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PUBLIC WORKS AND GOVERNMENT SERVICES CANADA (PWGSC)

SERVICE BUILDING EXTENSION

DONNACONA INSTITUTION

SPECIFICATIONS – ARCHITECTURE CALL FOR BIDS

R.074004.001

May 29th 2015



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SERVICES CANADA (TPSGC)**

SERVICE BUILDING EXTENSION
DONNACONA INSTITUTION

**SPECIFICATIONS – ARCHITECTURE
CALL FOR BIDS**

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Government of Canada

Donnacona Institution Service building – Expansion

Specifications Architecture, structure, mechanical, electrical, civil

For tender



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Date :
2015-05-29

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END OF SECTION

PART 1 GENERAL

1.1 WORKS COVERED BY CONTRACT DOCUMENTS

- .1 Works described in present specifications are related to the expansion of existing service building facility located at 1537, route 138, Donnacona (Québec) G3M 1C9. This expansion intended for motor vehicle washing and snow removal equipment, consists of one level laterally joined to the existing building. The described work includes, without limitation:
 - .1 **Architecture:**
 - .1 The building to be constructed consists roughly of light steel frame insulated walls with outdoor and indoor wall metal cladding. Roof will have an elastomer modified bitumen membrane cover. Insulated steel garage doors and swinging door are to be provided and installed.
 - .2 **Civil Engineering:**
 - .1 Civil engineering works consist roughly in supplying manpower, equipment and materials needed to realize following civil engineering works:
 - .1 Foundation drains connection;
 - .2 Asphalt pavement on granular sub-base layer;
 - .3 Backfills, landscaping and grass sodding;
 - .3 **Structure:**
 - .1 Structural works consist roughly in supplying manpower, equipment and materials needed to realize following works:
 - .1 Reinforced concrete conventional footing and foundation;
 - .2 Structural steel framing, supportive roof metal decking;
 - .3 Concrete slab on granular backfill;
 - .4 **Electrical / mechanics :**
 - .1 Electrical and mechanical works consist roughly in supplying manpower, equipment and materials needed to realise following work;
 - .1 Floor drains and connections;
 - .2 Plumbing for domestic water supply;
 - .2 Changing and adding heating and ventilation equipment;
 - .3 Electrical outlets, lighting, electrical supplies and alarm system;
 - .4 Duct for future connexion (video camera);
- .2 The work list is only made to inform contracting party and do not replace, by no means, complete architectural and engineered documents.

1.2 WORK SEQUENCE

- .1 Carry out work so that Owner can continuously use existing building during work. Building access, on expansion side only, will not be used during work.

- .2 Coordinate work progress calendar related to occupancy rate by Owner, during renovation work.
- .3 Maintain access for firefighting; also foresee applicable means when fighting fires.

1.3 CONTRACTOR USE OF PREMISES

- .1 Premises use is restricted to necessary zones to perform work, storage and general access in order to allow:
 - .1 Continuous use of existing building by Owner during work;
 - .2 Continuous access to existing building by Owner's employees and employee's vehicles during work;
- .2 Coordinate premises use according to Department Representative directions.
- .3 Remove or modify existing work to prevent any damages to parts of building that must remain in place.
- .4 Repair or replace in accordance to Departmental Representative, parts of existing building in order that they join some parts of existing work that had been modified during construction work.
- .5 When work is completed, existing building must be in equivalent or better condition than it was before the beginning of the work.

1.4 OWNER OCCUPANCY

- .1 Owner gets to use the existing building throughout the term of the contract and will continue his day-to day operations during that time.
- .2 Cooperate with Owner to schedule work, so that possible conflicts are reduced and facilitate premises use by the latter.

1.5 ALTERATIONS, ADDITIONS AND REPAIRS TO EXISTING BUILDING

- .1 Work must be carried out causing the least possible harm to building operations, to Owner's employees and normal use of premises. Take necessary arrangements with Departmental Representative to facilitate work execution.

1.6 EXISTING PUBLIC UTILITIES

- .1 Before interrupting any service facilities, inform Departmental Representative and utility company concerned and obtain all necessary authorizations.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by Departmental Representative with minimum disturbance to pedestrian vehicular traffic and tenant operations.
- .3 Anticipate, if necessary, alternative routes for staff, pedestrians and vehicles.
- .4 Before beginning work, define the scope of work and location of public utilities that are in work zone and inform Departmental Representative.

- .5 Submit Departmental Representative a calendar related to installation or active works closing for approval, including communication services outage or power supplies. Respect the approved calendar and inform all the parties affected by these.
- .6 Supply required temporary utility services to keep existing systems operating as, for example; the control system access and fire security system, according to Departmental Representative instructions so that be maintained critical systems for the building and its occupants.
- .7 When non-indexed public utilities are discovered, immediately inform Departmental Representative and put it in writing.
- .8 Protect, move or keep in service public utilities that are working. If non-functioning drains are found during work, close them in an authorized manner, by competent authorities.

1.7 REQUIRED DOCUMENTS

- .1 At all time, the following documents must be kept on building site.
 - .1 Contract drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of Outstanding Shop Drawings.
 - .6 Change Orders.
 - .7 Other Modifications to Contract.
 - .8 Field Test Reports.
 - .9 Copy of Approved Work Schedule.
 - .10 Health and Safety plan and Other Safety related documents.
 - .11 Other documents as specified.

1.8 WORK DEADLINE

- .1 All work must be completed within 90 days from reception of notice of acceptance of Offer.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 ADMINISTRATIVE

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Québec, Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 10 days for Departmental Representative's review of each submission.

-
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
 - .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
 - .7 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
 - .9 After Departmental Representative's review, distribute copies.
 - .10 Submit 6 prints of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
 - .11 Submit 6 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
 - .12 Submit 6 copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
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- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit 6 copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit 6 copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit 6 copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Submit 6 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .17 Delete information not applicable to project.
- .18 Supplement standard information to provide details applicable to project.
- .19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .20 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.

- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

- .1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

1.5 PROGRESS PHOTOGRAPHS

- .1 Submit progress photographs showing progress of Works at different stages of construction implementation, according to Departmental Representative requirements.

1.6 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after notice of acceptance of Offer, submit documents required by the "Commission de la santé et de la sécurité du travail".

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Contractor shall manage his operations so that safety and security of the public and of site workers always take precedence over cost and scheduling considerations.

1.2 REFERENCES

- .1 Canada Labour Code - Part II, Canadian Occupational Safety and Health Regulations.
- .2 Canadian Standards Association (CSA)
- .3 Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheet (MSDS)
- .4 Act Respecting Occupational Health and Safety, R.S.Q. Chapter S-2.1[2002].
- .5 Construction Safety Code, S-2.1, r.6 [2001].

1.3 SUBMITTALS

- .1 Submit the documents required according to section 01 33 00 Documents and samples to be submitted.
 - .2 Submit to Departmental Representative, the CSST the site-specific safety program, as outlined in 1.8 at least 10 days prior to start of work. The Contractor must review his program during the course of the project if any change occurs in work methods or site conditions. The Departmental Representative may, after receiving the program or at any time during the project, ask the Contractor to update or modify the program in order to better reflect the reality of the construction site and activities. The Contractor must make the required changes before work begins.
 - .3 Submit to Departmental Representative the site inspection sheet, duly completed, at the intervals indicated in 1.12.1.
 - .4 Submit to Departmental Representative within 24 hours a copy of any inspection report, correction notice or recommendation issued by federal or provincial inspectors.
 - .5 Submit to Departmental Representative within 24 hours an investigation report for any accident involving injury and any incident exposing a potential hazard.
 - .6 Submit to Departmental Representative all safety data sheets for hazardous material to be used at the site at least three days before they are to be used.
 - .7 Submit to Departmental Representative copies of all training certificates required for application of the safety program, in particular:
 - .1 General construction site safety and health courses;
 - .2 Safety officer attestations;
 - .3 First aid in the workplace and cardiopulmonary resuscitation;
 - .4 Work likely to release asbestos dust;
-

- .5 Work in confined spaces;
- .6 Lockout procedures;
- .7 Wearing and fitting of individual protective gear;
- .8 Forklift truck safe operation;
- .9 Positioning platform safe operation;
- .10 Any other requirement of Regulations of the safety program.
- .8 Medical examinations: Wherever legislation, regulations, directives, specification or a safety program require medical examinations, Contractor must:
 - .1 Prior to start-up, submit to Departmental Representative certificates of medical examination for all concerned supervisory staff and employees who will be on duty when the site opens.
 - .2 Thereafter, submit without delay certificates of medical examination for any newly hired concerned personnel as and when they start work at the site.
- .9 Emergency plan: The emergency plan, as defined in 1.8.3, shall be submitted to Departmental Representative at the same time as the site-specific safety program.
- .10 Notice of site opening : Notice of site opening shall be submitted to the Commission *de la santé et de la sécurité du travail* before work begins . A copy of such notice shall be submitted to Departmental Representative at the same time and another posted in full view at the site. During demobilization, a notice of site closing shall be submitted to the CSST, with copy to Departmental Representative.
- .11 Plans and certificates of compliance : Submit to the CSST and to Departmental Representative a copy signed and sealed by engineer of all plans and certificates of compliance required pursuant to the Construction Safety Code (S-2.1, r. 6), or by any other legislation or regulation or by any other clause in the specifications or in this contract. Copies of these documents must be on hand at the site at all times.
- .12 Certificate of compliance delivered by the CSST: The certificate of compliance is a document delivered by the CSST confirming that the contractor is in rule with the CSST, i.e. that he had pay out all the benefits concerning this contract. This document must be delivered to Departmental Representative at the end of the work.

1.4 HAZARDS ASSESSMENT

- .1 The contractor must identify all hazards inherent in each task to be carried out at the site.
- .2 The contractor must plan and organize work so as to eliminate hazards at source or promote mutual protection so that reliance on individual protective gear can be kept to a minimum. Where individual protection against falling is required, workers shall use safety harness that meets standard Can - CSA- Z-259.10 - M90. Safety belts shall not be used as protection against falling.
- .3 Equipment, tools and protective gear which cannot be installed, fitted or used without compromising the health or safety of workers or the public shall be deemed inadequate for the work to be executed.
- .4 All mechanical equipment shall be inspected before delivery to the site. Before using any mechanical equipment, submit to Departmental Representative a certificate of compliance signed by a qualified mechanic. Whenever he suspects a defect or accident risk, Departmental Representative may at any time order the immediate shut-down of equipment and require a new inspection by a specialist of his own choosing.

