INSULATION SCHEDULES**

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-1.
  - .1 Securements: [SS bands at 300 mm on centre.
  - .2 Seals: lap seal adhesive, lagging adhesive.
- .3 Thickness of insulation as listed in following table.
  - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
  - .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Applica- tion	Temp degrees C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
			Run out	to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over
Hot Water Heating	60 - 94	[A-1]	25	38	38	38	38	38
Hot Water Heating	up to 59	[A-1]	25	25	25	25	38	38

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.4

Finishes:

.1 Concealed, indoors: canvas on valves, fittings. No further finish.

**END OF SECTION**



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**Part 1 Products**

**1.1 CLEANING SOLUTIONS**

- .1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.
- .2 Sodium carbonate: 0.40 kg per 100 L water in system.
- .3 Low-foaming detergent: 0.01 kg per 100 L water in system.

**Part 2 Execution**

**2.1 MANUFACTURER'S INSTRUCTIONS**

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

**2.2 CLEANING HYDRONIC AND STEAM SYSTEMS**

- .1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.
- .2 Cleaning Agency:
  - .1 Retain qualified water treatment specialist to perform system cleaning.
- .3 Cleaning procedures:
  - .1 Provide detailed report outlining proposed cleaning procedures prior to proposed starting date. Report to include:
    - .1 Cleaning procedures, flow rates, elapsed time.
    - .2 Chemicals and concentrations used.
    - .3 Inhibitors and concentrations.
    - .4 Specific requirements for completion of work.
    - .5 Special precautions for protecting piping system materials and components.
    - .6 Complete analysis of water used to ensure water will not damage systems or equipment.
- .4 Conditions at time of cleaning of systems:
  - .1 Systems: free from construction debris, dirt and other foreign material.
  - .2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.
  - .3 Strainers: clean prior to initial fill.
  - .4 Install temporary filters on pumps not equipped with permanent filters.
  - .5 Install pressure gauges on strainers to detect plugging.
- .5 Report on Completion of Cleaning:
  - .1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.
- .6 Hydronic Systems:
  - .1 Fill system with water, ensure air is vented from system.

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- .2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (does not apply to diaphragm type expansion tanks).
- .3 Use water metre to record volume of water in system to +/- 0.5%.
- .4 Add chemicals under direct supervision of chemical treatment supplier.
- .5 Closed loop systems: circulate system cleaner at 60 degrees C for at least 36 h. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.
- .6 Flush velocity in system mains and branches to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.
- .7 Add chemical solution to system.
- .8 Establish circulation, raise temperature slowly to maximum design. Circulate for 12 h, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38 degrees C. Drain as quickly as possible. Refill with clean water. Circulate for 6 hours at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).

### 2.3

#### **START-UP OF HYDRONIC SYSTEMS**

- .1 After cleaning is completed and system is filled:
  - .1 Ensure air is removed.
  - .2 Repeat with water at design temperature.
  - .3 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.
  - .4 Bring system up to design temperature and pressure over a 24 hour period.
  - .5 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
  - .6 Adjust pipe supports, hangers, springs as necessary.
  - .7 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.
  - .8 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.
  - .9 Check operation of drain valves.
  - .10 Adjust valve stem packings as systems settle down.
  - .11 Fully open balancing valves (except those that are factory-set).

**END OF SECTION**

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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 20 05 01.

**Part 2 Products**

**2.1 PILOT POSITIONERS**

- .1 Full relay type: with interconnecting linkage for mechanical feedback on damper and valve operators acting in unison or sequenced from single controller.

**2.2 VALVES**

- .1 Pressure rating: as indicated.
- .2 Valve operators: spring return for "fail safe" in normally open or normally closed position, as indicated.
- .3 Water valves:
  - .1 Two-way: single double seated, equal percentage, linear, quick opening characteristics, as indicated.

**2.3 IDENTIFICATION**

- .1 Provide in accordance with Section 23 05 53 - Identification for HVAC Piping and Equipment.

**2.4 CONTROL AIR TUBING**

- .1 Plastic: flame retardant PVC tubing with minimum burst gauge pressure of 1.4 MPa at 80 degrees C.
- .2 Copper: type L complete with flared fittings.

**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 pneumatic control system for HVAC installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative].
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

**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 datasheet.

**3.3 INSTALLATION**

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- .1 Identify and code pneumatic tubing at every branch and at each piece of equipment and components.
- .2 Use copper tubing with flared fittings in following locations:
  - .1 Inaccessible areas.
  - .2 Where single lines travel from tube tray to instruments.
  - .3 Areas of heat above 80 degrees C.
  - .4 Mechanical rooms.
  - .5 Rooms where piping subject to damage.
  - .6 Adjacent to heating pipes passing through common sleeve.
  - .7 Where air pressures above 200 kPa.
  - .8 Where codes will not permit use of PVC.
  - .9 In fire rated walls and ceilings.
- .3 Run PVC tubing in cable trays or metal conduit as indicated. Use barb type fittings.
- .4 Follow building lines. Do not cover with insulation. Install drip legs and drains at low points.
- .5 Install controls compressor on [100] mm concrete pad with anti-vibration mounts.
- .6 Submit detail of damper motor location and support for review.
- .7 Install pilot positioners where indicated on operators.
- .8 Install refrigerated air dryer on 3 valve bypass.

**3.4 FIELD QUALITY CONTROL**

- .1 Start-Up and Adjustment:
  - .1 Upon completion of installation, test, adjust and regulate controls or safety equipment provided under this Section.
  - .2 Adjust and place in operating condition.

**END OF SECTION**

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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 20 05 01.

**Part 2 Products**

**2.1 TUBING**

- .1 Hard drawn copper tubing: to ASTM B88M

**2.2 FITTINGS**

- .1 Cast bronze threaded fittings: to ANSI/ASME B16.15
- .2 Wrought copper and copper alloy solder joint pressure fittings: to ANSI/ASME B16.22
- .3 Cast copper alloy solder joint pressure fittings: to ANSI B16.18

**2.3 FLANGES**

- .1 Brass or bronze: threaded.
- .2 Cast iron: threaded.
- .3 Orifice flanges: slip-on, raised face, 2100 kPa.

**2.4 JOINTS**

- .1 Solder, tin-antimony, 95:5: to ASTM B32
- .2 Silver solder BCUP: to ANSI/AWS A5.8
- .3 Brazing: as indicated.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hydronic systems installation in accordance with manufacturer's written instructions.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied..

**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 datasheet.

**3.3 PIPING INSTALLATION**

- .1 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.

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- .2 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping where ever practical.
- .3 Slope piping in direction of drainage and for positive venting.
- .4 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.
- .5 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.
- .6 Assemble piping using fittings manufactured to ANSI standards

**END OF SECTION**

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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 20 05 01.

**Part 2 Products**

**2.1 PIPE**

- .1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
  - .1 To NPS 6: Schedule 40.

**2.2 PIPE JOINTS**

- .1 NPS 2 and under: screwed fittings with PTFE tape or lead-free pipe dope.
- .2 Roll grooved: rigid coupling to CSA B242
- .3 Flanges: plain or raised face, ANSI/AWWA C111/ A21.11.
- .4 Orifice flanges: slip-on raised face, 2100 kPa.
- .5 Flange gaskets: to ANSI/AWWA C111/ A21.11.
- .6 Pipe thread: taper.

**2.3 Roll grooved coupling gaskets: type [EPDM]. FITTINGS**

- .1 Screwed fittings: malleable iron, to ASME B16.3, Class [150].
- .2 Pipe flanges and flanged fittings:
  - .1 Cast iron: to ASME B16.1, Class [125].
  - .2 Steel: to ASME B16.5
- .3 Fittings for roll grooved piping: malleable iron to ASTM A47/A47M .

**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 hydronic systems installation in accordance with manufacturer's written instructions.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 PIPING INSTALLATION**

- .1 Install pipework in accordance with Section 23 05 15 - Common Installation Requirements for HVAC Pipework.

**END OF SECTION**



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**Part 1            General**

**1.1                ACTION AND INFORMATIONAL SUBMITTALS**

- .1                Submit in accordance with Section 20 05 01.

**Part 2            Products**

**2.1                SEAL CLASSIFICATION**

- .1                Classification as follows:

Maximum Pressure Pa	SMACNA Seal Clas
500	[C]
250	[C]
125	[C]
125	[Unsealed]

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

**2.2                SEALANT**

- .1                Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus [30] degrees C to plus [93] degrees C.

**2.3                TAPE**

- .1                Tape: polyvinyl treated, open weave fiberglass tape, [50] mm wide.

**2.4                DUCT LEAKAGE**

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

**2.5                FITTINGS**

- .1                Fabrication: to SMACNA.
- .2                Radiused elbows:
  - .1                Rectangular: standard radius short radius with single thickness turning vanes centreline radius: [1.5] times width of duct.
  - .2                Round: smooth radius, centreline radius: [1.5] times diameter.
- .3                Mitred elbows, rectangular:
  - .1                To [407] mm: with single thickness turning vanes.
  - .2                Over [407] mm: with double thickness turning vanes.
- .4                Branches:

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- .1 Rectangular main and branch: with radius on branch [1.5] times width of duct.
- .2 Round main and branch: enter main duct at 45 degrees.
- .3 Provide volume control damper in branch duct near connection to main duct.
- .4 Main duct branches: with splitter damper.
- .5 Transitions:
  - .1 Diverging: [20] degrees maximum included angle.
  - .2 Converging: [30] degrees maximum included angle.
- .6 Offsets:
  - .1 RADIUSED elbows as indicated.
- .7 Obstruction deflectors: maintain full cross-sectional area.
  - .1 Maximum included angles: as for transitions.

**2.6 GALVANIZED STEEL**

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

**2.7 STAINLESS STEEL**

- .1 To ASTM A480/A480M, Type [304].
- .2 Finish: number [4].
- .3 Thickness, fabrication and reinforcement: as indicated.
- .4 Joints: to SMACNA.

**2.8 HANGERS AND SUPPORTS**

- .1 Hangers and Supports: in accordance with Section [23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .2 Upper hanger attachments:
  - .1 For concrete: manufactured concrete inserts.
  - .2 For steel joist: manufactured joist clamp.
  - .3 For steel beams: manufactured beam clamps:

**Part 3 Execution**

**3.1 EXAMINATION**

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

**3.2 GENERAL**

- .1 Do work in accordance with SMACNA and as indicated].
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .3 Install breakaway joints in ductwork on sides of fire separation.
- .4 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .5 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

**3.3 HANGERS**

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

**3.4 SEALING AND TAPING**

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

**3.5 LEAKAGE TESTS**

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .2 Do leakage tests in sections.
- .3 Make trial leakage tests as instructed to demonstrate workmanship.
- .4 Do not install additional ductwork until trial test has been passed.
- .5 Test section minimum of [30] m long with not less than three branch takeoffs and two 90 degrees elbows.
- .6 Complete test before performance insulation or concealment Work.

**END OF SECTION**



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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 20 05 01.

**Part 2 Products**

**2.1 GENERAL**

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

**2.2 FLEXIBLE CONNECTIONS**

- .1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
- .2 Material:
  - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus [40] degrees C to plus [90] degrees C, density of [1.3] kg/m<sup>2</sup>.

**2.3 ACCESS DOORS IN DUCTS**

- .1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.
- .2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.
- .3 Gaskets: neoprene or foam rubber.
- .4 Hardware:
  - .1 Up to [300 x 300] mm: two sash locks.

**2.4 TURNING VANES**

- .1 Factory or shop fabricated single thickness to recommendations of SMACNA and as indicated

**2.5 INSTRUMENT TEST**

- .1 [1.6] mm thick steel zinc plated after manufacture.
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28 mm minimum inside diameter. Length to suit insulation thickness.
- .4 Neoprene mounting gasket.

**2.6 SPIN-IN COLLARS**

- .1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
- .2 Sheet metal thickness to co-responding round duct standards.

**Part 3 Execution**

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**3.1**

**EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for air duct accessories installation in accordance with manufacturer's written instructions.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

**3.2**

**INSTALLATION**

- .1 Flexible Connections:
  - .1 Install in following locations:
    - .1 Inlets and outlets to supply air units and fans.
    - .2 Inlets and outlets of exhaust and return air fans.
    - .3 As indicated.
  - .2 Length of connection: [100] mm.
  - .3 Minimum distance between metal parts when system in operation: [75] mm.
  - .4 Install in accordance with recommendations of SMACNA
  - .5 When fan is running:
    - .1 Ducting on sides of flexible connection to be in alignment.
    - .2 Ensure slack material in flexible connection.
- .2 Access Doors and Viewing Panels:
  - .1 Size:
    - .1 [350] x [250] mm for person size entry.
    - .2 [200] x [100] mm for servicing entry.
    - .3 As indicated.
  - .2 Locations:
    - .1 Fire and smoke dampers.
    - .2 Control dampers.
    - .3 Devices requiring maintenance.
    - .4 Required by code.
    - .5 Reheat coils.
    - .6 Elsewhere as indicated.
- .3 Instrument Test Ports:
  - .1 General:
    - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions
  - .2 Locate to permit easy manipulation of instruments.
  - .3 Install insulation port extensions as required.
  - .4 Locations:
    - .1 For traverse readings:
    - .2 For temperature readings:
- .4 Turning Vanes:
  - .1 Install in accordance with recommendations of SMACNA and as indicated

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**END OF SECTION**



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**Part 1           General**

**1.1           ACTION AND INFORMATIONAL SUBMITTALS**

- .1           Submit in accordance with Section 20 05 01.

**Part 2           Products**

**2.1           GENERAL**

- .1           Manufacture to SMACNA standards

**2.2           SPLITTER DAMPERS**

- .1           Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.
- .2           Single thickness construction.
- .3           Control rod with locking device and position indicator.
- .4           Rod configuration to prevent end from entering duct.
- .5           Pivot: piano hinge.
- .6           Folded leading edge.

**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 damper installation in accordance with manufacturer's written instructions.
  - .1           Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2           Proceed with installation only after unacceptable conditions have been remedied.

**3.2           INSTALLATION**

- .1           Install where indicated.
- .2           Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions
- .3           Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- .4           Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5           Dampers: vibration free.
- .6           Ensure damper operators are observable and accessible.

**END OF SECTION**



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

- .1 Submit in accordance with Section 20 05 01.

**Part 2 Products****2.1 FIRE DAMPERS**

- .1 Fire dampers: arrangement, listed and bear label of ULC, meet requirements of Fire Commissioner of Canada (FCC) and NFPA 90A. Fire damper assemblies fire tested in accordance with CAN/ULC-S112.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
  - .1 Fire dampers: [1-1/2] hour fire rated unless otherwise indicated.
  - .2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.
- .3 Top hinged: offset single damper, round or square; guillotine type sized to maintain full duct cross section.
- .4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .5 [40 x 40 x 3] mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.
- .6 Equip fire dampers with steel sleeve or frame installed disruption ductwork or impair damper operation.
- .7 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.
- .8 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.
- .9 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition of floor slab depth or thickness.

**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 fire and smoke damper installation in accordance with manufacturer's written instructions.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 INSTALLATION**

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- .1 Install in accordance with NFPA 90A and in accordance with conditions of ULC listing
- .2 Maintain integrity of fire separation.
- .3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .4 Install access door adjacent to each damper. See Section 23 33 00 - Air Duct Accessories.
- .5 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.
- .6 Install break-away joints of approved design on each side of fire separation.

**END OF SECTION**

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

- .1 Submit in accordance with Section 20 05 01.