- .5 For use of equipment for lifting persons or materials, ensure that the inspections required by the standards are met and be able to provide a copy of certificates of inspection upon request of Departmental Representative.

1.5 MEETINGS

- .1 Contractor decisional representative must attend any meetings at which site safety and health issues are to be discussed
- .2 Set up a site safety committee, and convene meetings every in accordance with the Construction Safety Code (S-2.1, r.6).

1.6 LEGAL AND REGULATORY REQUIREMENTS

- .1 Comply with all legislation, regulations and standards applicable to the site and its related activities.
- .2 Comply with specified standards and regulations to ensure safe operations at site containing hazardous or toxic materials.
- .3 Regardless of the publication date shown in the construction safety code, always use the most recent version.

1.7 SITE-SPECIFIC CONDITIONS

- .1 At the site, the contractor must take account of the following specific conditions:
 - .1 Movements of vehicles and Owner staff must be maintained, to and from the existing service building that is located next to building site area, during work.

1.8 SAFETY AND HEALTH MANAGEMENT

- .1 Acknowledge and assume all the tasks and obligations which customarily devolve upon a principal Contractor under the terms of the Act Respecting Occupational Health and Safety (R.S.Q., chapter S-2.1) and the Construction Safety Code (S-2.1, r.6).
- .2 Develop a site-specific safety program based on the hazards identified and apply it from the start of project work until close-out is completed. The safety program must take account of all information appearing in 1.7 and must be submitted to all parties concerned, in accordance with the provisions set forth in 1.2. At a minimum, the site-specific safety program must include :
 - .1 Company safety and health policy.
 - .2 A description of the work, total costs, schedule and projected workforce curve.
 - .3 Flow chart of safety and health responsibility.
 - .4 The physical and material layout of the site.
 - .5 First-aid and first-line treatment standards.
 - .6 Identification of site-specific hazards.
 - .7 Risk assessment for the tasks to be carried out, including preventive measures and the procedures for applying them.
 - .8 Training requirements.
 - .9 Procedures in case of accident/injury
 - .10 Written commitment from all parties to comply with the prevention program.

- .11 A site inspection schedule based on the preventive measures.
- .3 The contractor must draw up an effective emergency plan based on the characteristics and constraints of the site and its surroundings. Submit the emergency plan to all parties concerned, pursuant to the provisions of 1.2. The emergency plan must include:
 - .1 Evacuation procedure;
 - .2 Identification of resources (police, firefighters, ambulance services, etc.);
 - .3 Identification of persons in charge at the site;
 - .4 Identification of those with first-aid training;
 - .5 Training required for those responsible for applying the plan;
 - .6 Any other information needed, in the light of the site characteristics.

1.9 RESPONSIBILITIES

- .1 No matter the size of the construction site or how many workers are present at the workplace, designate a competent person to supervise and take responsibility for health and safety. Take all necessary measures to ensure the health and safety of persons and property at or in the immediate vicinity of the site and likely to be affected by any of the work.
- .2 Take all necessary measures to ensure application of and compliance with the safety and health requirements of the contract documents, applicable federal and provincial regulations and standards as well as the site-specific safety program, complying without delay with any order or correction notice issued by the Commission de la santé et de la sécurité du travail.
- .3 Take all necessary measures to keep the site clean and in good order throughout the course of the work

1.10 COMMUNICATIONS AND POSTING

- .1 Make all necessary arrangements to ensure effective communication of safety and health information at the site. As they arrive on site, all workers must be informed of their rights and obligations pertaining to the site specific safety program. The Contractor must insist on their right to refuse to perform work which they feel may threaten their own health, safety or physical integrity or that of other persons at the site. The Contractor must keep and update a written record of all information transmitted with signatures of all affected workers.
- .2 The following information and documents must be posted in a location readily accessible to all workers:
 - .1 Notice of site opening;
 - .2 Identification of principal Contractor;
 - .3 Company OSH policy;
 - .4 Site-specific safety program;
 - .5 Emergency plan;
 - .6 Data sheets for all hazardous material used at the site;
 - .7 Minutes of site committee meetings;
 - .8 Names of site committee representatives;
 - .9 Names of those with first-aid training;
 - .10 Action reports and correction notices issued by the CSST.

1.11 UNFORESEEN CIRCUMSTANCES

- .1 Whenever a source of danger not defined in the specifications or identified in the preliminary site inspection arises as a result of or in the course of the work, immediately suspend work, take appropriate temporary measures to protect the workers and the public and notify Departmental Representative, both verbally and in writing. Then the Contractor must modify or update the site specific safety program in order to resume work in safe conditions.

1.12 INSPECTION OF SITE AND CORRECTION OF HAZARDOUS SITUATIONS

- .1 Inspect the work site and complete the site inspection sheet at least once a week.
- .2 Immediately take all necessary measures to correct any lapses from legislative or regulatory requirements and any hazards identified by a government inspector, by the Departmental Representative, by the site safety and health coordinator or during routine inspections.
- .3 Submit to Departmental Representative written confirmation of all measures taken to correct lapses and hazardous situations.
- .4 Give the safety officer or, where there is no safety officer, the person assigned to safety and health responsibilities, full authority to order interruption and resuming of work as and when deemed necessary or desirable in the interests of safety and health. This person should always act so that the safety and health of the public and site workers and environmental protection take precedence over cost and scheduling considerations.
- .5 Without limiting the scope of sections 1.8 and 1.9, Departmental Representative may order cessation of work if, in his/her view, there is any hazard or threat to the safety or health of site personnel or the public or to the environment.

1.13 BLASTING

- .1 Blasting and other use of explosives are forbidden.

1.14 POWDER ACTUATED DEVICES

- .1 Use of power hammers and other explosive-actuated devices must be authorized by Departmental Representative.
- .2 Any person using a power hammer shall hold a training certificate and meet all requirements of Section 7 of the Construction Safety Code (S-2.1, r. 6).
- .3 Any other explosive-actuated device shall be used in accordance with the manufacturer's directions and applicable standards and regulations

END OF SECTION

Part 1 General**1.1 PURPOSE**

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

1.2 DEFINITIONS

- .1 "Contraband" means:
 - .1 an intoxicant,
 - .2 a weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization,
 - .3 an explosive or a bomb or a component thereof,
 - .4 currency over any applicable prescribed limit, when possessed by an inmate without prior authorization, and
 - .5 any item not described in above paragraphs (.1) and (.4) that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.
- .2 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.
- .3 "CSC" means Correctional Service Canada.
- .4 "Director" means Director, Warden of the Institution.
- .5 "Construction employees" means persons working for the General Contractor, the Subcontractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
- .6 "Perimeter" means the fenced or walled area of the institution that restrains the movement of inmates.
- 7 "Construction limits" means the areas as shown on the Contract Drawings that the Contractor will be allowed to work. This area may or may not be isolated from the security area of the institution.
- .8 "CD" means Commissioner's Directive.
- .9 "CPIC" means RCMP Canadian Police Information Centre.
- .10 "Commissionaire" - Designated representative of the Director to monitor construction related activities including surveillance of inmate labour.
- .11 "Secure Construction Compound" means a full construction security fence with cameras, lights and fence detection already constructed and is in place around all the medium and maximum security living unit construction areas to provide the same level of delay as the existing perimeter fence. The resulting "Secure Construction Compound" is considered outside of the Institution perimeter but is still subject to all the rules of the penitentiary reserve. Note: that the FDS on the "Secure Construction Compound" fence will have the capacity to remain on 24hrs and be taken over to be active.

- .12 "Unauthorized Smoking and Smoking Items" means all smoking and smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing tobacco, cigarette making machines, matches and lighters.
- .13 "Departmental Representative" means the Project Manager from Public Works and Government Services Canada

1.3 GENERAL INSTRUCTIONS

- .1 Cooperate with institutional personnel in ensuring that security requirements are observed by all construction employees.
- .2 Inside of the Institution proper all normal rules will apply.

1.4 CONSTRUCTION EMPLOYEES REQUIREMENTS FOR ADMITTANCE

- .1 Submit to the Director a signed security clearance request form for each construction employee seeking admission to the (Name) Institution.
- .2 Allow two (2) weeks for processing of security clearances (CPIC's). Employees will not be admitted to the Institution without a valid security clearance (CPIC) in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at this institution.
- .3 The Director requires that these photographs (ID Cards) be displayed prominently on the construction employee's clothing while they are on the Site.
- .4 Entry to Institutional Property will be refused to any person there may be a reason to believe may be a security risk.
- .5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:
 - .1 appear to be under the influence of alcohol, drugs or narcotics.
 - .2 behave in an unusual or disorderly manner.
 - .3 are in possession of contraband.
- .6 CPIC's will be done for all construction workers but are not essential for access to the "Secure Construction Compound". The Warden retains the right to refuse access to the penitentiary reserve to anyone. However, work within the Main Institution will require a valid CPIC.

1.5 SITE ACCESS

- .1 Access to the "Secure Construction Compound" is controlled by Commissionaires. Commissionaires will verify that workers and material are a valid part of the construction but will not do vehicle searches. Commissionaires will verify the ID of all who access site.
- .2 Access to the site will be controlled by the Contractor and during the normal course of business Institutional staff will not be permitted on to the site due to Health and Safety Regulations.

1.6 VEHICLES

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

above will result in an immediate shutdown of the jobsite and a stoppage of the Work for an indefinite period of time at the General Contractor's expense.

- .2 The Director may limit at any time the number and type of vehicles allowed with the Institution.
- .3 If the Director permits trailers to be left inside the secure perimeter of the Institution, or within the secured construction compound, these trailers doors and windows will be locked at the close of business daily. All windows will be securely locked when left unoccupied.

1.7 PARKING

- .1 The "Contractor Parking Lot" will be located on the drawing. Construction employees shall park in the designated "Contractor Parking Lot". Parking in other locations is prohibited and vehicles may be subject to removal.

1.8 SHIPMENTS

- .1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the Institution's own shipments. The Contractor or subcontractor must have their own employees on site to receive and verify any deliveries or shipments. CSC staff will **not** accept receipt of deliveries or shipments of any materials or tools.

1.9 WORK HOURS

- .1 Normal work hours are 07:00 to 17:00, 5 days per week. Hours outside of this to be by agreement with the Institution.

1.10 OVERTIME WORK

- .1 If overtime work is required because of an emergency such as the completion of a concrete pour or work to make construction safe and secure, the Contractor will advise the Director as soon as this condition is known.

1.11 TOOLS AND EQUIPMENT

- .1 Particular attention is to be placed on the physical location of power driven tools, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device, to ensure they are not accessible to inmates on the outer reaches of the fenced enclosure.

Note: Ram sets (Hilti guns) and other cartridge driven tools are not permitted for Work at this Institution.

- .2 The Contractor is to ensure that, at the close of each business day, all tools and equipment are locked in a secure room or in secure lockable tool boxes.
- .3 All missing or lost tools or equipment shall be reported immediately to the Director.
- .4 When not in use all tools will be secured in a lockable location or in a lockable tool box.
- .5 Lay down areas will be identified on the drawings. Lay down areas may be inside the "Secure Construction Compound". Materials and equipment within the "Secure Construction Compound" must not be accessible to inmates or near the outer reaches of the fenced enclosure. If the lay down areas are outside the "Secure Construction Compound" then the materials and equipment must be secured by the Contractor.

1.12 HARDWARE**.1 Security Hardware/Keys - Existing:**

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

.2 Security Hardware/Keys - New:

- .1 The Contractor shall arrange with the security hardware supplier to have the cylinders/keys for the security hardware to be delivered from the manufacturer directly to the Institution, specifically the Security Maintenance Officer (SMO).
- .2 The SMO will provide a receipt to the Contractor for security hardware keys.
- .3 The Contractor will provide a copy of the above-mentioned receipt to the Departmental Representative.

.3 Construction Hardware/Keys:

- .1 The Contractor will use standard construction cylinders for locks for their use during the construction period.
- .2 The Contractor will issue instructions to their employees and subcontractors, as necessary, to ensure safe custody of the construction set of keys.
- .3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:
 - .1 accept the operational keys and lock manufacturer.
 - .2 CSC will arrange for removal and return of the construction cores and install the operational core in all locks.
- .4 Upon putting operational security hardware/keys into use, the CSC Commissionaire shall obtain these keys as they are required by the Contractor. The contractor shall issue instructions to their employees advising them that all security keys shall always remain with the CSC Commissionaire.

1.13 PRESCRIPTION DRUGS

- .1 Employees of the Contractor and Subcontractor who are required to take prescription drugs during the work day are allowed to bring their medicine into "Secure Construction Compound". The employee must keep the prescription drugs securely in their possession or in a secure location.
- 2 Any person found in violation of this directive shall be immediately required to remove the prescription drugs from the "Secure Construction Compound" and only retain sufficient supply for that day. If violation persists, such person will be removed from the Institution's property.

1.14 SMOKING RESTRICTIONS

- .1 Contractor's and subcontractor's employees are not permitted to:
 - .1 Smoke within the perimeter of the Institution. This includes the "Secure Construction Compound".
 - .2 Possess unauthorized smoking items within the secure perimeter of the institution. This includes the "Secure Construction Compound".
 - .3 Any person found in violation of this directive shall be immediately cease smoking and dispose of any unauthorized smoking items. If violation persists, such person will be removed from the Institution's property.
 - .4 Smoking on the institution's property is only permitted outdoors, outside the secure perimeter of the institution and in a location designated by the Director. This will most likely be in the Contractor Parking Lot. This will not include any contractor lay down areas.

1.15 CONTRABAND

- .1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on Institutional Property.
- .2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Director.
- .3 Contractors should be vigilant with both their staff and the staff of their subcontractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.
- .4 Presence of arms and ammunition in vehicles of Contractors, Subcontractors and suppliers of employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

1.16 SEARCHES

- .1 All vehicles and persons entering Institutional Property may be subject to search.
- .2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband, he may order that person to be searched.

1.17 ACCESS TO AND FROM REMOVAL INSTITUTIONAL PROPERTY

- .1 Construction personnel and commercial vehicles will not be admitted to the "Secure Construction Compound" of Institution after normal working hours, unless approved by the Director.

1.18 MOVEMENT OF VEHICLES

- .1 Vehicles shall be refused access to Institutional Property if, in the opinion of the Director, they contain any article which may jeopardize the security of the institution.
- .2 Private vehicles of construction employees will not be allowed within the perimeter of medium or maximum security institutions without the permission of the Director. This includes the "Secure Construction Compound".
- .3 When equipment is to remain in the "Secure Construction Compound" overnight or over the weekend, this equipment must be securely locked and disabled.

1.19 SURVEILLANCE AND INSPECTION

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

1.20 STOPPAGE OF WORK

- .1 The Director may request at any time that the Contractor, their employees, Subcontractors and their employees not enter or leave the Work site immediately due to a security situation occurring within the Institution. The Contractor's site supervisor shall

note the name of the staff member making the request and the time of the request and obey the order as quickly as possible.

- .2 The Contractor shall advise the "Departmental Representative" of this delay to the progress of the Work.

1.21 LOCKDOWN

- .1 In the event of a lockdown in the Institution the construction site will not be affected unless a count is short or there is a real threat to the site by riot. If an escape is suspected the gates to the site may be closed and Institutional staff will verify persons leaving the site.

1.22 CONTACT WITH INMATES

- .1 Unless specifically authorized, and in the course of Work related activity, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any contractor or subcontractors employees doing any of the above may be removed from the site and may have their security clearance revoked.
- .2 It is forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this Contract.

1.23 COMPLETION OF CONSTRUCTION

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

PART 1 GENERAL

1.1 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. 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 engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.3 ACCESS TO WORK

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

1.4 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
 - .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
-

- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 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 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.6 REPORTS

- .1 Submit four (4) copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested, to manufacturer, fabricator of material being inspected or tested.

1.7 TESTS AND MIX DESIGNS

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

1.8 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Departmental Representative as specified in specific Section.
- .3 Prepare mock-ups for Departmental Representative review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.
- .7 Mock-ups may remain as part of Work once they have been accepted by Departmental Representative.

- .8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.9 MILL TESTS

- .1 Submit mill test certificates as required by specification Sections.

1.10 EQUIPMENT AND SYSTEMS

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

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SUBMITTALS

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

1.2 INSTALLATION AND REMOVAL

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

1.3 WATER SUPPLY

- .1 Departmental Representative will provide continuous supply of potable water for construction use.
- .2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.

1.4 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
 - .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
 - .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
 - .4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
 - .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
-

- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.
- .7 On completion of Work for which permanent heating system is used, replace filters.
- .8 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.
- .9 Pay costs for maintaining temporary heat, when permanent heating system is not in working order.
- .10 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .11 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.5 TEMPORARY POWER AND LIGHT

- .1 Departmental Representative will pay for temporary electric power during construction for temporary lighting and operating of power tools, within limits of allowable circuits in existing mechanical room electric panels, without exceeding maximum capacity of existing installations.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
- .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.
- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lux.
- .5 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Repair any damage to lighting and electrical system caused by use under this Contract.

1.6 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and laws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121-M1978(R2003), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.
- .3 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

1.4 SCAFFOLDING

- .1 Scaffolding to be in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, swing, staging platforms, temporary stairs and other means.

1.5 SITE STORAGE/LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
-

- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.6 CONSTRUCTION PARKING

- .1 Parking will be allowed on site provided that it does not disrupt work performance or circulation of vehicles and operation of existing building.
- .2 Provide and maintain adequate access to project site.
- .3 Clean runway lanes where used by Contractor's equipment.

1.7 SECURITY

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

1.8 OFFICES

- .1 Contractor must provide and install, where allowed by Departmental Representative, a construction trailer with construction site office facility.
- .2 Provide marked and fully stocked first-aid case in a readily available location.

1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Contractor will be allowed to install a container or construction trailer to store materials and tools where approved by Departmental Representative.

1.10 SANITARY FACILITIES

- .1 Contractor must provide and maintain restroom facilities in sufficient number for construction site personnel needs, during whole building activities.

1.11 CONSTRUCTION SIGNAGE

- .1 No other signs or advertisements, other than warning signs, are permitted on site. Contractor must submit to Departmental Representative location of signs before proceeding to installation of the signs.
- .2 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .3 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Make sure that incoming and outgoing Contractor's equipment, rolling stock and delivery trucks for works harm the least possible normal traffic flow.

- .4 Verify adequacy of existing roads and allowable load limit on these roads. Contractor will be responsible for repair of damages to roads caused by construction operations.
- .5 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .6 Dust control: adequate to ensure safe operation at all times.
- .7 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .8 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.13 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Do not stack or store new or salvaged material in construction facilities.

PART 2 PRODUCTS**2.1 NOT USED**

- .1 Not Used.

PART 3 EXECUTION

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 52 00 – Construction Facilities.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
 - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

1.3 INSTALLATION AND REMOVAL

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

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 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3 Design enclosures to withstand wind pressure and snow loading.

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 public.
- .2 Maintain and relocate 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 FIRE ROUTES

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

1.8 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.

1.9 PROTECTION OF BUILDING FINISHES

- .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 with Departmental Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

1.10 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

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

1.2 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations.

1.3 AVAILABILITY

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

1.4 STORAGE, HANDLING AND PROTECTION

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

1.5 TRANSPORTATION

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

1.6 MANUFACTURER'S INSTRUCTIONS

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

1.7 QUALITY OF WORK

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

- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.8 CO-ORDINATION

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

1.9 CONCEALMENT

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

1.10 REMEDIAL WORK

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

1.11 LOCATION OF FIXTURES

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

1.12 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.
-

1.13 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and traffic in the vicinity of Work.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

PART 2 PRODUCTS**2.1 NOT USED**

- .1 Not Used.