**Part 2 Products****2.1 GENERAL**

- .1 Factory fabricated to CAN/ULC-S110
- .2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.
- .3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

**2.2 METALLIC - UNINSULATED**

- .1 Type 1: spiral wound flexible stainless steel, as indicated.
- .2 Performance:
  - .1 Factory tested to [2.5] kPa without leakage.
  - .2 Maximum relative pressure drop coefficient: [3].
  - .3

**2.3 METALLIC - INSULATED**

- .1 Type 2: spiral wound flexible aluminum with factory applied, [37] mm thick flexible glass fibre thermal insulation with vapour barrier and aluminum jacket, as indicated.
- .2 Performance:
  - .1 Factory tested to [2.5] kPa without leakage.
  - .2 Maximum relative pressure drop coefficient: [3].

**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 flexible ducts installation in accordance with manufacturer's written instructions.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied .

**3.2 DUCT INSTALLATION**

- .1 Install in accordance with: CAN/ULC-S110, NFPA 90A and SMACNA.

**END OF SECTION**



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

- .1 Submit in accordance with Section 20 05 01.

**Part 2 Products****2.1 DUCT LINER****.1 General:**

- .1 Mineral Fibre duct liner: air surface coated mat facing.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with CAN/ULC-S102 and NFPA 90A.
- .3 Fungi resistance: to ASTM C1338.

**.2 Rigid:**

- .1 Use on flat surfaces.
- .2 [25] mm thick, to ASTM C1071 Type [2], fibrous glass rigid board duct liner.
- .3 Density: [48] kg/m<sup>3</sup> minimum.
- .4 Thermal resistance to be minimum [0.76 (m<sup>2</sup>.degrees C)/W for 25 mm thickness] [1.15 (m<sup>2</sup>>2</sup>.degrees C)/W for 38 mm thickness] [1.53 (m<sup>2</sup>>2</sup>.degrees C)/W for 50 mm thickness] when tested in accordance with ASTM C177, at 24 degrees C mean temperature
- .5 Maximum velocity on faced air side: [[20.3] m/s].
- .6 Minimum NRC of [0.70 at 25 mm] thickness based on Type A mounting to ASTM C423

**.3 Flexible:**

- .1 Use on surfaces indicated.
- .2 [25] mm thick, to ASTM C1071 Type [1], fibrous glass blanket duct liner.
- .3 Density: [24] kg/m<sup>3</sup> minimum.
- .4 Thermal resistance to be minimum [0.37 (m<sup>2</sup>.degrees C)/W for 12 mm thickness] [0.74 (m<sup>2</sup>.degrees C)/W for 25 mm thickness] [1.11 (m<sup>2</sup>>.degrees C)/W for 38 mm thickness] [1.41 (m<sup>2</sup>.degrees C)/W to 50 mm thickness] when tested in accordance with ASTM C177, at 24 degrees C mean temperature.
- .5 Maximum velocity on coated air side: [25.4].
- .6 Minimum NRC of [0.65 at 25 mm] thickness based on Type A mounting to ASTM C423

**2.2 ADHESIVE**

- .1 Adhesive: to NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29 degrees C to plus 93 degrees C.
- .3 Water-based fire retardant type.

**2.3 FASTENERS**

- .1 Weld pins [2.0] mm diameter, length to suit thickness of insulation. Metal retaining clips, [32] mm square.

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**2.4 JOINT TAPE**

- .1 Poly-Vinyl treated open weave fiberglass membrane [50] mm wide.

**2.5 SEALER**

- .1 Meet requirements of NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68 degrees C to plus 93 degrees C.

**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 duct liner installation in accordance with manufacturer's written instructions.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied .

**3.2 GENERAL**

- .1 Do work in accordance with SMACNA HVAC Duct Construction Standard and as indicated except as specified otherwise.
- .2 Line inside of ducts where indicated.
- .3 Duct dimensions, as indicated, are clear inside duct lining.

**3.3 DUCT LINER**

- .1 Install in accordance with manufacturer's recommendations, and as follows:
  - .1 Fasten to interior sheet metal surface with 90% coverage of adhesive ASTM C916.
    - .1 Exposed leading edges and transverse joints to be factory coated or coated with adhesive during fabrication.
  - .2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425 mm on centres to compress duct liner sufficiently to hold it firmly in place.
- .2 In systems, where air velocities exceeds [20.3] m/s, install galvanized sheet metal noising to leading edges of duct liner.

**3.4 JOINTS**

- .1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:
  - .1 Bed tape in sealer.
  - .2 Apply [2] coats of sealer over tape.
- .2 Replace damaged areas of liner at discretion of Departmental Representative.

**END OF SECTION**

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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 20 05 01.

**Part 2 Products**

**2.1 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

**2.2 GENERAL**

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity [as indicated].
- .2 Frames:
  - .1 Full perimeter gaskets.
  - .2 Plaster frames as specified.
  - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators.
- .4 Colour: White.

**2.3 MANUFACTURED UNITS**

- .1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

**2.4 DIFFUSERS**

- .1 General: volume control dampers with flow straightening devices and gaskets.
- .2 Type DC: steel, square multi-pattern surface mounted. See specification on drawings.

**2.5 LINEAR GRILLES**

- .1 Bar core type with no margin.
- .2 Plaster frame, sealing strip and accessories as indicated.
- .3 Air volume control damper with concealed adjustment.
- .4 See specification on drawings.

**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 diffuser, register and grille installation in accordance with manufacturer's written instructions.

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- .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .2 Proceed with installation only after unacceptable conditions have been remedied .

**3.2 INSTALLATION**

- .1 Install in accordance with manufacturers instructions.
- .2 Install with torx type screws in countersunk holes where fastenings are visible.

**END OF SECTION**

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**Part 1           General**

**1.1           DESIGN REQUIREMENTS**

- .1       Confirm with Departmental Representative that Design Criteria and Design Intents are still applicable.
- .2       Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intents.

**1.2           ACTION AND INFORMATIONAL SUBMITTALS**

- .1       Submittals in accordance with Section 20 05 01.
- .2       Final Report: submit report to Departmental Representative.
  - .1       Include measurements, final settings and certified test results.
  - .2       Bear signature of commissioning technician and supervisor
  - .3       Report format to be approved by DCC Representative before commissioning is started.
  - .4       Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to Departmental Representative in accordance with Section 20 05 01.
  - .5       Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

**1.3           COMMISSIONING**

- .1       Do commissioning in accordance with Section [01 91 13 - GENERAL COMMISSIONING REQUIREMENTS].
- .2       Carry out commissioning under direction of PWGSC Commissioning Manager.
- .3       Inform, and obtain approval from, Departmental Representative in writing at least [14] days prior to commissioning or each test. Indicate:
  - .1       Location and part of system to be tested or commissioned.
  - .2       Testing/commissioning procedures, anticipated results.
  - .3       Names of testing/commissioning personnel.
- .4       Correct deficiencies, re-test in presence of Departmental Representative until satisfactory performance is obtained.
- .5       Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.
- .6       Load system with project software.
- .7       Perform tests as required.

**1.4           COMPLETION OF COMMISSIONING**

- .1       Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by PWGSC Commissioning Manager.

**1.5           ISSUANCE OF FINAL CERTIFICATE OF COMPLETION**

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- .1 Final Certificate of Completion will not be issued until receipt of written approval indicating successful completion of specified commissioning activities including receipt of commissioning documentation.

## **Part 2 Products**

### **2.1 EQUIPMENT**

- .1 Provide sufficient instrumentation to verify and commission the installed system. Provide two-way radios.
- .2 Instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.
- .3 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than [2] months prior to tests.
- .4 Locations to be approved, readily accessible and readable.
- .5 Application: to conform to normal industry standards.

## **Part 3 Execution**

### **3.1 PROCEDURES**

- .1 Test each system independently and then in unison with other related systems.
- .2 Commission each system using procedures prescribed by the Commissioning Manager.

### **3.2 FIELD QUALITY CONTROL**

- .1 Pre-Installation Testing.
  - .1 General : consists of field tests of equipment just prior to installation.
  - .2 Testing may be on site or at Contractor 's premises as approved by Departmental Representative.
  - .3 Configure major components to be tested in same architecture as designed system.
  - .4 After setting, test zero and span in [10] % increments through entire range while both increasing and decreasing pressure.
  - .5 DP switches to open and close within 2% of setpoint.
  - .6 Final Operational Testing: to demonstrate that EMCS functions in accordance with contract requirements.
    - .1 Prior to beginning of [30] day test demonstrate that operating parameters (setpoints, alarm limits, operating control software, sequences of operation, trends, graphics and CDL 's) have been implemented to ensure proper operation and operator notification in event of off-normal operation.
    - .2 Test to last at least [30] consecutive 24 hour days.
    - .3 Tests to include:
    - .4 System will be accepted when:
    - .5 In event of failure to attain specified AEL during test period, extend test period on day-to-day basis until specified AEL is attained for test period.
    - .6 Correct defects when they occur and before resuming tests.
- .7 Commissioning Manager to verify reported results.

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**3.3**

**ADJUSTING**

- .1 Final adjusting: upon completion of commissioning as reviewed by Departmental Representative], set and lock devices in final position and permanently mark settings.

**END OF SECTION**



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**Part 1            General**

**1.1                DESIGN REQUIREMENTS**

- .1 Preliminary Design Review: to contain following contractor and systems information.
  - .1 Location of office.
  - .2 Description and location of installing and servicing technical staff.
  - .3 Location and qualifications of programming design and programming support staff.
  - .4 Names of sub-contractors and site-specific key personnel.
  - .5 Sketch of site-specific system architecture.
  - .6 Specification sheets for each item including memory provided, programming language, speed, type of data transmission.
  - .7 Descriptive brochures.
  - .8 Sample CDL and graphics (systems schematics).
  - .9 Response time for each type of command and report.
  - .10 Item-by-item statement of compliance.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 20 05 01 and coordinate with requirements in this Section.
- .2 Submit preliminary design document within [5] working days after contract award, for review by Departmental Representative.

**1.3                DETAILED SHOP DRAWING REVIEW**

- .1 Submit detailed shop drawings within [60]working days after award of contract and before start of installation and include following:
  - .1 Corrected and updated versions (hard copy only) of submissions made during preliminary review.
  - .2 Wiring diagrams.
  - .3 Piping diagrams and hook-ups.
  - .4 Shop drawings for each input/output point, sensors, transmitters, showing information associated with each particular point including:
    - .1 Sensing element type and location.
    - .2 Transmitter type and range.
    - .3 Associated field wiring schematics, schedules and terminations.
    - .4 Pneumatic schematics and schedules.
    - .5 Manufacturer's recommended installation instructions and procedures.

**END OF SECTION**



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**Part 1            General**

**1.1                SYSTEM DESCRIPTION**

- .1            Language Operating Requirements: provide identification for control items in English and French.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submittals in accordance with Section 20 05 01 supplemented and modified by requirements of this Section.
- .2            Submit to Departmental Representative for approval samples of nameplates, identification tags and list of proposed wording.

**Part 2            Products**

**2.1                NAMEPLATES FOR PANELS**

- .1            Identify by Plastic laminate, 3 mm thick Melamine, matt white finish, black core, square corners, lettering accurately aligned and engraved into core.
- .2            Sizes: 25 x 67 mm minimum.
- .3            Lettering: minimum 7 mm high, black.
- .4            Inscriptions: machine engraved to identify function.

**2.2                NAMEPLATES FOR FIELD DEVICES**

- .1            Identify by plastic encased cards attached by chain.
- .2            Sizes: 50 x 100 mm minimum.
- .3            Lettering: minimum 5 mm high produced from laser printer in black.
- .4            Data to include: point name and point address.
- .5            Companion cabinet: identify interior components using plastic enclosed cards with point name and point address.

**2.3                NAMEPLATES FOR ROOM SENSORS**

- .1            Identify by stick-on labels using point identifier.
- .2            Letter size: to suit, clearly legible.

**2.4                WIRING**

- .1            Supply and install numbered tape markings on wiring at panels, junction boxes, splitters, cabinets and outlet boxes.
- .2            Colour coding: to CSA C22.1. Use colour coded wiring in communications cables, matched throughout system.
- .3            Power wiring: identify circuit breaker panel/circuit breaker number inside each EMCS panel.

**2.5                PNEUMATIC TUBING**

- .1            Numbered tape markings on tubing to provide uninterrupted tracing capability.

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**2.6 CONDUIT**

- .1 Colour code EMCS conduit.
- .2 Pre-paint box covers and conduit fittings.

**Part 3 Execution**

**3.1 NAMEPLATES AND LABELS**

- .1 Ensure that manufacturer's nameplates, CSA labels and identification nameplates are visible and legible at all times

**3.2 EXISTING PANELS**

- .1 Correct existing nameplates and legends to reflect changes made during Work.

**END OF SECTION**

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**Part 1 General**

**1.1 SYSTEM DESCRIPTION**

- .1 Pneumatic:
  - .1 Pneumatic tubing, valves and fittings for field control devices.
- .2 Mechanical:
  - .1 Wells and Control Valves Shall Be Supplied by EMCS Contractor and Installed by Division 23.
- .3 Structural:
  - .1 Special steelwork as required for installation of work.

**1.2 PERSONNEL QUALIFICATIONS**

- .1 Qualified supervisory personnel to:
  - .1 Continuously direct and monitor all work.
  - .2 Attend site meetings.

**1.3 EXISTING CONDITIONS**

- .1 Repair all surfaces damaged during execution of work.
- .2 Turn over to DCC Representative existing materials removed from work not identified for re-use.

**Part 2 Products**

**2.1 PIPING FOR PNEUMATIC CONTROL SYSTEMS**

- .1 Copper:
  - .1 Tubing: .
    - .1 Fittings: wrought copper solder type to ANSI/ASME B16.22, and 95.5 antimonial tin solder. At instruments use compression fittings
    - .2 At panels and junction boxes where there is a transition from plastic to copper use bulkhead fittings.
- .2 Plastic:
  - .1 Flame retardant, black PVC with minimum burst strength 1.3 MPa at 23 degrees Celsius[installed in conduit].
  - .2 Fittings: compression or barbed type as required.

**2.2 WIRING**

- .1 As per requirements of Division 26.
- .2 For 70V and above copper conductor with chemically cross-linked thermosetting polyethylene insulation rated RW90 and 600V. Colour code to CSA 22.1
- .3 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. All other cases use FT4 wiring.
- .4 Sizes:

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- .1 120V Power supply: to match or exceed breaker, size #12 minimum.
- .2 Field wiring to digital device: #18 AWG.
- .3 More than 4 conductors: #22 minimum solid copper.
- .5 Terminations:
  - .1 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

## 2.3 CONDUIT

- .1 As per requirements of Division 26.
- .2 Electrical metallic tubing to <CAN/CSA C22.2 No. 83</stdref. Flexible and liquid tight flexible metal conduit to CAN/CSA C22.2 No. 56. Rigid steel threaded conduit to CAN/CSA C22.2 No. 45.1.
- .3 Junction and pull boxes: welded steel.
  - .1 Surface mounting cast FS: screw-on flat covers.
  - .2 Flush mounting: covers with 25 mm minimum extension all round.
- .4 Outlet boxes: 100 mm minimum, square.
- .5 Conduit boxes, fittings:
  - .1 Bushings and connectors: with nylon insulated throats.
  - .2 With push pennies to prevent entry of foreign materials.
- .6 Fittings for rigid conduit:
  - .1 Couplings and fittings: threaded type steel.
  - .2 Double locknuts and insulated bushings: use on sheet metal boxes.
  - .3 Use factory "ells" where 90 degree bends required for 25 mm and larger conduits.
- .7 Fittings for thin wall conduit:
  - .1 Connectors and couplings: steel, set screw type.