PART 3 EXECUTION**3.1 NOT USED**

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

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

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only. Remove from site.
- .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.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7 Dispose of waste materials and debris off site.
- .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.
- .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.

1.3 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
 - .2 Prior to final review remove surplus products, tools, construction machinery and equipment.
 - .3 Remove waste products and debris including that caused by Owner or other Contractors and leave Work clean and suitable for occupancy.
 - .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
-

- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 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.
- .7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .8 Clean lighting reflectors, lenses, and other lighting surfaces.
- .9 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .10 Clean floor finishes, as recommended by manufacturer.
- .11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .12 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .13 Remove dirt and other disfiguration from exterior surfaces.
- .14 Sweep and wash clean paved areas.
- .15 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .16 Remove snow and ice from access to building.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 WASTE MANAGEMENT GOALS

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss PWGSC's Waste Management Plan and Goals.
- .2 PWGSC's Waste Management Goal 75 percent of total Project Waste to be diverted from landfill sites. Provide Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3 Accomplish maximum control of solid construction waste.
- .4 Preserve environment and prevent pollution and environment damage.

1.2 DEFINITIONS

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

- .12 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
- .13 Waste Management Co-ordinator (WMC) : contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

1.3 DOCUMENTS

- .1 Maintain at job site, one copy of following documents:
 - .1 Material Source Separation Plan.

1.4 WASTE PROCESSING SITES

- .1 Contractor must get information about waste materials processing plan.

1.5 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 for demolition from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
- .7 Protect surface drainage, mechanical and electrical works from damage and blockage.
- .8 Separate and store materials produced during dismantling of structures in designated areas.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
 - .3 Provide waybills for separated materials.

1.6 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.

- .3 Total tonnage generated.
- .4 Tonnage reused or recycled.
- .5 Reused or recycled waste destination.
- .4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.7 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by existing facility. Provide temporary security measures approved by Departmental Representative.

1.8 SCHEDULING

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

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 APPLICATION

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

- .1 Separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.
 - .1 Mark containers or stockpile areas.
 - .2 Provide instruction on disposal practices.
- .2 On-site sale of recovered waste materials is not permitted.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00- Submittal procedures.
- .2 Section 01 45 00- Quality control.

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned after final inspection, with Departmental Representative's comments.
- .4 Revise content of documents as required prior to final submittal.
- .5 Two 2 weeks prior to Substantial Performance of the Work, submit to the Departmental Representative , four 4 final copies of operating and maintenance manuals in English and French.
- .6 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.
- .7 Furnish evidence, if requested, for type, source and quality of products provided.
- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.

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, process flow, 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 Date of submission;
 - .2 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 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 specified in Section 01 45 00 - Quality Control.

1.5 AS-BUILTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 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 Departmental Representative .

1.6 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental 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 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.7 EQUIPMENT AND SYSTEMS

- .1 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 Include installed colour coded wiring diagrams.
- .4 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.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.

- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.
- .15 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 colour and texture designations. Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.9 SPARE PARTS

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

1.10 MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site location as directed; place and store.

- .4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.11 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to site location as directed; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

1.12 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 Departmental Representative.

1.13 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA S350-[M1980(R2003)], Code of Practice for Safety in Demolition of Structures.

1.2 SUBMITTALS

- .1 Submit shop drawings in accordance with Sections 01 33 00 - Submittal Procedures.
- .2 Before proceeding with demolition of load bearing walls or of other walls and where required by authority having jurisdiction submit for review by Departmental Representative shoring and underpinning drawings prepared by qualified professional engineer registered or licensed in the Province of Quebec, showing proposed method.
- .3 Prior to beginning of Work on site submit detailed Waste Reduction Workplan.
 - .1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
 - .2 Schedule of selective demolition.
 - .3 Number and location of dumpsters.
 - .4 Anticipated frequency of tippage.
 - .5 Name and address of haulers and waste facilities.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.

1.4 SITE CONDITIONS

- .1 Review "Designated Substance Report" and take precautions to protect environment.
- .2 Should material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
 - .1 Do not proceed until written instructions have been received from Departmental Representative.
- .3 Notify Departmental Representative before disrupting building access or services.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.
-

PART 3 EXECUTION

3.1 PREPARATION

- .1 Inspect building with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.
- .4 Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
 - .1 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.
 - .2 Immediately notify Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 PROTECTION

- .1 Prevent movement, settlement, or damage to adjacent structures, utilities, landscaping features and parts of building to remain in place. Provide bracing and shoring required.
- .2 Keep noise, dust, and inconvenience to occupants to minimum.
- .3 Protect building systems, services and equipment.
- .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
- .5 Do Work in accordance with applicable Health and Safety Requirements.

3.3 SALVAGE

- .1 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .2 Remove items to be reused, store as directed by Departmental Representative, and re-install under appropriate section of specification.

3.4 SITE REMOVALS

- .1 Remove items as indicated.
 - .2 Removal of Pavements, Curbs and Gutters:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying and adjacent granular materials.
-

3.5 DEMOLITION

- .1 Remove parts of existing building to permit new construction. Sort materials into appropriate piles for reuse and recycling.
- .2 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.

3.6 DISPOSAL

- .1 Dispose of removed materials, to appropriate recycling facilities except where specified otherwise, in accordance with authority having jurisdiction.

END OF SECTION

PART 1. GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal procedures.
- .2 Section 01 74 11 – Cleaning.
- .3 Section 01 74 21 – Construction/demolition waste management and disposal.
- .4 Section 09 21 16 – Gypsum board sheating.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-04a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A792/A792M-03, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .3 ASTM D3575, Standard Test Method for Flexible Cellular Materials Made From Olefin Polymers.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 CSA International
 - .1 CAN/CSA-G164-FM92(C2003), Hot galvanization for irregular form objects.
 - .2 CSA W47.1-F03, Certification of Companies for Fusion Welding of Steel Structures.
 - .3 CSA W55.3-1965(R2003), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .4 CSA W59-F03, Welded Steel Construction (Metal Arc Welding) Metric.
 - .5 CAN/CSA S136-F94 (C2001), North American Specification for the Design of Cold Formed Steel Structural Members.
- .4 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI 50M-87, Lightweight Steel Framing Manual.
 - .2 CSSBI 52M-91, Lightweight Steel Framing Binder.
 - .3 CSSBI Fact Sheet #3 April 1994, Care and Maintenance of Prefinished Sheet Steel Building Products.
 - .4 CSSBI Technical Bulletin Vol. 7, No. 2 February 2004, Changing Standard Thicknesses for Canadian Lightweight Steel Framing Applications.
 - .5 CSSBI S5-04, Guide Specification for Wind Bearing Steel Studs.
- .5 Master Painters Institute (MPI) / Architectural Painting Specification Manual – February 2004.
 - .1 MPI #18, Organic Zinc Rich Primer.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:

- .1 Indicate design loads, member sizes, materials, design thickness exclusive of coatings, coating specifications, connection and bracing details, screw sizes and spacing, and anchors.
- .2 Indicate locations, dimensions, openings and requirements of related work.
- .3 Indicate welds by welding symbols as defined in CSA W59.
- .3 Samples:
 - .1 Submit to Departmental Representative samples of framing components, screws, bolts and anchors for approval.
- .4 Submit drawings and calculation data stamped and signed by professional engineer registered or licensed in Province of Quebec. That seal certifies that metal stud framing systems conception is in accordance with Contractual Documents requirements.
- .5 Submit metal stud framing systems technical data sheets.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Protect steel studs during transportation, site storage and installation in accordance with CSSBI Sheet Steel Facts #3.
- .2 Handle and protect galvanized materials from damage to zinc coating.
- .3 Waste management and disposal
 - .1 Sort waste in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Evacuate packaging waste daily from site to processing plan.
 - .3 Sort packaging waste and drop in appropriate recycling containers according to Waste Management Plan.
 - .4 Make sure that empty containers are sealed and stored in a safe place prior to evacuation from site.

PART 2. PRODUCTS

2.1 MATERIALS

- .1 Steel: to CAN/CSA S136, fabricated from ASTM A653/A653M, Grade A to D steel.
- .2 Zinc coated steel sheet: quality to ASTM A653/A653M, with Z275 designation coating.
- .3 Intermediate gypsum board sheathing : refer to Section 09 21 16 Gypsum board sheathing.
- .4 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.
- .5 Screws: low profile head, self-drilling, self-tapping sheet metal screws, corrosion protected with minimum zinc coating thickness of 0.008 mm, minimum length 10 mm long.
- .6 Anchors: concrete expansion anchors or other suitable drilled type fasteners.
- .7 Bolts, nuts, washers: hot dipped galvanized to CAN/CSA-G164, 600 g/m² zinc coating.
- .8 Touch up primer: zinc rich, to CAN/CGSB-1.181.
- .9 Insulating strip: insulation strip of compressible polyethylene foam,
 - .1 Dimensions:
 - .1 Thickness: 6mm

- .2 Width: equivalent to the stud track.
- .2 Density (ASTM D3575, Suffix W, Method B) : 35 kg/m³
- .3 Compressive Deflection : (ASTM D3575, Method D) :
 - @ 10% : 7 kPa
 - @ 25% : 21 kPa
 - @ 50% : 83 kPa
- .4 Water Absorbtion (ASTM D3575, Suffix L) : 929 kg/m²
- .5 Thermal Conductivity (ASTM D3575, Suffix V) : <5 kg/m²
- .6 Tensile Strength @ peak (ASTM D3575, Suffixe T) : 310 kPa
- .7 Tensile Elongation (ASTM D3575, Suffixe T) : 85%
- .8 Tear Strength (ASTM D3575, Suffixe G) : 2.1 N/mm

2.2 STEEL STUD DESIGNATIONS

- .1 Colour code: to CSSBI Technical Bulletin Vol.7, No. 2.

2.3 METAL FRAMING

- .1 Steel studs: to CAN/CSA S136, fabricated from metallic coated steel, depth as indicated.
 - .1 Minimum (bare) steel thickness of 0.91 mm (#20 gauge).
- .2 Stud tracks: fabricated from same material and finish as steel studs, depth to suit.
 - .1 Bottom track: single piece.
 - .2 Top track: single piece 64 mm height with slotted holes.
 - .3 Insulation tape: neoprene tape of appropriate with.
- .3 Bridging: fabricated from same material and finish as studs, 38 x 12 x 1.09 mm minimum thickness.
- .4 Angle clips: fabricated from same material and finish as studs, 38 x 12 mm, 1.22 mm minimum (bare) thickness (#18 gauge).
- .5 Tension straps and accessories: as recommended by manufacturer.

2.4 SOURCE QUALITY CONTROL

- .1 Ensure mill reports covering material properties are reviewed by Departmental Representative.

PART 3. EXECUTION

3.1 GENERAL

- .1 Weld in accordance with CSA W59.
- .2 Certification of companies: to CSA W47.1 for fusion welding and CSA W55.3 for resistance welding.
- .3 Do structural metal stud framing work to CSSBI S5.

3.2 ERECTION

- .1 Erect components to requirements of reviewed shop drawings.
- .2 Place insulating strip under tracks of exterior walls.

- .3 Anchor tracks securely to structure at 800 mm on centre maximum, unless lesser spacing prescribed on shop drawings.
- .4 Erect studs plumb, aligned and securely attached with 4 screws minimum or welded in accordance with manufacturer's recommendations.
- .5 Seat studs into bottom and top tracks.
- .6 Install 50 mm minimum telescoping track at top of walls where required to accommodate vertical deflection.
 - .1 Nest top track into deflection channel minimum of 30 mm and maximum of 40 mm.
 - .2 Do not fasten tracks together.
 - .3 Stagger joints.
- .7 Install studs at not more than 50 mm from abutting walls, openings, and each side of corners and terminations with dissimilar materials.
- .8 Brace steel studs with horizontal internal bridging at 1220 mm maximum.
 - .1 Fasten bridging to steel clips fastened to steel studs with screws or by welding.
- .9 Frame openings in stud walls to adequately carry loads by use of additional framing members and bracing as detailed on shop drawings.
- .10 Touch up welds with coat of zinc rich primer.

3.3 ERECTION TOLERANCES

- .1 Plumb: not to exceed 1/500th of member length.
- .2 Camber: not to exceed 1/1000th of member length.
- .3 Spacing: not more than +/- 3 mm from design spacing.
- .4 Gap between end of stud and track web: not more than 4 mm.

3.4 CUTOUTS

- .1 Maximum size of cutouts for services as follows:

Member Depth	Across Member Depth	Along Member Length	Centre to Centre Spacing (mm)
92	40 max.	105 max.	600 min.
102	40 max.	105 max.	600 min.
152	65 max.	115 max.	600 min.

- .2 Limit distance from centerline of last unreinforced cutout to end of member to less than 300 mm.

3.5 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer's verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL**1.1 RELATED SECTIONS**

- .1 01 33 00 – Submittal Procedures.
- .2 01 56 00 – Temporary barriers and enclosures.
- .3 05 41 00 – Structural metal stud framing
- .4 07 21 16 – Blanket insulation.
- .5 07 52 00 – Modified bituminous membrane roofing.
- .6 07 92 00 – Joint sealants.
- .7 09 21 16 – Gypsum board sheating.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A123/A123M-02, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM C645-14, Standard Specification for Nonstructural Steel Framing Members.
 - .3 ASTM C1002-14, Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B111-[1974 (R2003)], Wire Nails, Spikes and Staples.
 - .2 CSA O121-[M1978(R2003)], Douglas Fir Plywood.
- .3 Forest Stewardship Council (FSC)
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber [2005].

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

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

- .3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Management and disposal of waste
 - .1 Separate waste materials for reuse and recycling.

PART 2 PRODUCTS

2.1 NON-LOAD BEARING METAL STUDS

- .1 Non-load bearing metal studs framing: indicated posts sizes; to ASTM C645, from hot-dipped galvanized rolled steel sheet 0.91 mm thick, designed to allow boards screwing.
- .2 Stud tracks: fabricated from same material and finish as steel studs, depth; 32 mm.

2.2 PANEL MATERIALS

- .1 Panel thickness as indicated on drawings and in this section.
- .2 Douglas fir plywood: to CSA O121, standard construction. Urea-formaldehyde free.

2.3 ACCESSORIES

- .1 Nails, spikes and staples: to CSA B111.
- .2 Steel self-drilling screws: to ASTM C1002. Bugle head screws (type S, S-12) self-drilling, with rust-proof treatment, for exterior application. For fastening to steel studs: drilling capacity and dimensions in compliance with board manufacturer's recommendations.
- .3 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .4 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

2.4 FINISHES

- .1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work, interior highly humid areas, pressure-preservative, fire-retardant or treated lumber.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Comply with requirements of NBC, supplemented by the following paragraphs.
- .2 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .3 Align and plumb faces of furring and blocking to tolerance of 1:600.

- .4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .5 Install sleepers as indicated.
- .6 Mechanically fasten panels in accordance with specific product manufacturer's recommendations.

3.2 ERECTION

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.

END OF SECTION

PART 1. GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal procedures.
- .2 Section 01 56 00 – Temporary barriers and enclosures.
- .3 Section 06 10 01 – Rough carpentry.
- .4 Section 07 21 16 – Blanket insulation.
- .5 Section 07 21 29.13 – Injected insulation – polyurethane foam.
- .6 Section 07 46 13 – Preformed metal sidings.
- .7 Section 07 62 00 – Sheet metal flashing and trim
- .8 Section 07 92 00 – Joint sealants.
- .9 Section 03 30 00 – (Structure specifications) Cast in place concrete.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM E96/E96M-14, Standard Test Methods for Water Vapour Transmission of Materials.
 - .2 ASTM E2178-13, Standard Test Method for Air Permeance of Building Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 71-GP-24M-77(C1983), Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's literature and specifications, and the Material safety data sheets and data sheets in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .3 Material safety data sheets (MSDS) :
 - .1 Submit safety data sheets for self-adhered air barrier membrane primer and polystyrene insulation board adhesive.

1.4 QUALITY ASSURANCE

- .1 Test reports : submit test reports regarding products and materials conformity to; specified physical characteristics and performance criterias.
- .2 Certificates: submit Certificates signed by Manufacturer certifying that the products and materials are satisfying specified physical characteristics and performance criterias.
- .3 One (1) week prior to start installation of board insulation on site hold a meeting to study:
 1. Particular Work demands;
 2. Condition of support and installation site conditions;
 3. Coordination of work with related ones;
 4. Manufacturer's installation instructions and products warranty terms;
- .4 Installer: installer of board insulation to be member of AIQ (Association d'Isolation du Québec) and specialized in execution of works from this section.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Sort waste in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Evacuate packaging waste daily from site to processing plan.
- .3 Sort packaging waste and drop in appropriate recycling containers according to Waste Management Plan.

PART 2. PRODUCTS

2.1 INSULATION BOARDS

- .1 Extruded polystyrene board: to CAN/ULC-S701.
 - .1 Type: 3.
 - .2 Thermal resistance RSI : 0.87 / 25.4mm
 - .3 Compressive strength: minimum 140 kPa.
 - .4 Thickness: 38 mm.
 - .5 Edges: shiplapped.
- .2 Expanded polystyrene board with laminated air barrier membrane : to CAN/ULC-S701.
 - .1 Type: 2.
 - .2 Thermal resistance RSI : 0.82 / 25.4mm
 - .3 Compressive strength: minimum 110 kPa.
 - .4 Air permeance: 0.002 L/s•m².
 - .5 Water vapour permeance (ASTM E96): 176.5 ng/Pa • s •m².
 - .6 Thickness: 25.4 mm.
 - .7 Edges: shiplapped.

2.2 AIR BARRIER MEMBRANE

- .1 Water tight air barrier membrane, water vapour permeable, self adhesive; to realise continuous air tight system at perimeter of openings and wall surfaces covered with air barrier laminated insulation boards and to realize membrane sealing at metal flashings.
 - .1 Self adhered polypropylene air barrier membrane with following properties:
 - .1 Air permeance (ASTM E2178): $\leq 0.02 \text{ L/s}\cdot\text{m}^2 @ 75 \text{ Pa}$;
 - .2 Water vapour transmission (ASTM E96/A (Dessicant): $202 \text{ g/m}^2/24 \text{ hours}$
 $1658 \text{ ng/Pa}\cdot\text{m}^2\cdot\text{s}$

2.3 AIR BARRIER MEMBRANE ADHESIVE PRIMER

- .1 Primer; as recommended by air barrier membrane manufacturer.

2.4 ADHESIVE

- .1 Synthetic rubber base adhesive, type II, for polystyrene: to CGSB 71-GP-24M, soluble, for trowelling, low VOC.

2.5 ACCESSORIES

- .1 Mechanical fasteners (for air barrier membrane laminated polystyrene boards):
 - .1 Self tapping metal screws, corrosion protected, size as needed, length to minimum 13mm steel studs penetration.
 - .2 Plates or washers: galvanized steel, minimum 50mm diameter or width.
- .2 Sealing tape (air barrier membrane)
 - .1 Polypropylene bi-oriented self-adhesive tape with permanent acrylic adhesive :
 - .1 Tensile strength: 472.5 N/100mm .
 - .2 Immediate tear strength: 26.4 N/100mm .
 - .3 Width: 72mm .

PART 3. EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Conformity: conform to manufacturer's requirements, recommendations and written specifications, including technical bulletins, installation instructions from products catalog and packaging and technical data.

3.2 EXAMINATION

- .1 Verify that conditions of substrate previously installed are acceptable and inform Departmental Representative, in writing, of unacceptable conditions.
- .2 Prior to proceed to installation:
 - .1 Make sure that substrate is solid, straight, smooth, dry and that it is free of snow, ice, frost, dust or debris.