## 2.4 WIRING DEVICES, COVER PLATES

- .1 Conform to CSA

## 2.5 SUPPORTS FOR CONDUIT, FASTENINGS, EQUIPMENT

- .1 Solid masonry, tile and plastic surfaces: lead anchors or nylon shields.
  - .1 Hollow masonry walls, suspended drywall ceilings: toggle bolts.
- .2 Exposed conduits or cables:
  - .1 50 mm diameter and smaller: one-hole steel straps.
  - .2 Larger than 50 mm diameter: two-hole steel straps.
- .3 Suspended support systems:
  - .1 Individual cable or conduit runs: support with 6 mm diameter threaded rods and support clips.
  - .2 Two or more suspended cables or conduits: support channels supported by 6 mm diameter threaded rod hangers.

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**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete

**3.2 PNEUMATIC CONTROL SYSTEMS**

- .1 General:
  - .1 Install tubing in accessible concealed locations, straight, parallel and close to building structure with required grades for drainage and venting.
  - .2 Install drip legs and drains at low points.
  - .3 Tubing to be free from surface damage.
  - .4 Tubing NOT to pass through or touch unheated ducts or enclosures.
  - .5 Do not cover pneumatic tubing with insulation.
  - .6 Test tubing, check joints after connection to system.
- .2 Copper tubing:
  - .1 Not to come into contact with dissimilar metal. Use non-metallic stand-offs on air handling systems.
  - .2 Install dielectric couplings where dissimilar metals are connected.
  - .3 Plastic tubing:
    - .1 Inaccessible locations: install plastic tubing in conduit.
    - .2 Inside panels: install in tube trays or racks, or clip individually to back of panel.
    - .3 Multiple tube bundles: install in tube trays, conduit or armoured flexible cable.

**3.3 ELECTRICAL GENERAL**

- .1 Do complete installation in accordance with requirements of:
  - .1 Division 26, this specification.
  - .2 CSA 22.1 Canadian Electrical Code
  - .3 ANSI/NFPA 70
  - .4 ANSI C2
- .2 Fully enclose or properly guard electrical wiring, terminal blocks, high voltage above 70 V contacts and mark to prevent accidental injury.
- .3 Do underground installation to CAN/CSA-C22.3 No.7, except where otherwise specified
- .4 Conform to manufacturer's recommendations for storage, handling and installation.
- .5 Check factory connections and joints. Tighten where necessary to ensure continuity.
- .6 Install electrical equipment between 1000 and 2000 mm above finished floor wherever possible and adjacent to related equipment.
- .7 Protect exposed live equipment such as panel, mains, outlet wiring during construction for personnel safety.
- .8 Shield and mark live parts "LIVE 120 VOLTS" or other appropriate voltage.
- .9 Install conduits, and sleeves prior to pouring of concrete.
- .10 Holes through exterior wall and roofs: flash and make weatherproof.

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- .11 Make necessary arrangements for cutting of chases, drilling holes and other structural work required to install electrical conduit, cable, pull boxes, outlet boxes.
- .12 Install cables, conduits and fittings which are to be embedded or plastered over, neatly and closely to building structure to minimize furring.

### 3.4 CONDUIT SYSTEM

- .1 Communication wiring shall be installed in conduit. Provide complete conduit system to link Building Controllers to BECC. Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems. Maximum conduit fill not to exceed 40%. Design drawings do not show conduit layout.
- .2 Install conduits parallel or perpendicular to building lines, to conserve headroom and to minimize interference.
- .3 Locate conduits at least 150 mm from parallel steam or hot water pipes and at least 50 mm at crossovers.
- .4 Bend conduit so that diameter is reduced by less than 1/10th original diameter.
- .5 Field thread on rigid conduit to be of sufficient length to draw conduits up tight.
- .6 Limit conduit length between pull boxes to less than 30 m.
- .7 Use conduit outlet boxes for conduit up to 32 mm diameter and pull boxes for larger sizes.
- .8 Fastenings and supports for conduits, cables, and equipment:
  - .1 Provide metal brackets, frames, hangers, clamps and related types of support structures as indicated and as required to support cable and conduit runs.
  - .2 Provide adequate support for raceways and cables, sloped vertically to equipment.
  - .3 Use supports or equipment installed by other trades for conduit, cable and raceway supports only after written approval from Departmental Representative.
- .9 Install polypropylene fish cord in empty conduits for future use.
- .10 Where conduits become blocked, remove and replace blocked sections.
- .11 Pass conduits through structural members only after receipt of Departmental Representative's written approval.
- .12 Conduits may be run in flanged portion of structural steel.
- .13 Group conduits wherever possible on suspended or surface channels.
- .14 Pull boxes:
  - .1 Install in inconspicuous but accessible locations.
  - .2 Support boxes independently of connecting conduits.
  - .3 Fill boxes with paper or foam to prevent entry of construction material.
  - .4 Provide correct size of openings. Reducing washers not permitted.
  - .5 Mark location of pull boxes on record drawings.
  - .6 Identify AC power junction boxes, by panel and circuit breaker.
- .15 Install bonding conductor for 120 volt and above in conduit.

### 3.5 WIRING

- .1 Install multiple wiring in ducts simultaneously.
- .2 Do not pull spliced wiring inside conduits or ducts.

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- .3 Use CSA certified lubricants of type compatible with insulation to reduce pulling tension
- .4 Tests: use only qualified personnel. Demonstrate that:
  - .1 Circuits are continuous, free from shorts, unspecified grounds.
  - .2 Resistance to ground of all circuits is greater than 50 Megohms.
- .5 Provide Departmental Representative with test results showing locations, circuits, results of tests.
- .6 Remove insulation carefully from ends of conductors and install to manufacturer's recommendations. Accommodate all strands in lugs. Where insulation is stripped in excess, neatly tape so that only lug remains exposed.
- .7 Wiring in main junction boxes and pull boxes to terminate on terminal blocks only, clearly and permanently identified. Junctions or splices not permitted for sensing or control signal covering wiring.
- .8 Do not allow wiring to come into direct physical contact with compression screw.
- .9 Install ALL strands of conductor in lugs of components. Strip insulation only to extent necessary for installation.

### **3.6 WIRING DEVICES, COVER PLATES**

- .1 Receptacles:
  - .1 Install vertically in gang type outlet box when more than one receptacle is required in one location.
  - .2 Cover plates:
    - .1 Install suitable common cover plate where wiring devices are grouped.
    - .2 Use flush type cover plates only on flush type outlet boxes.

### **3.7 GROUNDING**

- .1 Install complete, permanent, continuous grounding system for equipment, including conductors, connectors and accessories.
- .2 Install separate grounding conductors in conduit within building.
- .3 Install ground wire in all PVC ducts and in tunnel conduit systems.
- .4 Tests: perform ground continuity and resistance tests, using approved method appropriate to site conditions.

### **3.8 TESTS**

- .1 General:
  - .1 Perform following tests in addition to tests specified Section 25 08 20 - EMCS: Warranty and Maintenance.
  - .2 Conceal work only after tests satisfactorily completed.
  - .3 Report results of tests to Departmental Representative in writing.
  - .4 Preliminary tests:
    - .1 Conduct as directed to verify compliance with specified requirements.
    - .2 Make needed changes, adjustments, replacements.
    - .3 Insulation resistance tests:

### **3.9 IDENTIFICATION**

- .1 Refer to Section 25 05 54 - EMCS: Identification.

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**END OF SECTION**

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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 20 05 01.
- .2 Submit detailed inspection reports to Departmental Representative.
- .3 Submit network analysis report showing results with detailed recommendations to correct problems found.

**1.2 MAINTENANCE SERVICE DURING WARRANTY PERIOD**

- .1 Provide services, materials, and equipment to maintain EMCS for specified warranty period. Provide detailed preventative maintenance schedule for system components as described in Submittal article.
- .2 Emergency Service Calls:
  - .1 Initiate service calls when EMCS is not functioning correctly.
  - .2 Qualified control personnel to be available during warranty period to provide service to "CRITICAL" components whenever required at no extra cost.
  - .3 Furnish DCC Representative with telephone number where service personnel may be reached at any time.
  - .4 Perform Work continuously until EMCS restored to reliable operating condition.
- .3 Operation: foregoing and other servicing to provide proper sequencing of equipment and satisfactory operation of EMCS based on original design conditions and as recommended by manufacturer.
- .4 Work requests: record each service call request, when received separately on approved form and include:
  - .1 Serial number identifying component involved.
  - .2 Location, date and time call received.
  - .3 Nature of trouble.
  - .4 Names of personnel assigned.
  - .5 Instructions of work to be done.
  - .6 Amount and nature of materials used.
  - .7 Time and date work started.
  - .8 Time and date of completion.
- .5 Provide system modifications in writing.
  - .1 No system modification, including operating parameters and control settings, to be made without prior written approval of [Departmental Representative] [DCC Representative] [Consultant].

**Part 2 Execution**

**2.1 FIELD QUALITY CONTROL**

- .1 Following inspections are minimum requirements and should not be interpreted to mean satisfactory performance:

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- .1 Perform calibrations using test equipment having traceable, certifiable accuracy at minimum 50% greater than accuracy of system displaying or logging value.
  - .2 Check and Calibrate each field input/output device in accordance with Canada Labour Code - Part I and CSA Z204.
  - .3 Provide dated, maintenance task lists, as described in Submittal article, as proof of execution of complete system verification.
- .2 Rectify deficiencies revealed by maintenance inspections and environmental checks.
  - .3 Continue system debugging and optimization.
  - .4 Testing/verification of occupancy and seasonal-sensitive systems to take place during four (4) consecutive seasons, after facility has been accepted, taken over and fully occupied.
    - .1 Test weather-sensitive systems twice: first at near winter design conditions and secondly under near summer design conditions.

**END OF SECTION**

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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit shop drawings and manufacturer's installation instructions in accordance with Section 25 05 02 - EMCS: Submittals and Review Process.
- .2 Pre-Installation Tests.
  - .1 Submit samples at random from equipment shipped, as requested by Departmental Representative, for testing before installation. Replace devices not meeting specified performance and accuracy.
- .3 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions for specified equipment and devices.

**1.2 EXISTING CONDITIONS**

- .1 Repair surfaces damaged during execution of Work.
- .2 Turn over to DCC Representative existing materials removed from Work not identified for re-use.

**Part 2 Products**

**2.1 GENERAL**

- .1 Control devices of each category to be of same type and manufacturer.
- .2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, shockproof, vibration-proof, heat resistant, assembly.
- .3 Operating conditions: 0 - 32 degrees C with 10 - 90% RH (non-condensing) unless otherwise specified.
- .4 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.
- .5 Transmitters and sensors to be unaffected by external transmitters including walkie talkies.
- .6 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.
- .7 Outdoor installations: use weatherproof construction in NEMA[4] enclosures.
- .8 Devices installed in user occupied space not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

**2.2 TEMPERATURE SWITCHES**

- .1 Requirements:
  - .1 Operate automatically. Reset automatically, except as follows:
    - .1 Low temperature detection: manual reset.
  - .2 Adjustable setpoint and differential.
  - .3 Accuracy: plus or minus [1]degrees C.
  - .4 Type as follows:
    - .1 Room: for wall mounting on standard electrical box with protective guard as indicated.

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## 2.3 CONTROL VALVES

- .1 Body: globe style.
  - .1 Flow characteristic as indicated on control valve schedule: linear.
  - .2 [Normally open], as indicated.
  - .3 Two port, as indicated.
  - .4 Leakage rate ANSI class IV, 0.01% of full open valve capacity
  - .5 Packing easily replaceable.
  - .6 Stem, stainless steel.
  - .7 Plug and seat, stainless steel.
  - .8 Disc, replaceable, material to suit application.
  - .9 NPS 2 and under:
    - .1 Screwed National Pipe Thread (NPT) tapered female connections.
    - .2 Valves to ANSI Class [250], valves to bear ANSI mark
    - .3 Rangeability [50:1]minimum.

## 2.4 PNEUMATIC VALVE ACTUATORS

- .1 Requirements:
  - .1 Construction: steel, cast iron, aluminum.
  - .2 Diaphragm: moulded Buna-N rubber, nylon reinforced.
  - .3 Spring return to normal position.
  - .4 Spring range adjustment and position indicator.
  - .5 Provide pilot positioners on modulating control valves over 50 mm and where indicated on drawings. Positioners to operate between 20 to 90 kPa unless otherwise noted or required by sequence.
  - .6 Minimum shut-off pressure: refer to control valve schedule.

## 2.5 WIRING

- .1 In accordance with Section 26.
- .2 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. Other cases use FT4 wiring.
- .3 Wiring must be continuous without joints.
- .4 Sizes:
  - .1 Field wiring to digital device: #18AWG.
  - .2 Analog input and output: shielded #18 minimum solid copper.

## Part 3 Execution

### 3.1 INSTALLATION

- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete
- .2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.

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- .3 Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, controllers, relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in cases when dissimilar metals make contact.
- .4 Fire stopping: provide space for fire stopping in accordance with Section 20. Maintain the fire-resistance rating integrity of the fire separation.
- .5 Electrical:
  - .1 Complete installation in accordance with Section 26.
  - .2 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.
  - .3 Install communication wiring in conduit.
    - .1 Provide complete conduit system to link Building Controllers, field panels and OWS(s).
    - .2 Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.
    - .3 Maximum conduit fill not to exceed 40%.
    - .4 Design drawings do not show conduit layout.
- .6 Pneumatic: provide Pneumatic tubing, valves and fittings for field control devices in accordance with Section 23 09 43 - Pneumatic Control System for HVAC.
- .7 Mechanical: supply and install in accordance with Section 23 09 43 - Pneumatic Control System for HVAC.
  - .1 Pipe Taps.
  - .2 Wells and Control Valves.
  - .3 Air flow stations, dampers, and other devices.
- .8 VAV Terminal Units: supply, install and adjust as required.
  - .1 Air probe, actuator and associated vav controls.
  - .2 Tubing from air probe to dp sensor as well as installation and adjustment of air flow sensors and actuators.
  - .3 Co-ordinate air flow adjustments with balancing trade.

### **3.2 TESTING AND COMMISSIONING**

- .1 Calibrate and test field devices for accuracy and performance in accordance with Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

**END OF SECTION**



**Part 1            General**

**1.1        REQUIREMENTS**

- .1        General requirements
  - .1        Refer to section 20 05 01.

**1.2        CODES AND STANDARDS**

- .1        Refer to section 20 05 01.
- .2        Fully implement and comply with the CSA C22.10-18, 2018 Canadian Electrical Code.

**1.3        COORDINATION WITH OTHER SPECIALTIES**

- .1        Refer to section 20 05 01.
- .2        Actively participate in the above and provide all the required information and follow the arrangements agreed between the specialties.
- .3        Be responsible for any required changes in location resulting from a failure to comply with the above.

**1.4        DOCUMENTS / SAMPLES TO BE SUBMITTED**

- .1        Submit all the required documents and samples in accordance with section 20 05 01.

**1.5        PARTICULARITIES AND IMPLEMENTATION RELATING TO ELECTRICITY WORK**

- .1        Ensure that maintenance, dismantling and replacement of equipment can be carried out by having to move as little as possible the connecting elements of cable ducts and without the structural elements of the building or any other installation constituting a barrier.
- .2        Seat any major piece of equipment such as switchgear cabinets, transformers of 500 kVA and more, on a slab 100 mm high, with bevelled edges, and projecting at least 50 mm all around the devices for facilitate their cleaning.
- .3        In the basement, sit all the pieces of equipment to be supported by the floor on a 100 mm slab all around the devices to protect them and facilitate their cleaning.