3.3 INSTALLATION

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .6 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.4 PERIMETER FOUNDATION INSULATION

- .1 Interior application: extend boards as indicated. Install on interior face of perimeter foundation wall with adhesive in accordance with manufacturer's recommendations.

3.5 RIGID INSULATION INSTALLATION

- .1 Install insulation boards on exterior face of gypsum board primer sheathing (fiberglass reinforced gypsum board) and fasten mechanically to steel studs using self-tapping screws with plates or washers to board manufacturer's recommended spacing.
- .2 Seal all joints with specified sealing tape.

3.6 AIR BARRIER MEMBRANE INSTALLATION

- .1 Apply self-adhesive air barrier membrane as indicated on drawings: at openings perimeter, at connection with existing building, at joint with roof, at deflection joints, at flashings and other situations.
- .2 Coordinate air barrier membrane installation with metal flashings installation by Section 07 46 13 - Preformed metal sidings.

3.7 CLEANING

- .1 Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 01 33 00 – Submittal Procedures.
- .2 06 10 01 – Rough carpentry.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C177-13, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - .2 ASTM C518-10, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .3 ASTM C553-13, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .4 ASTM C612-14, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .5 ASTM C665-12, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .6 ASTM C1320-10, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CGA-B149.1-[05], Natural Gas and Propane Installation Code Handbook.
 - .2 CAN/CGA-B149.2-[05], Propane Storage and Handling Code.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B111-[1974(R2003)], Wire Nails, Spikes and Staples.
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies.
 - .2 CAN/ULC-S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 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.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling.

1.6 ACCEPTABLE MATERIALS AND PRODUCTS

- .1 When materials and products are prescribed by their commercial names, refer to Bidders Instructions for appropriate method to submit a demand for an equivalent product.

PART 2 PRODUCTS

2.1 INSULATION

- .1 Non-combustible stone wool blanket insulation for exterior wall metal building construction to ASTM C553, Types I, II, and III, with following characteristics:
 - .1 Non-Combustibility: CAN/ULC-S114
 - .2 Surface burning characteristics: CAN/ULC S102
 - .3 Thermal resistance (ASTM C518 (C177)) : RSI value/25.4mm @ 24°C: 0.71
 - .4 Corrosiveness to steel (ASTM C 665) : Pass
 - .5 Water Vapor Sorption: 0,03%
 - .6 Density (ASTM C 612-00) actual: 32 kg/m³
 - .7 Thickness: as indicated on drawings.
 - .8 Width: related to studs spacing as indicated on drawings.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSULATION INSTALLATION

- .1 Install insulation in compliance to standard ASTM C1320-10.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

- .3 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .4 Do not compress insulation to fit into spaces.
- .5 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.3 CLEANING

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

END OF SECTION

PART 1. GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal procedures.
- .2 Section 01 45 00 – Quality control.
- .3 Section 01 56 00 – Temporary barriers and enclosures.
- .4 Section 01 61 00 – Common product requirements.
- .5 Structural steel – See structural engineer documents.

1.2 REFERENCES

- .1 Canadian Urethane Foam Contractors' Association (CUFCA)/Association canadienne des entrepreneurs en mousse de polyurethane
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C518-10, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .2 ASTM D1621-10, Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
 - .3 ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - .4 ASTM D1623-09, Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
 - .5 ASTM D2842-12, Standard Test Method for Water Absorption of Rigid Cellular Plastics.
 - .6 ASTM D2856-94(1998), Standard Test Method for Open-Cell Content of Rigid Cellular Plastics by the Air Pycnometer (withdrawn 2006).
- .3 Health Canada/ Workplace Hazardous Materials Information System (WHMIS):
 - .1 Material Safety Data sheets (MSDS).
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-04, Construction and materials fire performance test method.
 - .2 CAN/ULC-S102-03, Standard method of test; surface burning characteristics of building materials and assemblies.
 - .3 CAN/ULC-S705.1-01, Including amendments #1 and #2; Average density sprayed rigid polyurethane foam thermal insulation standard– Materials related specifications.
 - .4 CAN/ULC-S705.2-05, Average density sprayed rigid polyurethane foam thermal insulation standard - Application.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal procedures.
- .2 Technical data

- .1 Submit specified product technical data as well as manufacturer's procedure, specifications and recommendations. Technical data must indicate products' characteristics, performance criteria, dimensions and application conditions and constraints.
- .3 Quality insurance : submit required documents in accordance with section 01 45 00 – Quality control.
 - .1 Test reports: submit test reports delivered by recognized independent laboratories that must certify that insulation materials meet requirements regarding physical characteristics and performance criteria.
 - .2 Manufacturer's instructions: supply instructions provided by manufacturer, including indications of particular handling methods, implementation and cleaning.
 - .3 Installer's complete name with proof of identity (competency card) proving that installer is certified to apply the product by manufacturer's quality program standards and recognized by him.

1.4 QUALITY INSURANCE

- .1 Workers in charge of insulating foam implementation must meet quality assurance program requirements CUFCA quality assurance.
- .2 Quality control on site
 - .1 Keep a copy of the on-site manual or manufacturer's installation guide on the application of polyurethane foam.
 - .2 Allow access to the site of the representative of the manufacturer to provide technical assistance or to conduct an audit of the applicator according to manufacturer's quality program.
- .3 Health and safety: workers protection
 - .1 Insure workers protection according to manufacturer's recommendations and standard CAN/ULC-S705.2.
 - .2 Workers must never eat, drink nor smoke while they are proceeding to insulation foam implementation.

1.5 DELIVERY, STORAGE ET HANDLING

- .1 Packaging, transport, 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 in accordance with manufacturer's written instructions.
- .2 Waste management and disposal.
 - .1 Sort waste in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 SITE CONDITIONS

- .1 Make sure of work zone continuous ventilation, is used to extract stale hot air from the inside and introduce fresh air from outside, during complete implementation time and during the following 24 hours, to maintain a non-toxic, non-polluted and safe atmosphere.

- .2 Protect work surfaces and adjacent materials against damages from insulation material spill-over, during expansion. Mark off working area. Make sure to get approval of protective installations before beginning any application. Pay even more attention to the following:
 - .1 Strong winds conditions.
 - .2 Adjacent and underlying surfaces protection.
 - .3 Scaffolding.
- .3 Only proceed to foam insulation implementation when surface temperature and surrounding air temperature respect manufacturer's recommendations.
- .4 Evacuate waste polyurethane materials daily to area designated by contractor, and decontaminate empty containers in accordance with foam insulation manufacturer's instructions.

PART 2. PRODUCTS

2.1 MATERIALS

- .1 Low density two components semi-flexible injected polyurethane foam especially made for foam casting:
 - .1 Density (ASTM D1622) : 40 kg/m³ (2.53 lb/sq ft).
 - .2 Compressive strength (ASTM D1621): 144 kPa (27.0 lb/sq in).
 - .3 Tensile strength (ASTM D1623): 241 kPa (21 lb/sq in).
 - .4 Open-cells content (ASTM D2856) : 8.0%.
 - .5 Initial thermal resistance (50 mm) (ASTM C518): RSI 1,46.
 - .6 Water absorption (ASTM D2842): 2% per volume.

2.2 EQUIPEMENT

- .1 Injection equipment must be approved by manufacturer.

PART 3. EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: conform to requirements, recommendations and written manufacturer's specifications, including all available technical bulletins, instructions related to handling, storage and product implementation, and data sheets indications.

3.2 VERIFICATIONS

- .1 Check that openings are of required diameter for injection equipment, that their number and localisation allow completion of work from this section. Signal to Departmental Representative any anomaly or discrepancy. Do not begin work before necessary corrective measures are made.

3.3 IMPLEMENTATION

- .1 Prepare elements to isolate, by adequately protecting injection zone openings, using polyethylene film, tarp and tape.
- .2 Inject insulation from underlying openings and proceed according with manufacturer's recommendations to fill completely every hollow space to inject while avoiding excessive installation of product and spill-over.
- .3 Avoid material spill-over on adjacent and underlying surfaces. Use tarpaulins and, or masking tape to protect surfaces.

3.4 FIELD QUALITY CONTROLS

- .1 On-site quality controls by manufacturer.
 - .1 Manufacturer must make recommendations on product or products use, and carry-out on-site visits to ensure implementation according to his recommendations.

3.5 CLEANING

- .1 Make sure cleaning is done according to section 01 74 11 - Cleaning.
- .2 Once implementation, monitoring and performance are done, evacuate surplus materials from building site, waste, tools and equipment.

END OF SECTION

PARTIE 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal procedures
- .2 Section 01 74 11 – Cleaning
- .3 Section 07 92 00 – Joint sealants
- .4 Section 03 30 00 - Cast in place concrete (Structure specifications)

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC S102.2-M88, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor covering and Miscellaneous Materials and Assemblies.
- .3 ASTM International
 - .1 ASTM D1709-15, Puncture resistance.
 - .2 ASTM E96-14, Standard Test Methods for Water Vapor Transmission of Materials.
 - .3 ASTM E154 (2013), Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
 - .4 ASTM E1643-11, Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - .5 ASTM E1745-11, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil Or Granular Fill Under Concrete Slabs.
 - .6 ASTM F1249-13, Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [vapour retarders] and include :
 - .1 product characteristics;
 - .2 performance criteria;
 - .3 constraints,

1.4 DELIVERY, STORAGE AND HANDLING

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

1.5 INSTALLATION CONDITION

- .1 Specified products must never be installed on frozen ground.

PARTIE 2 PRODUCTS

2.1 WALL SHEET VAPOUR RETARDER

- .1 Polyethylene sheet: to CAN/CGSB-51.34-M86 :
 - .1 Flame spread (CAN/ULC S102.2-M88): < 150.
 - .2 Thickness: 0.15 mm (6 mils.).
- .2 Joint sealing tape:
 - .1 Air resistant pressure sensitive adhesive tape, type recommended by vapour barrier sheet manufacturer;
 - .2 Minimum width: 65 mm.

2.2 UNDER SLAB SHEET VAPOUR RETARDER

- .1 Polyolefin-based resin/chemical vapour retarder sheet; to ASTM E1745, Class A, B and C:
 - .1 Watre vapour permeance (ASTM E-96 and ASTM F1249): 0,018 Perm
 - .2 Water vapour transmission (ASTM F1249): 0.007 grains/pi²/hr.
 - .3 Resistance to substrate and organism (ASTM E124, section 13): 0 .027 Perms
 - .4 Tensile strength (ASTM E154, section 9): 14,7 N/mm.
 - .5 Puncture resistance (ASTM D 1709, B Method): 52 N.
 - .6 Thickness: 0.38 mm (15 mils.).
- .2 Joint sealing tape: air resistant pressure sensitive high density adhesive tape, recommended by vapour barrier sheet manufacturer, 100 mm minimum width.
- .3 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer. To Section 07 92 00 - Joint Sealants.

PARTIE 3 EXECUTION

3.1 UNDER SLAB RETARDER INSTALLATION

- .1 Verify that conditions of substrate are acceptable and inform Departmental Representative, in writing, of unacceptable conditions.
- .2 Prepare surface in accordance with the written instructions of the membrane manufacturer and in compliance to standard ASTM E 1643-11.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Install sheet vapour retarder:
 - .1 Install sheet retarder over whole surface of approved compacted backfill, exceeding 300mm at perimeter and overlapping 300 mm at joints in all directions, then seal joints continuously with manufacturer's recommended sealing tape;

- .2 Make sure to avoid any wrinkling or installation defect;
- .3 Fold exceeding sheet at perimeter in upright way and seal sheet to foundation wall.
- .4 Seal any penetration (including utility equipments) with recommended tape and sealant.
- .5 Protect sheet vapour barrier from any damage until concrete pouring. Make sure to avoid any damage to vapour barrier in pouring concrete.

3.2 WALL RETARDER INSTALLATION

- .1 Ensure services and blanket insulation are installed and inspected prior to installation of retarder.
- .2 Install sheet vapour retarder on warm side of exterior wall assemblies prior to installation of interior metal siding to form continuous retarder.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Overlap sheets vapour retarder to the joints and seal them continuously with sealing tape.
- .5 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.
- .6 Ensure continuous retarder for whole building taking particular attention to:
 - .1 wall corners;
 - .2 joints with existing building;
 - .3 spandrel beam detail;
 - .4 joints with roof;
 - .5 openings perimeter;
- .7 Repair punctures and tears with sheet retarder patches overlapping 150 mm around repair area and seal with joint sealing tape.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

PARTIE 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 00 – Rough carpentry.
- .2 Section 07 21 13 – Board insulation.
- .3 Section 07 21 16 – Blanket insulation.
- .4 Section 07 21 29.13 – Injected insulation - polyurethane foam.
- .5 Section 07 62 00 – Sheet metal flashing and trim.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI).
 - .1 ANSI B18.6.4-1998 (R2005), Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws.
- .2 Canadian Sheet Steel Building Institute(CSSBI)
 - .1 CSSBI S8-2008, Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.
- .3 ASTM International
 - .1 ASTM D2369-03, Test Method for Volatile Content of Coatings.
 - .2 ASTM D2832-92(R1999), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
 - .3 ASTM D5116-97, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-93.5-92, Installation of Metal Residential Siding, Soffits and Fascia.
- .5 CSA International
 - .1 CSA S-136-94(R2001), Cold Formed Steel Structural Members.

1.3 DESIGN CRITERIA

- .1 Calculate metal sidings to CSA S136-94 and S136-95.
- .2 Design metal sidings to allow dilatation and contraction movements based on 80°C differential without; excessive constraints on fasteners, siding distortion, sealing joint breakage or any damage to metal sidings.
- .3 Design joints to allow dilatation and contraction movements, between panels and between panels and structure, due to structure movement without permanent distortion to sidings, damage to joint seals or water infiltration.
- .4 Design sidings taking account of specified tolerances for support framing.
- .5 Tolerances for metal siding installation:
 - .1 Straightness : maximum 20 mm / 10m length.
 - .2 Alignment between elements in same plan: 1 mm.

- .3 Component should support both static and dynamic (wind) loads to NBC and local regulations. Deflection under wind load: maximum $1/180 \times \text{span}$.
- .4 Design sidings to ensure evacuation of condensation and rain water that could penetrate trough joints.

1.4 SAMPLES

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit 2 samples 300 mm x full width of metal sidings.

1.5 SHOP DRAWINGS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings: Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, metal furring, and related work.
- .3 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec at Contractor fees.
- .4 Components gauges indicated on drawings are minimum gauges for information only. Components have to be calculated to National Building Code and local regulations. Submit calculation data stamped by professional engineer registered or licensed in Province of Quebec.

1.6 SUBMITTALS VERIFICATION

- .1 Ensure that shop drawings, products data, calculation data and samples have been verified prior to submittal to Departmental Representative.
- .2 Inform Departmental Representative, by writing, of any difference between documents and specifications.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Protect prefinished materials during delivery, store and handle, in accordance to CSSBI specifications.
- .2 When stored at the site, the materials must be stacked off ground on wooden blocages with sufficient slope to ensure rainwater drainage.

PARTIE 2 PRODUCTS

2.1 STEEL CLADDING AND COMPONENTS

- .1 Exterior cladding:
 - .1 Prefinished steel, thickness : 0.63mm (#24 gauge), finish coating: vinylidene polyfluorure coating. (full height without horizontal joints)
 - .2 Profile : CL 435 model manufactured by Vicwest or approved replacement product.
 - .3 Colour: "Pure white" QC-6076, according to the "Weather X" color system by Vicwest or approved replacement product.
- .2 Interior cladding:

- .1 Prefinished steel, thickness : 0.63mm (#24 gauge), finish coating: vinylidene polyfluorure coating.(full height without horizontal joints)
- .2 Profile : as indicated on drawings or approved replacement product.
- .3 Colour: "Pure white" QC-6076 or approved similar color.

2.2 FINISHING PROFILES

- .1 Exposed trim: inside corners, outside corners, cap strip, drip cap, undersill trim, starter strip and window/door trim of same material, colour as cladding, with fastener holes pre-punched.
- .2 Non-exposed profiles: hidden mouldings and flashing fastening strips to be made of Z-275 (G-90) designation hot galvanized steel.
- .3 Typical mouldings:
 - .1 Prefabricated from prefinished steel sheet:
 - .1 Finish: pre-painted on one side;
 - .2 Color: "Pure white" QC-6076 or approved similar color.
 - .3 Profile: as indicated on drawings.
 - .2 Shaped: shape flashings, top mouldings et roof edges as indicated on drawings from prefinished steel sheet:
 - .1 Color: "Pure white" QC-6076 or approved similar color.
 - .2 Thickness: as indicated on drawings.
 - .3 Thickness of hidden or exposed profiles to be as indicated on drawings.

2.3 ACCESSORIES

- .1 Sealing butyl tape: butyl-polyisobutylene tape 100% solids, thickness: 3 mm thick, width: 13 mm , rolled with protective film.
- .2 Sealant: as specified in Section 07 92 00 – Joint sealants.
- .3 Steel furrings: galvanised steel furrings size and gauge as indicated on drawings.
- .4 Thermal break: rubber foam tape 1,5 mm thick x 38 mm width to cover mounting face of "Z" bars and sub-framing profiles, rolled with protective film.

2.4 FASTENERS

- .1 Metal screws: to ANSI B18.6.4-1998 (R2005) and as recommended by cladding manufacturer.
- .2 Exposed fasteners: #14, type AB, cadmium steel self-tapping screw, pre-painted hexagonal head, color as cladding, with EPDM washer. Length: 19 mm for joint between panels, 25 mm for fastening to steel furrings.
- .3 Stichting screw: #14 carbon steel screw, cadmium plated, hexagonal head, length:19 mm.
- .4 Steel frame screws: #14 carbon steel screw, cadmium plated, hexagonal head, length: long enough to penetrate 13 mm structural steel.

2.5 FABRICATION

- .1 Make all components as indicated on shop-drawings (dimensions, profiles, gauges, details, flashings, trims, etc..), to CSSBI requirements.

- .2 Manufacture components in maximum length.
- .3 Shape components square, levelled and accurate to exact expected dimensions without distortion or other defects that could affect appearance or efficiency.

PARTIE 3 EXECUTION

3.1 PREPARATORY WORKS

- .1 Protect with insulating coating metal surfaces in contact with concrete, mortar, plaster, aluminium or any hydraulic binder based product.

3.2 REQUIRED EQUIPMENT

- .1 Installer of this section have to provide any equipment necessary to achieve work.
- .2 No grinder is acceptable for steel cutting.
- .3 Use up to date equipments, like laser equipment, to ensure perfect alignment of flashings, trims and cladding.

3.3 INSTALLATION

- .1 Install cladding in accordance with shop-drawings.
- .2 Install sidings in accordance with CSSBI and manufacturer's written instructions.
- .3 Installer for this section must be authorized by cladding manufacturer. Installation have to be performed by competent and experimented workers.
- .4 Flashings and trims:
 - .1 Install starter strips, drips and coordinate with Section 07 21 13 – Insulation boards, for installation of membrane flashing.
 - .2 Install inside and outside corners, edgings, cap, sill and door opening flashings as indicated.
- .5 Sidings :
 - .1 Install cladding elements according to installation procedures recommended by manufacturer. Respect recommended overlap and details to ensure weathertight siding.
 - .2 Fasten siding elements according to manufacturer's recommendations. Align fasteners on a regular and accurate pattern vertically and horizontally.
 - .3 Install fastening strips and flashings.
- .6 Joint sealant :
 - .1 Caulk junctions with adjoining work with sealant. Do work in accordance with Section 07 92 00 - Joint Sealants.
- .7 Install starter strips, inside and outside corners, edges and flashings around openings in accordance with shop drawings with non-exposed fasteners.
- .8 Install cladding according to CGSB 93.5 and written instructions from manufacturer.
- .9 Install with care and accuracy; inside and outside corners, filling strips and closers to get a clean and accurate result.
- .10 Ensure perfectly aligned joints and elements.
- .11 Fasten elements to allow dilatation and contraction of material.