**1.6        ISLEEVES**

- .1        Refer to section 20 05 05.
- .2        For all sleeves serving as passage of electrical and telecommunications wiring through a fire partition, use a resealable sleeve such as Hilti # CP653 or equivalent.

**1.7        MATERIALS AND EQUIPMENT**

- .1        Provide material and equipment in accordance with sections 01 61 00 and 20 05 01.

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- .2 All material and equipment must be new and certified by the CSA or another organization recognized CCQ chapter 5. In cases where there is no other choice but to provide non-approved equipment , it is up to the specialty to obtain special approval. No challenge to this requirement will be acceptable.
- .3 Control panels and component parts must be assembled in the factory.

**1.8 NOMINAL VOLTAGES**

- .1 The operating voltages must comply with standard CAN3-C235-83 (2010).
- .2 Motors, electric heaters, control and distribution devices must operate satisfactorily at nominal voltages of 120, 208, 240, 347 and 600 V, at the frequency of 60 Hz and at 'within the limits established in the above-mentioned standard. The equipment must be able to operate without being damaged, under the extreme conditions defined in this standard.

**1.9 PROTECTION AND WARNING SIGNS**

- .1 During construction, protect exposed or live equipment to ensure personnel safety.
- .2 Enclose and mark all live parts with the inscription "Circuit under voltage XXX V" (enter the appropriate voltage) in French.
- .3 Provide for the installation of temporary doors to close rooms containing electricity distribution equipment. Keep these doors locked, except when directly supervised by an electrician.
- .4 Provide warning signs in accordance with the requirements of the electrical installation inspection service as well as the instructions of the Ministry representant, the architect and the owner. Use decals of at least 175mm x 250mm.

**1.10 DESIGNATION OF ELECTRICAL EQUIPMENT**

- .1 Identify all equipment, wiring, raceways and control operating devices by function. All equipment identification shall be with permanent nameplates in English and Spanish.
- .2 Indicator plates:
  - .1 Engraving plates in laminated plastic 3 mm thick with black face and white core, mechanically fixed by means of self-tapping screws.

PLATE FORMAT INDICATORS			
Format 1	10 x 50 mm	1 height line	3 mm letters
Format 2	12 x 70 mm	1 height line	5 mm letters
Format 3	12 x 70 mm	2 lines high	3 mm letters
Format 4	20 x 90 mm	1 height line	8 mm letters
Format 5	20 x 90 mm	2 lines high	5 mm letters
Format 6	25 x 100 mm	1 height line	12 mm letters
Format 7	25 x 100 mm		6 mm letters

		2 lines high	
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- .2 The inscriptions on the nameplates must be coordinated and approved by the Ministry representant before the plates are manufactured.
- .3 Allow an average of twenty-five (25) letters per plate.
- .4 All electrical circuits and conductors shall be identified at the distribution panel. Circuit directories affixed to distribution panels shall be comprehensive in nature and typewritten or computer printed. Each switch control and outlet face plate shall have the circuit and distribution panel number identification..
- .5 For electrical systems components installed above ceiling, provide proper labelling at ceiling level indicating the type of device and its associated circuit number.
- .6 Provide identification at each starter; disconnect switch and /or controls.
- .7 All distribution panels must have a circuit directory associated, fixed on the panel and computer typed.

**1.11 IDENTIFICATION OF THE SECTOR**

- .1 Using numbered or colored plastic tape, permanently and indelibly mark both ends of phase conductors of each artery and branch circuit.
- .2 Maintain the order of phases and the same color code for the entire installation.
- .3 The color code must conform to CSA C22.1.

**1.12 IDENTIFICATION OF DUCTS AND CABLES**

- .1 Color code conduits, boxes and metal sheathed cables.
- .2 The conduits of the fire alarm systems, data / computer and optical fiber will be colored identifying them over their entire length.
- .3 For all conduits and cables other than those listed in item .2, use plastic tape or paint as color marks on the cables or conduits every 3 m and at the penetrations of walls, ceilings and floors.
- .4 The bands of the basic colors must be 25 mm wide and those of the complementary colors must be 20 mm wide.

	<b>Conduit color</b>	<b>Ribbon color</b>	<b>Complementary ribbon color</b>
Up to 250 V	Grey	Yellow	
Up to 600 V	Grey	Yellow	Green
Fire alarm	Red	---	---
Emergency communication	Grey	Red	Blue
Security	Grey	Red	Green
Grounding	Grey	Green	
BAS	Grey	Orange	---
Access control	Grey	Blue	---
CCTV	Grey	Violet	---

**1.13 MANUFACTURER AND CSA IDENTIFICATION**

- .1 Once equipment installed, manufacturer and CSA stickers must be readable and apparent.

**1.14 WIRE TERMINATION**

- .1 Terminals, lugs, and screws used for wire connections must allow for copper and aluminum conductors.

**1.15 LOCATION OF OUTPUTS AND SOCKETS**

- .1 Do not install outlets and outlets back to back in a wall; leave a horizontal clearance of at least 150 mm between the boxes.
- .2 The location of outlets and outlets may be changed without additional charge or credit, provided that the displacement does not exceed 3000 mm and that notice is given before installation.
- .3 Place light switches near doors, handle side. In rooms with mechanical installations and elevator machinery, place the disconnectors near the doors, on the handle side.

**1.16 MOUNTING HEIGHTS FOR OUTLETS AND ELECTRICAL EQUIPMENT**

- .1 Unless otherwise indicated, the mounting height of the material is measured from the surface of the finished floor to the center line of the unit.
- .2 In cases where the mounting height is not indicated in the table below, check with the supervisor before starting the installation.
- .3 In places designated by the architect and in order to comply with the barrier-free design standard, install the electrical equipment at the height indicated below:

<b><u>DESCRIPTION</u></b>	<b><u>HEIGHT (mm)</u></b>
- Light switch in general	1 370 mm
- Wall socket in general	300 mm
- Wall socket on top of heating cabinet	200 mm
- Fire alarm manual handle	1 100 mm

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<u>DESCRIPTION</u>	<u>HEIGHT (mm)</u>
- Distribution panel : According to Code requirement or indications	

**END OF SECTION**



**Part 1            General**

**1.1        DEFINITIONS**

- .1        Dismantling work
  - .1        Dismantling work refers to all disconnection, removal, recovery and storage of existing electrical materials to be reused and/or returned to the owner.
- .2        Demolition work
  - .1        Demolition work refers to all removal and evacuation of the site, existing electrical equipment and/or materials that will not be reused and/or recovered by the owner.

**1.2        COORDINATION**

- .1        Coordinate power interruptions with the owner and power distributor.
- .2        All work will be done taking into account that the normal operation of the business must not be interrupted at any time.

**1.3        TEMPORARY LIGHTING**

- .1        Maintain at all times, and for the duration of the work, a minimum lighting of 300 lux in the occupied premises.

**Part 2            Execution**

**2.1        DISMANTLING WORK**

- .1        Before proceeding with dismantling existing electrical equipment to be recovered, it will be the responsibility of the electrical specialty contractor to inspect said equipment and report in writing to the owner's representative all breakages and / or defects found. Failure to do so will result in the equipment being considered to be in perfect condition and any breakage or defect detected subsequently must be repaired at the expense of the electrical specialty contractor.
- .2        Recovered electrical equipment must be temporarily stored by the electrical specialty contractor who, therefore, will take full responsibility. No additional cost will be granted for the replacement of missing and / or damaged equipment during the period in which this equipment has been stored.
- .3        When reinstalling existing electrical equipment recovered, the electrical specialty contractor must provide all the brackets and other mounting accessories required in order to make a complete installation that works perfectly.

**2.2        DEMOLITION WORK**

- .1        Pre-demolition work
  - .1        Before proceeding with the demolition of existing electrical equipment, the contractor in the electrical specialty must perform the following preliminary work:
    - .1        Turn off the feeders supplying the electrical equipment to be demolished.

- .2 Disconnect the retained equipment from the existing circuits to be removed and ensure electrical continuity of the retained circuits or supply them from a new circuit from a retained existing electrical panel.
  - .3 Dismantle existing equipment to be reused and/or retained.
- .2 Demolition work
- .1 All demolition work will be carried out by the electrical contractor in coordination with other specialties and under the General Contractor's responsibility.
  - .2 Existing electrical equipment to be disconnected or removed is not fully indicated on the drawings, it is the electrical sub-contractor's responsibility to visit the site in order to properly assess the extent of demolition work relative to its specialty.
  - .3 Plan for the removal of the existing electrical equipment that will not be reused, such as: fixtures, electrical outlets, switches, distribution boards, starters, telephone outlets, computer outlets, fire alarms, access control devices, etc.
  - .4 Disconnect and remove up to its power source any feeder supplying a removed and not-reused existing mechanical and/or control device. The device remains the property of the mechanical specialty.
  - .5 In general, the equipment that is removed, but not reused, must be removed from the site. However, return to the owner the existing equipment he identified as recovered materials.
  - .6 When existing electrical equipment is removed, its existing electrical supply, wires and conduits, must be dismantled up to the electrical panel from which the supply originates, if no other existing equipment is supplied by that feeder, or up to the first retained existing equipment that is supplied by that feeder.
  - .7 Rewire the circuits that will have been cut by the demolition or by the cutting of existing surfaces.
  - .8 Remake the electrical continuity of the retained outlets and/or equipment and use the existing or new branch boards to supply the retained circuits by adding the required circuit breakers.
  - .9 When required, disconnect and remove the electrical equipment to allow the work of other specialties and reconnect them after the work.
  - .10 Plan for the sealing of openings left in existing walls and/or floors to be retained during the demolition and/or dismantling of existing feeders. For fire separations, either walls or floors, use an intumescent sealant.
  - .11 During demolition work, in a building that remains occupied, ensure that the fire alarm system remains operational at all times. In the areas affected by the work, temporarily replace smoke detectors with thermal detectors for the duration of the work. At the end of the work, reinstall the smoke detectors at their original location or as indicated on the drawings.

**END OF SECTION**

**Part 1            General Information**

**1.1        REFERENCES**

- .1        National Building Code of Canada (NBC) and its supplements
- .2        Quebec Construction Code – Chapter I – Building.
- .3        CSA C22.10 Canadian Electrical Code, Part I and Quebec’s modifications.
- .4        CSA C22.2 No. 0.3, Test methods for electrical wires and cables.

**1.2        DOCUMENTS AND SAMPLES TO BE SUBMITTED**

- .1        Submit the required data sheets as well as the manufacturers’ specifications and documentation for the products in accordance with section 20 05 01 – Documents and samples to be submitted. Specify product characteristics, performance criteria and constraints.

**Part 2            Products**

**2.1        CONDUCTORS**

- .1        All conductors will be copper.
  - .1        The feeder will not be used to supply any mechanical equipment or apparatus.
  - .2        If required, the Contractor will replace, at his own expense, the thimble connections of the equipment.
  - .3        All modifications will be recorded on the copy of the plans, as executed.

**2.2        BUILDING WIRING**

- .1        Copper wiring, solid conductors for gauges 10 AWG and lower, then stranded for gauges 8 AWG and higher.
- .2        Copper conductors, minimum size 12 for power and minimum size 14 for controls, and according to the specifications on the drawings.
- .3        Chemically cross-linked thermosetting polyethylene.
- .4        For general use: RW-90 XLPE, isolated at 600 V.
- .5        For use directly exposed by the sun, wire and cables must be specifically approved to that end and be marked for it, type SR.

**2.3        CABLES**

- .1        Teck Cable
  - .1        Cables: as requested in standard CAN/CSA-C22.2 n° 131.
  - .2        Conductor

1. Grounding conductor : In copper
2. Feed conductor : In copper, size according to indications.
- .3 Insulation
  1. Polyethylene heat-hardening, chemically bonding, type RW90, made for 1000volts.
- .4 Internal protective sleeve : in polychloride vinyl
  1. Grounding conductor : In copper
  2. Feed conductor : In copper, size according to indications.
- .5 Metal protection : Aluminum sheet
- .6 External sleeve : Polychloride vinyl.
- .2 Aluminum sleeve cable (CORFLEX)
  - .1 Conductor : Copper size as indicated.
  - .2 Insulation : Type RA90, made for 600 volts tension and a 90°C temperature.
  - .3 Sleeve: Aluminum, spiraling on all length, without holes or defects.
- .3 Cable with non-metallic sleeve
  - .1 Conductor : Copper size as indicated.
  - .2 Insulation : 300 volts
  - .3 Cable with chloride polyvinyl nylon, type NMD90 for general use.

### **Part 3 Execution**

#### **3.1 INSTALLATION OF THE BUILDING WIRING**

- .1 Install the cable as follows:
  - .1 In white conduits, in accordance with section 26 05 33.
- .2 Retain the order of the phases and the colour coding for the entire installation.
- .3 Particular care of the phases and colour coding for the entire installation.
- .4 Particular care must be taken if it is necessary to install the wiring when the building temperature is between -9.5°C and -1.1°C. When the temperature is lower than -9.5°C, consult the Departmental Representative.
- .5 For the size of the wires, notwithstanding the instructions on the drawings and specifications, take the necessary steps so that the voltage drop does not exceed 3% between the secondary of the power transformer and any other device in use, when all devices are in service. In the event that the poor function of a device is due to a voltage drop of more than 3%, make the necessary corrections without any additional cost.
- .6 The electrical joints are mechanically rigid, and then covered in a connector of the type Marr, Marrette, and according to the manufacturer's instructions.
- .7 The terminals, thimbles and screws used to connect the wires must be suitable for copper or aluminum conductors based on the wire used.
- .8 No grease product will be accepted to facilitate the passage of wires in the conduits. Cable lubricant, chalk, talc or mica powder will be used.

### **3.2 INSTALLATION OF TECK CABLE (0-1000V)**

- .1 Install cables
  1. As much as possible, group cables on U shaped hangers.
- .2 Ensure cable termination in accordance with section 26 05 20 – Cable and Box Connectors, 0-1000 V.
  1. Use aluminum mounting flanges to fix apparent cables of 25 mm diameters or less.
  2. Use U shaped hangers installed at 900 mm of center distance to hold a group of 2 cables or more.
- .3 Use threaded rods of 6 mm diameter to support U shaped hangers. Add special fixes in required location.
- .4 In any case it is allowed to install tack cables under plenum ceiling.

### **3.3 INSTALLATION OF ALUMINIUM SLEEVE CABLES (CORFLEX)**

- .1 Group all cables in U shaped hangers everywhere it is doable.
- .2 Make the angles at 90° with a radius wide enough so the sleeve does not break.
- .3 Finish the cable ends in accordance with section 26 05 20.

### **3.4 INSTALLATION OF NON METALLIC CABLES**

- .1 Install the cables
- .2 Install the flanges and cable connectors at the junction boxes, according to the needs.
- .3 Use non-metallic sleeved cables only for tension of 300 Volts and less.
- .4 Install the non-metallic sleeved cables as required by the drawings indications and in accordance with section 12, article 500 to 526 of standard ACNOR C22.10.
- .5 Except in fire proofed access shafts where diameter for coring is limited to maximum 25 mm, group all cables everywhere it is possible.
- .6 Protect the cables with an adequate protector when going through a shaft in drywall.

**END OF SECTION**



**Part 1            Products**

**1.1            MATERIALS**

- .1            Pressure type wire connectors compliant with CSA standard C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors as required.
- .2            Fixture type splicing connectors compliant with CSA standard C22.2 No. 65, with current carrying parts of copper sized to fit 10 AWG copper conductors or less.
- .3            Bushing stud connectors compliant with standard EEMAC 1Y-2 consist of:
  - .1            Connector body and stud clamp for stranded copper conductors.
  - .2            Clamp for copper bar.
  - .3            Stud clamp bolts.
  - .4            Bolts for copper bar.
  - .5            Sized for conductors, as indicated.
- .4            Clamps or connectors for armoured cables, compliant with CAN/CSA-C22.2 No. 18.

**Part 2            Execution**

**2.1            INSTALLATION**

- .1            Remove insulation carefully from ends of conductors and:
  - .1            Install mechanical pressure type connectors and tighten screws. Installation must meet secureness tests in accordance with CSA standard C22.2 No. 65.
  - .2            Install fixture type connectors and tighten. Replace insulating cap.
  - .3            Install bushing stud connectors in accordance with EEMAC 1Y-2.
  - .4            Use the appropriate crimpers for connector models and sizes, as recommended by the connector manufacturer.
  - .5            For the connection of equipment and fixtures in places where space is limited, use 90° angled connectors.

**END OF SECTION**



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**Part 1            Products**

**1.1        EQUIPMENT**

- .1        Copper earthing wall bus bars mounted on insulated brackets.
- .2        Earth conductors: annealed bare copper, stranded, size indicated.
- .3        Flexible copper earthing braids complete with ferrules and terminal lugs. Capacity and length as indicated.
- .4        Conductor under green insulation, size as indicated.
- .5        Accessories: anti-corrosion, necessary to complete the earthing system, type, dimensions and materials as indicated, including among others the following items
  - .1        Bonding and earthing sleeves.
  - .2        Protective wire clamps.
  - .3        Connectors to be welded by the "thermit" process, for conductors.
  - .4        Riders, binding bridles.
  - .5        Pressure connectors, for conductors.

**Part 2            Execution**

**2.1        GENERALITIES**

- .1        Install a continuous grounding system, consisting of the following: electrodes, conductors, connectors and accessories in accordance with the requirements of the local authority having jurisdiction.
- .2        Install the connectors according to the manufacturer's instructions.
- .3        Protect exposed grounding conductors against material damage.
- .4        Use mechanical connectors for connections to equipment with grounding lugs.
- .5        When metal electrical tubes (EMT type) are used, pass the insulated earthing conductor through the tubes.

**2.2        GROUNDING OF THE EQUIPMENT**

- .1        Ground all equipment including but not limited to and / or exhaustively the following equipment:
  - .1        External lights
  - .2        Steel frame
- .2        Make the ground connections of the telecommunication cable trays using a green insulated copper conductor of minimum # 6 AWG or as indicated.

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**2.3 TESTING**

- .1 Check the continuity and resistance of the earthing network according to methods carried out under local conditions and approved by the Engineer and the competent local authorities.
- .2 Perform the tests before switching on the electrical installation.
- .3 During testing, disconnect the earth leakage indicator.

**END OF SECTION**

**Part 1            Products**

**1.1            U-PROFILE SUPPORTS**

- .1            Supports 41 mm wide, variable in height and length, with the capacity required to suit the weight of the equipment and / or conduits they support.
  
- .2            Substrates made from the following materials and having the following finishes:
  - .1            Brackets made from an extruded aluminum alloy.
  - .2            Steel brackets painted with epoxy paint applied by an electrostatic procedure.
  - .3            Structural grade hot-dip galvanized steel brackets.
  - .4            Structural grade pregalvanized steel brackets.
  - .5            Stainless steel brackets.
  
- .3            Manufacturers
  - .1            Eaton / B-Line
  - .2            Thomas & Betts / Superstrut
  - .3            Unistrut Ltée
  - .4            Or approved equivalent

**1.2            TIES**

- .1            Twist clips for attaching surface equipment to inverted "T" rails on suspended ceilings.
- .2            Ties used to hold cables and / or conduits to supports.
- .3            Fasteners to support suspension rods from structural members.
- .4            Recognized manufacturers
  - .1            Erico-Caddy
  - .2            Or approved equivalent

**Part 2            Execution**

**2.1            INSTALLATION**

- .1            Secure equipment to masonry, tile and plaster surfaces using lead anchors.
- .2            Secure equipment to poured concrete surfaces using expandable flush anchors.
- .3            Secure equipment to hollow masonry walls or suspended ceilings, using toggle bolts.

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- .4 Attach surface mounted equipment to inverted "T" rails in suspended ceilings using twist clips. Before installing the prescribed equipment, make sure that the "T" ties are sufficiently supported to support the weight. Suspensions of inverted "T" ceilings are part of division 9.
- .5 Support equipment for conduits or cables consisting of clips, spring bolts and cable ties designed as accessories to the basic supports, "U" profiles.
- .6 Provide metal consoles, mounts, hooks, clamps and other types of support where indicated or as needed to support the equipment.
- .7 Provide adequate support for piping and cables laid vertically to the equipment when there is no wall support.
- .8 Do not use tie wire or perforated strip for support.
- .9 Do not use supports or equipment installed for other trades, as support, except with permission from those skilled in those other trades and with the approval of the Engineer.
- .10 Install clips and brackets according to the needs of each type of equipment, conduit and cable and following the manufacturer's recommendations for the indicated application.
- .11 Use the hardware recommended by the manufacturer depending on the type of substrate and the application.

**END OF SECTION**

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**Part 1            Products**

**1.1        BOXES**

- .1        General purpose outlet boxes
  - .1        Single hot-dip galvanized steel boxes, at least 76mm x 50mm x 38mm or as indicated, for flush mounting of devices. These boxes can be grouped together when several wiring devices are installed at the same location.
  - .2        Hot dipped galvanized steel outlet boxes, 102 mm square when more than one conduit enters one side with extension and plaster rings, as required.
  - .3        102 mm square or octagonal hot dipped galvanized steel outlet boxes for lighting fixture outlets.
  - .4        Hot dipped galvanized steel outlet boxes, 102 mm square when more than one conduit enters one side with extension and plaster rings, for devices embedded in finished plaster or ceramic tile walls.
- .2        Concrete mounting outlet boxes
  - .1        Hot dipped galvanized steel outlet boxes, for flush mounting wires devices built in concrete.
- .3        Non-metallic sleeved cables outlet boxes
  - .1        Hot dipped galvanized steel outlet boxes, able to dismantle, able to be grouped by screws, of at least 76 mm x 50 mm x 63 mm, with two double flanges, for non-metallic sleeved cables.
- .4        Pull box and junction
  - .1        Standard manufactured hot dipped galvanized steel boxes, 102 mm square or octagonal with blind lid.
  - .2        Custom-made pre-painted steel boxes compliant with CSA C22.10.10. These boxes may or may not have knockouts. When these boxes are intended for flush installation, the lid will protrude 25 mm on each side.
  - .3        Square or rectangular PVC boxes, minimum size 114 mm x 120 mm or 102 mm octagonal with openings of appropriate dimensions for gluing the conduits. These boxes will have a tight lid and mounting feet.
- .5        Splitter boxes
  - .1        Splitter boxes according to use and / or according to the indications in the drawings.
  - .2        Boxes approved in accordance with C-22.10.10.
  - .3        Steel sheet splitter boxes of required dimensions to be suitable for all connected equipment.
  - .4        Splitter boxes fitted with terminal boards corresponding to the size and number of conductors that will be connected to them. Provide a minimum of three (3) free secondary connection terminals for future connections.

**1.2        CONDUITS**

- .1        Conduits - General
  - .1        All conduits will be approved for the use for which they are intended in accordance with the CSA Code B.22.10.10.
  - .2        Conduits must have a minimum diameter of 21mm unless otherwise specified.

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- .3 Aluminum conduit will not be accepted unless otherwise specified.
  - .4 Fiberglass conduits will not be accepted unless otherwise specified.
  - .5 Flexible polyethylene conduits are not accepted.
  - .6 The conduits used for the passage of the wiring of the fire alarm system will be of the "Metal electrical tube (TEM)" type.
  - .7 Except mentioned otherwise, it is not allowed to install conduits under concrete slabs.
  - .8 Only where specifically mentioned on the drawings, conduits that must be installed under concrete slabs must be installed under a sand bed, with a minimum of 100 mm under the concrete slab.
- .2 Metal electrical tubes (TEM)
    - .1 Thin-walled metal electrical tube, made of corrosion-resistant hot-dip galvanized steel, with interior coated with a coating to facilitate sliding between the tube and the wiring.
  - .3 Rigid PVC conduit for outdoor
    - .1 Polychloride vinyl conduits for sun exposure use must be approved for that end specifically and marked in accordance.

### 1.3 CONNECTORS

- .1 Common connectors
  - .1 Sleeves and connectors with insulated nylon collars.
  - .2 Pressure seals to prevent foreign bodies from penetrating the boxes and connectors.
  - .3 Outlet body for conduits up to 32 mm in diameter and pull boxes for conduits of larger dimensions.
  - .4 Metal end caps with nylon throats of appropriate size for conduit diameter, such as Thomas & Betts series 1222 to 1231.
- .2 Clamping screw connectors for electrical metallic tubing (EMT)
  - .1 Zinc alloy connectors for electrical metallic tubing with single screw couplings for pipes with a diameter of 41 mm and less, then with double screw couplings for pipes with a diameter of 53 mm and more.
  - .2 Acceptable products:
    - .1 Connectors with insulated collar: Iberville CI5004 series -IT to CI5032-IT or approved equivalent.
    - .2 Couplings: Iberville series CI5104 to CI5132 or approved equivalent.
- .3 Tight compression connectors for electrical metallic tubing (EMT)
  - .1 Zinc alloy liquid-tight connectors with cast zinc lock nuts.
  - .2 Acceptable products:
    - .1 Connectors with insulated collar: Iberville series CI5804 -IT to CI5832-IT.
    - .2 Couplings: Iberville series CI5904 to CI5932.
- .4 PVC conduits connectors
  - .1 Polychloride vinyl connectors of appropriate dimensions and length, allowing a strong connection.
  - .2 Expanding connector in polychloride vinyl with O-ring.

## 1.4 CONDUIT FASTENERS

- .1 Fastening clamps to secure visible conduits.
- .2 Single-hole clamps to secure cables of 41 mm in diameter or less and two-hole clamps to secure cables of 53 mm in diameter or more.
- .3 Clamps made of flexible iron for rigid metal conduits and electrical metallic tubing.
- .4 Clamps made of PVC-coated steel for PVC conduit.
- .5 U-shapes to support several suspended lines.
- .6 Brackets to secure visible metallic conduits.
- .7 6 mm diameter threaded rods to support suspended lines.

## Part 2 Execution

### 2.1 INSTALLING CONDUITS

- .1 General
  - .1 It is forbidden to use a corrosive product to unblock the conduits; open and replace the obstructed part of the conduit.
  - .2 Properly dry the conduits before running wires through them.
  - .3 Unless otherwise stated, conduits must not cross the framing components.
  - .4 Install the conduits parallel to the steam or hot water lines, leaving a lateral clearance of at least 75 mm and a vertical clearance of at least 25 mm between the conduits and the piping that cross each other.
  - .5 From each flush mounted panel, raise to ceiling void and lower to floor void, two 27 mm diameter spare conduits. The conduits must end up in a junction box measuring 152 mm x 152 mm x 152 mm x 102 mm housed in the ceiling; in the case of an exposed concrete slab, they must end up in boxes embedded in the slab.
  - .6 Provide and install a pull cord made of polypropylene in empty conduits to facilitate the eventual process of drawing in the wires.
  - .7 Conceal the conduits, except those found in the mechanical and electrical rooms and in areas where otherwise indicated.
  - .8 Bend the cold conduits so that crushing does not cause a decrease of more than 1/10 of the original diameter of the conduit. Consider that all curves that are twisted or that result in crushing greater than 1/10 are defective and replace the conduits.
  - .9 Mechanically bend steel tubes larger than 21 mm in diameter.
  - .10 For visible installations, install conduits that are glued to the ceiling and/or concrete slab so as not to reduce the height of the room. In addition, use "LB" type connectors to bypass visible beams.
  - .11 Use conduit support systems including: profiles, crossarms, cross members, brackets, fasteners, squares, anchors and accessories, such as Thomas & Betts, B-Line or an equivalent type to group multiple conduits.
  - .12 Install the conduits in a straight line following the building's grid lines.

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- .2 Installing electrical metallic tubes (EMT)
  - .1 Place a protective cap on each of the open ends.
  - .2 Use single or double screw conduit connectors depending on conduit diameter.
  - .3 Use tight compression connectors when they are subject to water spray (other than sprinklers) or when required by the owner.
  - .4 Groups conduits on conduit supports.
- .3 Installing polychloride vinyl conduits (PVC).
  - .1 Generalities
    - 1. Install conduits as per manufacturer requirements.
    - 2. Properly clean inside the conduits prior to installation.
    - 3. All seals must be waterproofed.
    - 4. Where wires are required in PVC, provide and install a grounding wire, connected to ground terminals of the outlet boxes, junction boxes or other devices until a proper ground is made.

## 2.2 INSTALLING BOXES

- .1 General
  - .1 Secure the boxes so that they are supported independently of the conduits that are connected to them.
  - .2 Fill the boxes with paper, sponge, mousse or another similar approved material to prevent construction materials from entering them.
  - .3 Install embedded elements with the finished wall, use plaster rings and ensure that the edges of the wall covering terminate within 6.3 mm of the opening, in accordance with standard C22.10, clause 12 3018.
  - .4 Provide open boxes of suitable dimensions for connecting conduits and armoured cables. Use of reducing washers is forbidden.
  - .5 Do not install the outlets back-to-back in a wall; leave a horizontal clearance of at least 150 mm between the boxes.
  - .6 Modify the location of the electrical outlets without additional cost or credits, under the condition that the displacement does not exceed 3 m and that the change advice is given before the installation.
- .2 Surface installation
  - .1 All installation of wiring on the surface must be done using a box without slugs.
  - .2 Moulded boxes will be used for the installation of wiring devices.
  - .3 Sheet metal boxes with a lid can be used as junction boxes.
- .3 Installing splitter boxes
  - .1 Install the splitter boxes according to the instructions and mount them level, and lined up square with the building walls.
- .4 Installing junction and pull boxes

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- .1 Only the main junction and pull boxes will appear on the drawings. Provide a sufficient number of pull boxes so that the ducts installed between each box are no more than 30 m long. Provide a pull box at most for every four (4) direction changes.
- .2 Install the pull boxes in concealed but easy-to-access areas.
- .5 Lids
  - .1 For the surface installations, the lids must cover the entire casing, up to their edges.
  - .2 For the embedded installations, the lids must cover the wall in which the casings are installed.
  - .3 Check with the architectural details to ensure that the casings and their lids fit perfectly.
- .6 Identification tags
  - .1 Refer to section 26 05 01.
  - .2 Provide and install the identification tags on the junction boxes, pull boxes and cabinets, format 2, indicating the name of the network, the current and the voltage used, as applicable

**END OF SECTION**



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**Part 1            Products****1.1        EQUIPMENT**

- .1        Unless otherwise indicated, only use wiring devices from the same manufacturer.
- .2        Unless otherwise specified, wiring devices will be white.

**1.2        STANDARD SWITCHES**

- .1        Single pole switches, 15A, 120V.
  - .1        Acceptable products:
    - .1        Leviton, 1200 Series
    - .2        Hubbell # 1200
    - .3        Legrand, PS15 AC1 series
    - .4        Or approved equivalent

**1.3        OUTLETS**

- .1        Power outlets: double, CSA 5-15R configuration, 125V, 15A, "U" ground.
  - .1        Acceptable products:
    - .1        Leviton, Series 5262
    - .2        Hubbell, HBL 5262 series
    - .3        Legrand, series 5262
    - .4        Or approved equivalent
- .2        Double receptacle 15 / 20A, 120V, CSA 5-20R configuration, "U" ground
  - .1        Acceptable products:
    - .1        Hubbell, HBL5362
    - .2        Leviton, 5362
    - .3        Legrand 5362
    - .4        Or approved equivalent

**1.4        COVER PLATE**

- .1        Equip the wiring devices with suitable cover plates.
- .2        Cover plate: in 1 mm thick stainless steel, for wiring devices mounted in a flush-mounted outlet box.
- .3        Weatherproof cast aluminum cover plate with spring-loaded leaf (s), with gaskets for outlets installed outside or as indicated. Two (2) leaf plates for standard double sockets and one leaf for decorative sockets.
- .4        Stainless steel blind cover plate for unused outlets of telecommunication systems, television, cameras, etc.

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- .5 Single hole stainless steel cover plate for TV systems, cameras, etc. as indicated.
- .6 Stainless steel cover plate for modular telecommunication sockets as indicated.
- .7 Galvanized sheet steel plate for surface mounted elements and secured with 4 screws.
- .8 White color, commercial specification nylon cover plate for decorative wiring devices mounted in a flush outlet box. They will be such as Leviton 804 series or equivalent.

## Part 2 EXECUTION

### 2.1 INSTALLATION

- .1 Unless otherwise indicated, installation height of wiring devices in accordance with section 26 05 01.
- .2 Do not install the outlets back to back in a wall, leave a horizontal clearance of at least 150 mm between the boxes.
- .3 Place the light switches near the doors on the lock side.
- .4 Unless specifically noted, the position of the electrical outlets shown on the plans is approximate.
- .5 The location of the electrical outlets in rooms with a decorative finish or prefabricated panels must be obtained from architectural detail plans.
- .6 When several electrical outlets must be placed side by side, they must be aligned horizontally or vertically, as the case may be.
- .7 Do not install dimmers under a heating thermostat.
- .8 Unless otherwise specified by the Architect and where otherwise indicated, all heights are to be taken from the center of the fixtures and from the finished floor.
  - .1 Switches:
    - .1 Install the one-way switches so that the handle is in the raised position when the contacts are closed.
    - .2 Install switches in grouped outlet boxes, when more than one switch is required in the same location.
    - .3 In metal door frames, use a narrow switch and plate mounting and advise the general contractor to coordinate the required openings in these frames.
  - .2 Outlets:
    - .1 Install outlets in grouped outlet boxes, when more than one outlet is required in the same location.
    - .2 The outlets will be installed vertically, and the ground will be at the bottom.
  - .3 Cover plate:
    - .1 Protect the finish of the stainless-steel cover plates with a sheet of paper or plastic which will not be removed until all painting or other work is completed.
    - .2 When devices are grouped, use an appropriate common cover plate.

**2.2 EMERGENCY**

- .1 When connected to the emergency network, switches, electrical sockets and their cover plates must be red.

**END OF SECTION**



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**Part 1 General**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 20 05 01.

**1.2 CLOSEOUT SUBMITTALS**

- .1 Operation and Maintenance Data: submit maintenance data.. Include following:
  - .1 System configuration and equipment physical layout.
  - .2 Functional description of equipment.
  - .3 Manufacturer's Instructions for operation, adjustment and cleaning.
  - .4 Illustrations and diagrams to supplement procedures.

**Part 2 Products**

**2.1 DESIGN CRITERIA**

- .1 Support: camera functions such as pan/tilt and zoom fully supported by Closed Circuit Television (CCTV) system.
  - .1 Provide operator with ability to control all camera functions.
- .2 Alarm point monitoring: system capable, upon alarm recognition, of switching CCTV cameras associated with alarm point.
- .3 Switching:
  - .1 Provision to switch any camera in system to any monitor in system manually or automatically.
  - .2 Provision to switch system video recorders to selective monitor outputs in system.
- .4 Control: provision for any camera equipped with pan, tilt, and/or motorized zoom lens:
  - .1 Manually control pan, tilt and lens functions.
  - .2 Set pan and tilt home position.
  - .3 Set and clear movement limits of pan and tilt mechanism.
  - .4 Adjust motorized zoom lens.
- .5 Enter and edit CCTV programs and save them for future use.
- .6 Set dwell time for viewing of any camera picture.
- .7 Define sequence for viewing cameras on each monitor.
- .8 Bypass cameras in system during sequencing to monitor.
- .9 Provide ability to display stored 'video image' of cardholder, and switch real-time camera to card reader location for specific card usage.
- .10 Overall control of CCTV provided through software control, which provides complete integration of security components.
- .11 Environment: design video components and systems to operate with specified requirements under following ambient temperatures:
  - .1 Indoor installations:

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- .1 Temperature: 0 degrees C to 30 degrees C.
- .2 Humidity: 10 to 90%.
- .2 Outdoor installations:
  - .1 Temperature: -40 degrees C to 60 degrees C.
  - .2 Humidity: 10 to 100%.

## 2.2 CHARACTERISTICS

- .1 Video Camera:
  - .1 Colour.
  - .2 Sensitivity: lighting requirements, [infrared capability]. Measured in 0,008 LUX for useable video image.
  - .3 Resolution: lines of horizontal resolution:
    - .1 Colour: high resolution 720P.
  - .4 Format: 1/2".
  - .5 Environment: indoor and outdoor.
  - .6 Mounting: visible.
  - .7 Lens functions: motorized auto iris.
  - .8 Additional features: backlight compensation.
  - .9 Operational voltage: standard 24 AC, 12 DC.
- .2 Lenses:
  - .1 Motorized Zoom Lens.
  - .2 Auto iris lens with driver.

## 2.3 CAMERA HOUSINGS

- .1 Indoor: ceiling corner mount.
- .2 Domes: indoor.
- .3 Outdoor: equipped with heater/blower.
- .4 Transmission Methods: coax.

## 2.4 JUNCTION BOX

- .1 Metal, sized to handle all system conduit interconnections with appropriate expansion.

## Part 3 Execution

### 3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for video surveillance installation in accordance with manufacturer's written instructions.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied .

### 3.2 INSTALLATION

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- .1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheet.
- .2 Install video surveillance equipment and components in accordance with ULC-S317.
- .3 Install cable, boxes, mounting hardware, brackets, video cameras and system components in accordance with manufacturer's written installation instructions.
- .4 Install components secure, properly aligned and in locations shown on reviewed shop drawings.
- .5 Connect cameras to cabling in accordance with installation instructions.

### **3.3 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Obtain written reports from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product.
  - .2 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .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 .
    - .3 Upon completion of Work, after cleaning is carried out.

### **3.4 SYSTEM STARTUP**

- .1 Provide all necessary tools, ladders and equipment.
- .2 Ensure appropriate subcontractors , manufacturer's representatives and security specialists are present for verification.
- .2 Visual verification: objective is to assess quality of installation and assembly and overall appearance to ensure compliance with Contract Documents. Visual inspection to include:
  - .1 Sturdiness of equipment fastening.
  - .2 Non-existence of installation related damages.
  - .3 Compliance of device locations with reviewed shop drawings.
  - .4 Compatibility of equipment installation with physical environment.
  - .5 Inclusion of all accessories.
  - .6 Device and cabling identification.
  - .7 Application and location of ULC approval decals
- .3 Technical verification: purpose to ensure that all systems and devices are properly installed and free of defects and damage. Technical verification includes:
  - .1 Measurements of tension and power.
  - .2 Connecting joints and equipment fastening.
  - .3 Measurements of signals (dB, lux, baud rate, etc).
  - .4 Compliance with manufacturer's specification, product literature and installation instructions.
- .4 Operational verification: purpose to ensure that devices and systems' performance meet or exceed established functional requirements. Operational verification includes:
  - .1 Operation of each device individually and within its environment.

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- .2 Operation of each device in relation with programmable schedule and or/specific functions.
- .3 Operation control of camera lens, pan, tilt and zoom.
- .4 Switching of camera to any monitor.
- .5 Switching of system video recorder to selective monitor.
- .6 Set dwell times.
- .7 Demonstrate:
  - .1 Sequence viewing of cameras on each monitor.
  - .2 Bypass capability.
  - .3 Display of stored image to cardholder.

**3.5 ADJUSTING**

- .1 Remove protective coverings from cameras and components.
- .2 Adjust cameras for correct function.

**END OF SECTION**

**PART 1 GENERAL****1.1 RELATED SECTIONS**

- .1 It is the responsibility of the specialized contractor to get a copy of all sections of this specification even if they seem irrelevant to his specialty. The contractor acknowledges implicitly accepts the clauses and requirements of all sections of the specification, even if it fails to refer to certain sections. Refer to the table of contents for a complete list of the sections of the specification.

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM) :
- .2 ASTM C 131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;
- .3 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates;
- .4 ASTM C 535-12, Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;
- .5 ASTM C 837-09, Standard Test Method for Methylene Blue Index of Clay;
- .6 ASTM D 422-63(2007), Standard Test Method for Particle-Size Analysis of Soils;
- .7 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>);
- .8 ASTM D 1557-12, 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>);
- .9 ASTM D 2167-08, Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method;
- .10 ASTM D 4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils;
- .11 ASTM D 6928-10, Standard Test Method for Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus;
- .12 ASTM D 6938-10, Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth);
- .13 ASTM D 7428-08e1, Standard Test Method for Resistance of Fine Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus.

- .14 Canadian standards (CSA)/CSA International Association:
  - .1 CAN/CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 et A3005).
  - .2 CSA A3001-13, Liants utilisés dans le béton.
  - .3 CAN/CSA A23.1-F09/A23.2-F09, Concrete: components and implementation of standard practices for concrete and work/test methods.
  
- .15 Bureau de normalisation du Québec (BNQ) :
  - .1 CAN/BNQ 2501-250, Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage normale (600 kN m/m<sup>3</sup>), 2013-12-20;
  - .2 CAN/BNQ 2501-255, Sols - Détermination de la relation teneur en eau-masse volumique - Essai avec énergie de compactage modifiée (2 700 kN m/m<sup>3</sup>), 2013-12-20;
  - .3 NQ 2560-114/2014, Travaux de génie civil – Granulats;
  - .4 BNQ 1809-300/2018 – Travaux de construction – Clauses techniques générales – Conduites d'eau potable et d'égout.
  
- .16 The Canada Green Building Council (CGBC) :
  - .1 LEED Canada-NC 2009, LEED (Leadership in Energy and Environmental Design) : Green building for new construction and major renovations rating system.
  
- .17 Ministère des Transports du Québec (MTQ) :
  - .1 Cahier des charges et devis généraux (CCDG), most recent edition;
  - .2 Méthode d'essai LC 31-228, Évaluation de la teneur en matière organique dans les granulats et les sols;
  - .3 Norme 1101, Classification des sols, version 2018-12-15;
  - .4 Norme 2101, Granulats, version 2007-12-15;
  - .5 Norme 13101 – Géotextiles, version 2018-12-15.
  
- .18 The Canada General Standards Board (CGSB) :
  - .1 CAN/CGSB 8.1-88, Test sieves of metal, non-metallic canvas;
  - .2 CAN/CGSB 8.2-M88, Test sieves of metal, metric canvas.
  
- .19 U.S. Environmental Protection Agency (EPA)/Office of Water :
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### **1.3 DEFINITIONS**

- .1 Class A borrow material
  - .1 Complies with NQ 2560-114 standard and the 1101 standard designation of the Ministère des Transports du Québec (MTQ).
  - .2 These materials are natural granular or non-plastic soils, such as: sand, gravel or stone. The diameter of the granular materials must not exceed one third of the thickness of the layers.
  - .3 These materials are non-freezing and may be used in backfilling of trenching excavation if indicated.

- .2 Class B materials: all soils compactable compliant with the standard 1101 of the MTQ. These materials must be free of stones the largest dimension of which exceeds seventy-five (75) mm, clinker, ashes, turf plates, waste and roots. Organic soil or soils containing organic material, contaminated soil or containing waste and soils containing frozen masses are excluded from this classification. The material must be draining and compactable. The last three hundred millimetres (300 mm) of backfill below the infrastructure line must be free of stones more than seventy-five (75) mm.
- .3 Excavation Materials: Unfrozen materials from the excavation, authorized by the Ministry Representative for the proposed use.
- .4 Borrow materials: Materials from an external source authorized by the Ministry Representative for the proposed used, such as for backfilling and other parts of the work.
- .5 Excavation classes: (two) classes of excavation will be recognized; common excavation (2nd class or mass excavation) and rock excavation (1st class).
- .1 Rock: solid material in excess of (1.25) m<sup>3</sup> and which cannot be removed by means of heavy-duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket, shall be considered as 1st class excavation. Frozen material not classified as rock.
- .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .6 Topsoil
- .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 mm (1 inch) in any dimension.
- .7 Waste material: excavated material unsuitable for use in works such as debris, concrete, asphalt, brush, weeds, grass, etc.
- .8 Unsuitable materials:
- .1 Weak, chemically unstable, and compressible materials.
- .2 Frost susceptible excavation materials:
- .1 Fine-grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradations within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
- .2 Table
- | Sieve Designation | % Passing |
|-------------------|-----------|
| 2.00 mm           | 100       |
| 0.10 mm           | 45 - 100  |
| 0.02 mm           | 10 - 80   |
| 0.005 mm          | 0 - 45    |
- .3 Coarse-grained soils containing more than (20) % by mass passing 0.075 mm sieve.

**1.4 DOCUMENTS/SAMPLES TO SUBMIT**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
  - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
  - .2 Submit for review by the Ministry Representative proposed dewatering and heave prevention methods as described in PART 3 of this section.
  - .3 Submit to the Ministry Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
  - .4 Submit to the Ministry Representative written notice when bottom of excavation is reached.
  - .5 Submit to the Ministry Representative testing, inspection, results and reports as described in PART 3 of this section.
- .3 Preconstruction Submittals:
  - .1 Submit construction equipment list of major equipment to be used in this section prior to the beginning of work;
  - .2 Submit technical product descriptions of backfill material listed in part 2, in accordance with the requirements of section 01 33 00 – Submittal procedures.
  - .3 Submit records of underground utilities locates, indicating: location plan of existing utilities as found in the field, clearance record from utility authority, location plan of relocated and abandoned services, as required.
- .4 Samples:
  - .1 Submit shoring samples in accordance with Section 01 33 00 - Submittal Procedures.
    - .1 The drawings must bear the seal and signature of a competent engineer recognized and certified by the ‘Ordre des ingénieurs du Québec’ (OIQ).
  - .2 Shop drawings shall indicate, show or understand the method of construction and the timetable, procedures concerning shoring, the bracing and the resumption of underpinning, the materials, and the location of the temporary parts recessed. Comply with the CSA S269.1 standard for temporary shoring works drawings. Comply to the standard CAN/CSA S269.3 drawings of the formwork if required.
  - .3 When a temporary work uses an existing structural element or structure under construction as support, shop drawings must indicate the transmitted maximum efforts and their direction.
  - .4 Submit a letter signed by a competent engineer recognized and certified by the ‘Ordre des ingénieurs du Québec’ (OIQ), stating that the construction of temporary structures is consistent with its plans submitted prior to installing the shoring. The engineer attesting the conformity of the temporary shoring must visit the facilities prior to the production of the letter and attach its report of visit.
  - .5 If the contractor does not use shoring, the Ministry Representative may require that it demonstrates that shoring are not necessary through a certificate signed by a qualified engineer member of (OIQ).

**1.5 WASTE MANAGEMENT AND DISPOSAL**

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

**1.6 DESIGN OF TEMPORARY WORKS**

- .1 The contractor is solely responsible for the design of works by shoring, bracing and recovery in underpinning which are an integral part of the work or which are necessary to achieve these. No review or comment by the Ministry Representative or anyone who can relieve the contractor of its responsibility for these works.
- .2 Comply with the requirements of the section and regulations applicable at a provincial and municipal level to protect existing elements.
- .3 Retain the services of an engineer, Member of the 'Ordre des ingénieurs du Québec' (OIQ) for the design and inspection of the cofferdams and works by shoring, bracing and recovery in underpinning required for the work.
- .4 At least two (2) weeks prior to beginning the work, submit for verification the design documents and related technical data. Wait for the review of the documents by the Ministry Representative before beginning the work.
- .5 Design documents and related technical data submitted must bear the seal and signature of a professional engineer, Member of the Ordre des ingénieurs du Québec (OIQ).
- .6 Keep a copy of the calculations and related data on the construction site.
- .7 Certificate of qualification: the engineer responsible for the design of the temporary structures must provide proof that he has a policy of professional liability insurance.
- .8 If the engineer is an employee of the contractor, submit a document proving that the contractor's insurance policy covers the work and the works carried out under the direction of the engineer.
- .9 Protect and prevent the work movement or settlement, survey markers, bench marks, underground systems and paved surfaces, trees and landscaping in the immediate vicinity. Install shoring and prevent water infiltration.
- .10 Repair any damage and the costs. Also assume responsibility for any accident caused by shoring work, of bracing and recovery in underpinning poorly executed.
- .11 Health and safety :
  - .1 Take the necessary measures on health and safety in construction in accordance with the general requirements.

## 1.7 EXISTING CONDITIONS

- .1 Buried services:
  - .1 Prior to beginning the work, verify and establish location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with the execution of work: pay costs of relocating services or for temporary works.
  - .3 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .4 Prior to beginning excavation work of the buried lines, notify applicable the Ministry Representative Authorities having jurisdiction establish location and state of use of buried utilities and structures. Make a request to Info-Excavation and to the Ministry Representative Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work. The contractor is responsible for locating all above and underground utilities.
  - .5 Confirm locations of buried utilities by careful test excavations and/or soil hydrovac methods.
  - .6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
  - .7 Obtain the appropriate directives from the Ministry Representative before removing a utility pipe or a work identified in the excavation area.
  - .8 Record location of maintained, rerouted and abandoned underground lines.
  - .9 Confirm locations of recent excavations adjacent to the area of excavation.
  - .10 Repair as soon as possible any network utilities that have been damaged during work and bear the costs of the repair work. The contractor shall, in all cases, notify the Ministry Representative of damage he has thus caused or the danger he created by, or on the occasion of its work.
  - .11 The alignment and depth of existing lines shown on the plans are approximate. The contractor is responsible for performing, at his expense, all trial pits required prior to the beginning of work to validate the exact position and depth of existing pipes at the points of connection and crossover points with the projected lines. This activity must be done in the presence of the Ministry Representative. Any situation resulting in a change to the plans and specifications must be noticed in writing to the Ministry Representative as soon as possible. The Ministry Representative will signify to the contractor, if any, the changes to be made to the elevation and alignment of the projected works. The contractor shall comply without additional costs.
- .2 For all structures or visible structural parts located in the trench, the Contractor must dismantle and dispose of existing structures. A cap should be put in place at the end of the pipe which remains buried (on the edge of the excavation). The location of the pipe caps must appear on the as-built drawing.
- .3 Existing buildings and surface features
  - .1 Conduct, with the Ministry Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work.

- .2 Protect existing buildings and surface features from damage while work is in progress. In the event of damage, immediately make repairs as directed by the Ministry Representative, and at the expense of the contractor.
- .3 The Contractor shall take all necessary precautions to identify, protect and replace all works necessary and existing structures to preserve (poles, guy, ducts and electrical wires, telephone or otherwise, frames, buffers and manhole and catch basin lid and grate, buildings, bench, signage, signs, posters, fences of all kinds, Fountain (water point), box flowers wood, illuminated bollards, landscaping)(, trees, shrubs, vegetation, etc.) what they whether or not shown on the plans and whether they are on private land or within Street rights-of-way. In short, any existing works for which no particular article was provided must be taken into account.
- .4 All costs incurred by the contractor for the identification, protection and replacement (if damaged by the work) of all these works are deemed included in the bid amount.

## 1.8 WATER MANAGEMENT

- .1 Keep excavations free of water while work is in progress, which includes groundwater, surface waters, from rain, snow, sewers, etc.
- .2 **The Contractor shall submit for approval, the details of the temporary adjustments it intends to put in place for water management, the period during which these adjustments will be required and an emergency procedure in the event of significant water inflow. In particular, the Contractor must avoid adding sediment to the storm sewer system caused by materials that may be eroded and transported to the site.**
- .3 The Contractor shall ensure at all times not to alter the quality or block the free flow of water.

## 1.9 ACCIDENTAL SPILLAGE

- .1 In the event of an accidental spill, the contractor must contact the Ministry Representative and officer of the environment.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- .1 Class A borrow material and conform to NQ 2560-114.
  - .1 MG-112 borrow materials: used for sub-base foundations, filter sand or draining

Sieve Designation	% Passing MG-112
112 mm	100
31.5 mm	-
20 mm	-
14 mm	-
5 mm	12 - 100

<b>Sieve Designation</b>	<b>% Passing MG-112</b>
1.25 mm	-
0.315 mm	-
0.080 mm	0 - 10

### **PART 3 EXECUTION**

#### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control plans, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

#### **3.2 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalks neatly along limits of proposed excavation in order that surface may break evenly and cleanly. The saw-cut lines must be made at 300 mm from the upper edge of the excavation.

#### **3.3 PREPARATION/PROTECTION**

- .1 Protect existing features in accordance with applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to the Ministry Representative approval.
- .4 Protect natural and artificial elements required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.
- .6 Protect the slope of excavation from the effects of frost, erosion, landslides, rock falls and any other natural or accidental degradation phenomenon of soil.

- .7 Protect the bottom excavations against frost.
- .8 Take the necessary measures and approved to eliminate dust produced.
- .9 Protect levelling guides, route guides, survey limits geodetic terminals.
- .10 Protect adequately facilities and existing equipment located on the site, so that they are not damaged during the work.
- .11 Protect the bottom excavations against any softening. If this happens, then remove the softened earth and replace it by 20 mm clean stone borrow material according to the guidelines of the Ministry Representative.
- .12 Never stack dredged material to a location where they could potentially affect the work or drainage of the land. Follow the regulations and applicable law (including the rules of the CNESST) for storage of materials excavated near the excavated area.

### **3.4 STOCKPILING**

- .1 Stockpile borrow materials and excavation materials in areas designated by the Ministry Representative.
  - .1 Stockpile granular materials in a manner to prevent segregation.
  - .2 A minimum clearance of one (1) meter from the security fencing must be respected.
- .2 Protect borrow materials and excavation materials from contamination.
  - .1 The Contractor shall install a geotextile under all stockpiled materials. The Contractor shall take all necessary measures to protect the geotextile.
  - .2 For contaminated materials, the Contractor shall comply with the specifications of the section 01 35 43 – Environmental Procedures
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release out of work site limits and into streams/watercourses.

### **3.5 SURPLUS MATERIALS**

- .1 All excess excavation material will be removed from the site at the contractor's expense.

### **3.6 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 Dispose of water to approved cumulation areas in accordance with section 01 35 43 – Environmental Procedures, runoff areas and in a manner not detrimental to public and private property, or portion of work completed or under construction:
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

- .4 Provide for the Ministry Representative's review and approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

### 3.7 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated on plans.
- .2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation. Waste materials must be disposed out of the work site.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations. Do not disturb the cone of normal load transfer at 45 degrees under the supporting structures.
- .4 Stockpile excavation and borrow materials at a safe distance from the edge of the trenches as directed by the Ministry Representative.
- .5 Restrict vehicle operations directly adjacent to open trenches.
- .6 Dispose of excavation materials that are waste materials offsite and stockpile surplus excavation materials in the area designated by the Ministry Representative.
- .7 Do not obstruct the flow of surface drainage or natural streams/watercourses.
- .8 Protect existing lines in the areas of excavation. Ensure that the flow in the pipes is maintained for the duration of the excavation.
- .9 Trench bottoms shall be of approved grade and consist of undisturbed soil, level, free from loose, soft or organic matter.
- .10 Notify the Ministry Representative when the projected level of excavation bottom is reached.
- .11 Obtain the Ministry Representative approval of completed excavation.
- .12 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Ministry Representative.
- .13 Correct unauthorized over-excavation as follows:
  - .1 If materials from the bottom of the excavation have been disturbed, compact them to a density at least equal to that of the undisturbed soil;
- .14 When required, carefully saw-cut, concrete, along the lines of excavation so that the surface breaks sharply and equal. The saw-cut lines must be vertical.

**3.8 STRUCTURES OF CONCRETE AND ASPHALT CUT**

- .1 Dig the trenches of a width exceed 600 mm on each side the width of concrete structures.
- .2 The bottom of trench excavation shall be level, solid and free from pieces of rock or loose rock, mud, earth and other debris.
- .3 Equalize the bottom of trench excavation to prevent the formation of water basin.
- .4 Compact the soil on the bottom of the work to ninety-five percent (95%) of maximum dry density corrected.

**3.9 ASPHALT SURFACE CUT**

- .1 Before excavation in a street, road, parking or other surface paved, cut paving using a saw designed for this kind of work.
- .2 Take account of an area planned for the transition between the new excavation and the existing part.
- .3 Remove and transport waste materials containing pieces of surface covers, sidewalks, curbs in a site approved by the Minister of the Environment and Fight Against Climate Change (MELCC).

**3.10 FILL - GENERAL**

- .1 Notify the Ministry Representative following the installation of the elements at bury before beginning the work of backfill to permit inspection.
- .2 Do not start before filling before:
  - .1 The inspection and approval of facilities by the Ministry Representative;
  - .2 Inspection, testing, approval of underground utilities networks and the recording of their location;
  - .3 The removal of formwork for concrete;
  - .4 The removal of the works by shoring and bracing;
  - .5 Filling the gaps with an approved material.
- .3 Areas to backfill must be free of debris, snow, ice, water, and frozen ground.
- .4 It is forbidden to use of backfill materials which are frozen or contain snow, ice or debris.
- .5 Implement backfill materials in uniform layers not exceeding the prescribed thickness, until the levels indicated. Compact each layer before extending the next layer.
- .6 Take necessary measures to maintain the backfill material humidity such that it can be compacted to the required density.
- .7 If, during the work, tests show that the borrow materials are not in accordance with the requirements set out in the present specifications, the contractor shall remove and replace the unacceptable materials at its own expense.

**3.11 BACKFILL FOR PAVING**

- .1 Sub base :
  - .1 Sub base material : MG-112 borrow material;
  - .2 Perform the setting up and the compaction of the sub base by successive layers of 300 mm maximum thickness to obtain the total thickness such that requested plans;
  - .3 Compact up to ninety-five percent (95%) of maximum dry density corrected.
- .2 Foundation:
  - .1 Foundation material: MG-20 borrow material;
  - .2 Perform the setting up and the compaction of the upper Foundation by successive layers of 200 mm maximum thickness;
  - .3 Layer thickness : as indicated on drawings;
  - .4 Compact up to ninety-eight percent (98%) of the maximum dry density corrected.
- .3 Spread perfectly implemented and compacted materials on a clean surface, unfrozen, free of snow and ice.
- .4 Before you apply the next layer materials, give each layer a uniform profile and compact until the prescribed density.

**3.12 CONCRETE STRUCTURE FILL**

- .1 Do not start filling before structures are inspected and approved by the Ministry Representative.
- .2 Install the drainage system in the embankment, according to indications
- .3 Implement and compact the backfill layer material in a continuous and uniform manner of no more than 300 mm thickness to the state not compacted. Take care not to move or damage to underground utility lines, drainage systems, water repellent coating and sealant of foundation walls. Repair any damage if necessary.
- .4 Backfill foundation drains as required under the relevant sections.
- .5 Complete backfill with a class A material (MG-112 borrow material), compacted to ninety five (95%) of the maximum dry density corrected, to the structure of the roadway. For concrete trenches, compact to 95% of the maximum dry density corrected.
- .6 Do not implement the material around or above the works of concrete cast-in-place in the twenty-four (24) hours following the casting of concrete.
- .7 Place the layers of MG-112 borrow material simultaneously on each side of the structures installed, to balance the load. The difference between the heights of filling shall not exceed 300 mm.
- .8 When the ground is likely to temporarily put uneven pressure on the walls or on the other structures:
  - .1 Let the concrete harden for at least fourteen (14) days, or wait that it is robust enough to withstand the pressure exerted by the backfilling and compaction, and it is approved by the Ministry Representative.

- .2 If it is approved by the Ministry Representative, install stays or of wall plates in order to neutralize the uneven pressure and leave it in place until it authorizes the removal.
- .3 Under concrete structures, make a base layer of 300 mm thick after compaction, with MG-20 borrow materials. Compact the layer to 95% of maximum dry density corrected.
- .4 Under concrete works (curbs, sidewalk) make a base layer of 150 mm thick after compaction, with MG-20 borrow materials. Compact the layer to 98% of maximum dry density corrected.

### **3.13 EXCAVATION OF UNSTABLE SOIL AND BACKFILLING**

- .1 If a overburden excavation is required by the Ministry Representative below the theoretical depth of planned excavations (pavement, concrete slabs, pipelines, structures, etc.), this overburden excavation must be backfilled with the backfill material further selected by the Ministry Representative among those listed below:
  - .1 Class A borrow material - sand;
  - .2 20 mm clean stone borrow material.
- .2 At the time to require the over-excavation, the Ministry Representative will determine and instruct the contractor the choice of the complementary backfill material and the modalities of its implementation.

### **3.14 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed the Ministry Representative.
- .2 Replace topsoil as indicated the Ministry Representative.
- .3 Reinstate lawns to elevation which existed before excavation or according to elevations on plans.
- .4 For existing infrastructures to conserve, repair pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by the Ministry 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 SECTION CONTENT**

- .1 Materials, equipment and methods of installation associated with MG-112 borrow material used as a sub-base for pavement structure and other work.

**1.2 RELATED SECTIONS**

- .1 Despite the previous enumeration, it is the responsibility of the specialized contractor to get a copy of all sections of this specification even if they seem irrelevant to his specialty. The contractor acknowledges implicitly accepts the clauses and requirements of all sections of the specification, even if it fails to refer to certain sections. Refer to the table of contents for a complete list of the sections of the specification.

**1.3 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM C117-13, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C131-06, 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 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>).
  - .5 ASTM D1557-12, 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</sup>).
  - .6 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .7 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 The Canada General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Test sieves of metal wire mesh, non-metric.
  - .2 CAN/CGSB-8.2-M88, Test sieves of metal wire mesh, metric.
- .3 Ministère des Transports du Québec (MTQ), cahier des charges et devis généraux (CCDG) and tomes I to VIII, most recent edition.
- .4 NQ 2501-258/2012 – Sols – Détermination de la relation teneur en eau – masse volumique – Essai au marteau vibrant.
- .5 MTQ, Norme 1101 – Classification des sols, version 2009-12-15.
- .6 MTQ, Norme 2101 – Granulats, version 2007-12-15.
- .7 BNQ 2560-114/2014, Travaux de génie civil – Granulats;

**1.4 MANAGEMENT AND DISPOSAL OF WASTE**

- .1 Stockpile onsite unused MG-112 material in stockpiling area designated.

**PART 2 PRODUCTS****2.1 MATERIALS**

- .1 MG-112 borrow material for granular sub-base shall be in accordance with those set forth below.

**PART 3 EXECUTION****3.1 PLACING**

- .1 Place MG-112 borrow material for the sub-base after the sub-base or subgrade is inspected and approved by the owner.
- .2 Placing:
  - .1 Construct granular sub-base to depth and grade in areas indicated.
  - .2 Ensure no frozen material is placed.
  - .3 Place material only on clean unfrozen surface, free from snow or ice.
  - .4 Place granular sub-base material using methods which do not lead to segregation or degradation.
  - .5 Place material to full width in uniform layers not exceeding 300 mm compacted thickness.
  - .6 Shape each layer to smooth contours and compact to specify density before succeeding layer is placed.
  - .7 Remove and replace portion of layers in which material has become segregated during spreading.
- .3 Compaction:
  - .1 Compaction equipment must be capable of obtaining required material density.
  - .2 Compact to density of not less than 95% maximum dry density.
  - .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
  - .4 Apply water as necessary during compaction to obtain specified density.
  - .5 In areas where it is impossible to use compacting equipment, also called rolling equipment, compact materials to specified density with vibrating plate compactor or mechanical tampers approved by the owner.
  - .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

**3.2 TRANSITION**

- .1 The transition to the connection with the existing pavement structure should be 1 V: 1 H in the base and sub-base layers.

**3.3 SITE TOLERANCES**

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

**3.4 PROTECTION**

- .1 Maintain finished sub-base in condition conforming to this section until succeeding sub-base is constructed, or until acceptance by the owner.

**3.5 BATCH REJECTION**

- .1 A batch is rejected when the difference between the average of the three (3) particle size and the required values exceed at least one of the critical differences ( $E_c$ ) defined below:
  - .1  $E_c$  (for the specification to 112 mm sieve) : - 5 %;
  - .2  $E_c$  (for the higher specification of the 80  $\mu$ m sieve) : + 1 %.
  - .3 In this case, the contractor removes and replaces, at its expense, granular materials included in the rejected batch.

END OF SECTION



**PART 1 GENERAL****1.1 SECTION CONTENT**

- .1 Materials, equipment and methods of installation associated with MG-20 borrow material used as a base for pavement structure and other work.

**1.2 PRODUCTS APPLY ONLY UNDER THE TERMS OF THIS SECTION**

- .1 Granular materials required for the realization of the base layer provided by the contractor.

**1.3 RELATED SECTIONS**

- .1 Despite the previous enumeration, it is the responsibility of the specialized contractor to get a copy of all sections of this specification even if they seem irrelevant to his specialty. The contractor acknowledges implicitly accepts the clauses and requirements of all sections of the specification, even if it fails to refer to certain sections. Refer to the table of contents for a complete list of the sections of the specification.

**1.4 REFERENCES**

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  - .1 ASTM C117-13, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
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  - .3 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 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>).
  - .5 ASTM D1557-12, 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</sup>).
  - .6 ASTM D1883-07e2, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .7 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 The Canada General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Test sieves of metal wire mesh, non-metric.
  - .2 CAN/CGSB-8.2-M88, Test sieves of metal wire mesh, metric.
- .3 Ministère des Transports du Québec (MTQ), cahier des charges et devis généraux (CCDG) and Tomes I to VIII, most recent edition.
- .4 NQ 2501-258/2012 – Sols – Détermination de la relation teneur en eau – masse volumique – Essai au marteau vibrant.
- .5 MTQ, Norme 1101 – Classification des sols, version 2009-12-15.

- .6 MTQ, Norme 2101 – Granulats, version 2007-12-15.
- .7 BNQ 2560-114/2014, Travaux de génie civil – Granulats.

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

- .1 Deliver MG-20 borrow material and put them in piles.

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

- .1 Stockpile onsite unused MG-20 borrow material in stockpiling the area designated.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 MG-20 material for granular base shall be in accordance with the followings prescriptions.

## **PART 3 EXECUTION**

### **3.1 PLACEMENT AND INSTALLATION**

- .1 Place granular base after, sub-base, or base surface is inspected and approved in writing.
- .2 Placing
  - .1 Construct granular base to depth and grade in areas indicated.
  - .2 Ensure no frozen material is placed.
  - .3 Place material only on clean unfrozen surface, free from snow and ice.
  - .4 Place material using methods which do not lead to segregation or degradation of aggregate.
  - .5 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
  - .6 Place material to full width in uniform layers not exceeding 300 mm compacted thickness.
  - .7 Shape each layer to smooth contours and compact to specified density before succeeding layer is placed.
  - .8 Remove and replace that portion of layers in which material becomes segregated during spreading.
- .3 Compaction Equipment
  - .1 Ensure compaction equipment is capable of obtaining required material density.
- .4 Compacting
  - .1 Compact to density not less than 98% maximum dry density.
  - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
  - .3 Apply water as necessary during compacting to obtain specified density.

- .4 In areas where it is impossible to use compacting equipment, also called rolling equipment, compact materials to specified density with vibrating plate compactor or mechanical tampers approved by the owner.
- .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

### **3.2 TRANSITION**

- .1 The transition to the connection with the existing pavement structure should be 1V: 1 H in the foundation and granular base layers.

### **3.3 SITE TOLERANCES**

- .1 Finished base surface to be within plus or minus 10 mm of established grades and cross section but not uniformly high or low.

### **3.4 PROTECTION**

- .1 Maintain finished base in condition conforming to this section until succeeding material is applied or until acceptance by the owner.

### **3.5 BATCH REJECTION**

- .1 A batch is rejected when the difference between the average of the three particle size and the required values exceed at least one of the critical differences ( $E_c$ ) defined below:
  - .1  $E_c$  (for the lower specification of 5 mm sieve): - 5 %;
  - .2  $E_c$  (for the higher specification of 5 mm sieve): + 5 %;
  - .3  $E_c$  (for the higher specification of the 80  $\mu$ m sieve) : + 1 %.
  - .4 In this case, the contractor removes and replaces, at its expense, granular materials included in the rejected batch.

END OF SECTION



**PART 1 GENERAL****1.1 SECTION CONTENT**

- .1 Supply and delivery of materials required for the construction of bituminous concrete coatings.

**1.2 PRODUCTS APPLY ONLY UNDER THE TERMS OF THIS SECTION**

- .1 All materials related to this section are provided by the contractor.

**1.3 RELATED SECTIONS**

- .1 Despite the previous enumeration, it is the responsibility of the specialized contractor to get a copy of all sections of this specification even if they seem irrelevant to his specialty. The contractor acknowledges implicitly accepts the clauses and requirements of all sections of the specification, even if it fails to refer to certain sections. Refer to the table of contents for a complete list of the sections of the specification.

**1.4 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 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>)).
- .2 Ministère des Transports du Québec (MTQ) :
  - .1 Cahier des charges et devis généraux (CCDG), most recent edition;
  - .2 Norme 4201, Enrobé à chaud formulé selon le principe de la méthode Marshall, 2007-12-15;
  - .3 Norme 4202, Enrobé à chaud formulé selon la méthode du Laboratoire des chaussées, 2011-12-15;
  - .4 Norme 4104, Bitumes fluidifiés, 2008-12-15;
  - .5 Norme 4105, Émulsions de bitume, 2013-12-15.
  - .6 Tomes I to VIII, most recent edition.

**1.5 TECHNICAL SHEETS**

- .1 Submit technical data sheets and other documents required.

**1.6 MANAGEMENT AND DISPOSAL OF WASTE**

- .1 Evacuate from the worksite all packing materials and dispose of them to the appropriate recycling facilities.
- .2 Place in designated containers substances that meet the definition of toxic or dangerous waste.
- .3 Dispose of unused bituminous materials to a proper recycling facility.

**1.7 PROTECTION MEASURES**

- .1 Do not allow any vehicles to circulate on the freshly laid surface until the surface temperature is below 38 ° C. Do not allow stationary loads on the surface for a period of at least 24 h after its establishment.

**PART 2 PRODUCTS****2.1 MATERIALS**

- .1 Bituminous mixtures in accordance with standard 4201 or standard 4202 of the Ministère des Transports du Québec (MTQ) :
  - .1 Base layer: type and thickness according to plans.
  - .2 Surface layer: type and thickness according to plans.
- .2 Grade PG58H34 asphalt binder.
- .3 Aggregates: intrinsic and manufacturing characteristics:
  - .1 Coating GB-20: 3c2;
  - .2 Coating ESG-10: 3c2.
- .4 Bitumen of printing: bitumen emulsion complies with the MTQ 4105:
  - .1 Upon approval, use a fluidized bitumen complying with the MTQ 4104 after October 1 and before May 1.

**2.2 EQUIPMENT**

- .1 Pavers: use a mechanical [grade controlled] self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- .2 Rollers: sufficient number of types and weight to obtain specified density of compacted mix.
- .3 Plant testing facilities: provide laboratory space at work sites for exclusive use of DCC Representative, for performing tests, keeping records and making reports.

**2.3 MIXTURE DOSAGE FORMULA**

- .1 The theoretical formula must be signed and dated by manufacturer's quality control and must be presented to owner at least one week prior to work. It must be accompanied by the result of the quantitative tests of aggregates used. A theoretical formula is required for every type of asphalt and bitumen as well as for any change in material supply source. Must meet:
  - .1 Standard 4201 for the hot asphalt by Marshall Method;
  - .2 Standard 4202 for the asphalt hot formulated according to the method of formulation of the roadways Laboratory of the Ministry of Transport of Quebec.

**PART 3 EXECUTION****3.1 SURFACE PREPARATION**

- .1 Verification of Conditions: verify that conditions of the substrate previously installed under other sections are acceptable for asphalt paving in accordance with the owner.
- .2 Before starting the work, clean and clear all surfaces of non-adherent substances or foreign, such as leaves or other residues from trees.
- .3 Place mixtures of asphalt once the layer of foundation is dry, not frozen, free of snow, and ice and the temperature of the air and the surface is above 2 ° C.
- .4 The temperature of the mixture should never be less than 120 ° C or higher than 160 °C.
- .5 Compact each layer with a steamroller as soon as it can support the weight without cracking or moving.
- .6 Continue the rolling until traces of the roller disappear from the surface. Compact until a density which is not less than 93% of the reference value (CCDG).
- .7 Keep the roller at a speed low enough to avoid moving the mixture and do not immobilize the roller on the coating freshly laid.
- .8 Moisten the roller cylinders with water to prevent the adhesion of the mixture.
- .9 Compact the mixture with hot rammer or another material approved in places inaccessible to the roller.
- .10 Run a smooth surface with no more than 10 mm irregularities and accusing no greater than 10 mm gap, when it is checked in with a 4.5 m ruler placed in any direction.

**3.2 JOINTS MAKING**

- .1 Before installing the asphalt layer, coat with a bituminous binder the apparent vertical surfaces of the joints, the manholes and catch basins rim, borders, and other similar structures.
- .2 Before the establishment of the surface layer, coat the base of a bituminous binder layer.
- .3 Implement the bituminous material when it is warm and compact carefully on the surfaces of the joints.

**3.3 MIX TRANSPORT**

- .1 Transport mix to work site in vehicles cleaned of foreign material. The tarp is required on trucks for transport of materials.
- .2 Deliver material to pavers at a uniform rate and in an amount within capacity of paving and compacting equipment.

- .3 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes in temperature within range as directed by DCC Representative, never be less than 120 ° C or higher than 160 ° C.

### 3.4 PLACING

- .1 Obtain owner's approval of base, prior to placing asphalt.
- .2 Place asphalt concrete to thicknesses, grades and lines as indicated on plans.
- .3 Placing conditions
  - .1 Place asphalt mixtures only when air temperature is higher than 2 degrees Celsius.
  - .2 When the temperature of the surface on which material is to be placed falls below 10 degrees Celsius, provide extra rollers as necessary to obtain required compaction before cooling.
  - .3 Do not place hot-mix asphalt when there is the presence of water stagnation on the surface to be paved, during rain, or when surface is damp.
  - .4 Clean all debris before conducting paving operations.
  - .5 Make the second layer of pavement when the first layer temperature is lower than 50 degrees Celsius.
- .4 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.
  - .1 Correct the defects of the coated surface immediately after the passage of the spreader. Remove, shovel or squeegees, the leftover materials forming bumps. Fill the cavities with hot bituminous mixture and smooth. It is forbidden to spread materials on the fly in the areas repair.
  - .2 Do not apply surplus materials on surfaces that come to be evened.
- .5 Impregnation binding
  - .1 Install the binder on a dry granular surface and the base layer of the asphalt at a rate of 0.8 to 1.6 L/m<sup>2</sup>

### 3.5 COMPACTING

- .1 Roll asphalt continuously using established rolling pattern for test strips and to density between 93 % à 98 % of maximum density determined for test strips.
- .2 General
  - .1 Provide at least 2 rollers and as many additional rollers as necessary to achieve specified pavement density. When more than 2 rollers are required, 1 roller must be pneumatic tired type.
  - .2 Start rolling operations as soon as placed mix can bear weight of rollers without excess displacement of material or cracking of the surface.
  - .3 Operate roller slowly initially to avoid the displacement of material.
  - .4 Overlap successive passes of rollers by a minimum of 200 mm and vary pass lengths.
  - .5 Keep wheels of rollers slightly moistened with water to prevent pick-up of material but do not overwater.

- .6 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.
- .7 Do not permit heavy equipment or rollers to stand on the finished surface before it has been compacted and has thoroughly cooled.
- .8 After traverse and longitudinal joints and outside edges have been compacted, start rolling longitudinally at the low side and progress to the high side. Ensure that all points across the width of pavement receive essentially equal numbers of passes of compactors.
- .9 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to the original grade of loose material before rerolling.

### 3.6 JOINTS

- .1 General
  - .1 Remove surplus material from the surface of previously laid strip. Do not deposit on the surface of freshly laid strip.
  - .2 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.
- .2 Transverse joints
  - .1 Offset transverse joints in succeeding lifts by at least 1000 mm.
  - .2 Cut back to full depth vertical face and tack face with a thin coat of hot asphalt prior to continuing paving.
  - .3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.
- .3 Longitudinal joints
  - .1 Offset longitudinal joints in succeeding lifts by at least 300 mm.
  - .2 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.
  - .3 Roll longitudinal joints directly behind paving operations.
- .4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix. Place and compact joint to ensure joint is smooth and without visible breaks in grade. Locate feather joints as indicated.
- .5 Construct butt joints as indicated.

### 3.7 FINISH TOLERANCES

- .1 Finished asphalt surface to be within 10 mm of design elevation but not uniformly high or low.
- .2 Finished asphalt surface not to have irregularities exceeding 10 mm when checked with a 4.5 m ruler or straight edge placed in any direction.

**3.8 DEFECTIVE WORK**

- .1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.
- .2 Repair areas showing checking, rippling, or segregation.
- .3 Adjust roller operation and screed settings on pavers to prevent further defects such as rippling and checking of pavement.

**3.9 CONNECTION TO THE EXISTING PAVEMENT**

- .1 On the limits of the work, the Contractor must provide the levelling and saw cut of the existing asphalt such as shown on the plans.
- .2 Levelling depth must correspond to the projected surface layer thickness.
- .3 The Contractor shall dispose of asphalt levelling waste out the work site.
- .4 The saw cuts in the asphalt must be linear and on the full thickness of the surface.
- .5 At locations where a cut and a repair is needed (before an existing concrete curb), the contractor must comply with the details outlined plans.

END OF SECTION