- .12 Caulk junctions with adjoining work with sealant. Do work in accordance with Section 07 92 00 - Joint Sealants.
- .13 Execute openings for mechanical and electrical works. Apply sealant with accuracy around piping or accessories getting trough cladding.

3.4 CLEANING

- .1 Ensure that all surfaces are free from any dirt or dust.
- .2 Remove any sealant excess with recommended solvent.
- .3 Clean site from any waste, metal scraps or unused products.

END OF SECTION

PARTIE 1 GENERAL**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal procedures.
- .2 Section 01 35 29.06 - Health and Safety
- .3 Section 01 45 00 – Quality control.
- .4 Section 01 78 00 – Closeout submittals.
- .5 Section 06 10 01 – Rough carpentry.
- .6 Section 07 21 16 – Blanket insulation.
- .7 Section 07 62 00 – Sheet metal flashing and trim.

1.2 REFERENCES

- .1 Association des Maîtres couvreurs du Québec (AMCQ).
 - .1 Devis, Couvertures, de l'AMCQ.
 - .2 Canadian Standards Association (CSA International)
 - .1 CSA-A123.4-04 (R2013) Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.
 - .3 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S107-0, Methods of Fire Tests of Roof Coverings.
 - .2 CAN4-S114-M80, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .3 CAN/ULC-S770-09, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.
 - .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 37.56-M(9th draft), Membrane, Modified Bituminuous, Prefabricated, and Reinforced for Roofing.
 - .2 CGSB 37-GP-15M-84, Application of Asphalt Primer for Asphalt Roofing, Dampproofing and Waterproofing.
 - .3 ONGC 37-GP-56M-85, Membrane, Modified Bituminuous, Prefabricated, and Reinforced for Roofing.
 - .5 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C165-07(2012), Standard Test Method for Measuring Compressive Properties of Thermal Insulation.
 - .2 ASTM C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - .3 ASTM C209-12, Standard Test Methods for Cellulosic Fiber Insulating Board.
 - .4 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .5 ASTM C612-09, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
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- .6 ASTM C1104, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
- .7 ASTM C1289-14, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- .8 ASTM D1623-09, Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- .9 ASTM D2126-09, Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
- .10 ASTM D6163, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcement.
- .11 ASTM E84-15, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .12 ASTM E96-14, Standard Test Methods for Water Vapor Transmission of Materials.

1.3 PERFORMANCE REQUIREMENTS

- .1 It is critically important that different roofing materials are compatible with each other. Submit to Departmental Representative a written declaration certifying that roofing system materials and components are fully compatible.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide two copies of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide required shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.
- .5 Manufacturer's Certificate: certify that products meet or exceed specified requirements.
- .6 Manufacturer's field inspections reports: in accordance with Section 01 45 00 - Quality Control.
- .7 Field inspection reports must indicate installation methods applied, ambient temperature and wind velocity during installation.

1.5 QUALITY ASSURANCE

- .1 Submit laboratory test reports, in accordance with Section 01 45 00 - Quality Control.
- .2 Submit laboratory test reports certifying that bituminous materials and roof membranes are complying to present section specifications.

1.6 STORAGE, AND HANDLING

- .1 Provide and maintain dry, off-ground weatherproof storage.
- .2 Store rolls of felt and membrane in upright position. Store membrane rolls with salvage edge up on transport palette to avoid deformation.
- .3 Store concrete panels horizontally in a dry place and protect with tarpaulin.
- .4 Remove only in quantities required for same day use.
- .5 Do not stock materials on completed roof.
- .6 Store sealants at +5 degrees C minimum.

- .7 Store insulation protected from daylight, weather, and deleterious materials.
- .8 Handle roofing materials according to manufacturer's instructions to protect them from damages and performance degradation.
- .9 Material label must indicate:
 - .1 Manufacturer's name and address;
 - .2 Applicable Standards reference and material classification;
 - .3 Weight, when appropriate.
- .10 Deliver materials in original packaging, sealed, with intact label.
Make sure that expiry date is not pass.
- .11 Deliver fasteners in boxes or drums and protect them adequately prior to use.
Never oil or or grease fasteners.
- .12 Remove from site damaged or rejected materials and products.

1.7 FIRE PROTECTION

- .1 Fire Extinguishers: Stored pressure type, rechargeable 9 or 14 kg as required, ULC labelled for A, B and C class protection. Maintain one fire extinguisher, per torch applicator, within 6 m of torch applicator.
- .2 Never use torch over old dry wood.
- .3 Maintain fire watch for 1 hour after each day's roofing operations cease. Equipped with Fire Extinguisher and infrared thermometer.
- .4 Apply all the security measures from manufacturer and AMCQ.
- .5 Fire Extinguishers: Stored pressure type, rechargeable 9 or 14 kg as required, ULC labelled for A, B and C class protection. Maintain one fire extinguisher, per torch applicator, within 6 m of torch applicator.

1.8 WASTE MANAGEMENT

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Place packaging materials in appropriate bins installed on site for recycling, according to waste management plan.
- .4 Sort steel, metal and plastics for recycling and place in appropriate bins installed on site, according to waste management plan.
- .5 Place materials defined as hazardous or toxic waste, including tubes and containers, in containers or areas designated for hazardous waste.
- .6 It is forbidden to pour paint, sealants or bituminous materials in sewers, drains, waterways, lake, ground or anywhere it could present a risk to health or environment.

1.9 SITE CONDITIONS

- .1 Do not install roofing when temperature remains below -18 degrees C, for torch application refer to manufacturers' recommendations.
- .2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.10 ROOFING PRODUCTS MANUFACTURER

- .1 Roofing membranes and primers must all provide from one single manufacturer.

1.11 ACCREDITATION

- .1 Roofing contractor and his subcontractors must be officially recognized by Roofing Membrane Manufacturer as being authorized installer and be formal member of AMCQ (Association des Maîtres Couvresseurs du Québec).
- .2 Submit to Departmental Representative, Roofing Membrane Manufacturer's accreditation certificates.

PARTIE 2 PRODUCTS**2.1 DECK COVERING (Steel deck and parapets covering)**

- .1 Light concrete panels with following properties;
 - .1 Thickness: 15.9mm for steel deck covering.
12.7mm for parapet covering.
 - .2 Weight: 15.9mm thick : 17.2kg/m²
12.7mm thick : 14.3kg/m²
 - .3 Modulus of rupture (ASTM C947): 15.9mm thick: 6.2 MPa
12.3mm thick: 5.5 MPa
 - .4 Maximal water absorption % (ASTM D1037): 5%
 - .5 Flame spread/ smoke emission (ASTM E84 / ULC S-102): 0/0

2.2 PLYWOOD

- .1 Plywood
 - .1 As specified in Section 06 10 01 – Rough Carpentry.

2.3 VAPOUR RETARDER

- .1 Vapour retarder for roof, welded to light concrete panel roof substrate.
 - .1 Waterproofing membrane made from heavy-duty glass mat and SBS modified bitumen, and in accordance with CAN/CGSB-37.56-M 9th draft, with these following characteristics:
 - .1 Thickness (mm): 2,2
 - .2 Dimensions (m): 15 x 1
 - .3 Weight (Kg): 41
 - .4 Surface: sanded
 - .5 Underface: thermofusible film
 - .6 Glass mat reinforcement
 - .7 Installation: welded by torch
 - .8 Strain energy, L/T : 1.3
 - .9 Tensile strength, L/T (kN/M): 8.5
 - .10 Ultimate elongation (L/T): 4%
 - .11 Tear resistance (N): 30
 - .12 Puncture resistance (N): 160
 - .13 Plastic flow: ≥ 115°C

- .14 Cold bending: -30°C
- .2 Vapour retarder for roof edges (under parapets), adhered to light concrete panel roof substrate.
 - .1 Self-adhering waterproofing membrane made from heavy-duty glass mat and SBS modified bitumen, top surface must be sealing torch sealable, and in accordance with ASTM D6163 standards with the following features in accordance with CAN/CGSB-37.56-M:
 - .1 Conditioning (m): 15 x 1
 - .2 Top surface: thermofusible film
 - .3 Soffits: self-adhesive (protected by removable film)
 - .4 Thermal distortion resistant, L/T (kN/M): 8,4 / 8,3
 - .5 Tensile strength, L/T (kN/M): 18 / 16
 - .6 Break elongation, L/T (%): 55 / 56
 - .7 Tear strength (N): 120
 - .8 Static load deformation resistance (N): 380
 - .9 Dimensional stability (%): 0,1 / 0,4
 - .10 Cold bending: -30°C

2.4 POLYISOCYANURATE INSULATION

- .1 Polyisocyanurate board roof insulation
 - .1 Closed-cell polyisocyanurate foam insulation board laminated on both side to heavy coated glass filament facer, in accordance with ASTM C 1289 standard, Type II, Class 1, Grade 2 and with these following characteristics :
 - .1 Thermal resistance @ 24°C (CAN/ULC S770) : 1.0 RSI / 25.4mm
 - .2 Tensile strenght (ASTM C 209) : 35kPa (nom.).
 - .3 Compression strenght (10% slump) : 138 kPa.
 - .4 Dimensional stability (ASTM D 2126) : 2% max.
 - .5 Tensil adhesion (ASTM D 1623) : 35 kPa
 - .6 Water absorption (ASTM C 209) : 1.0% max.
 - .7 Perméance à la vapeur d'eau (ASTM E 96) : 85.8 ng/(Pa•s•m²) max.
 - .8 Flame spread (ASTM E 84) : 20 - 30.
 - .9 Smoke developed (ASTM E 84) : 55 - 250.
 - .10 Panels Dimension : 1220 x 1220mm
 - .11 Thickness : 50.8mm
 - .2

2.5 MINERAL FIBER INSULATION

- .1 Mineral fiber roof insulation shingles
 - .1 Double-density waterproof mineral fiber insulated shingle, inorganic, made of basalt and steel slags, bitumen coated top layer, sealing torch compatible membrane, with the following characteristics :
220 kg/m³ density and 22,2 lb/p² compression strength at 10% distortion. Bottom layer has 160 kg/m³ density and compression strength at 10.3 lb/p² at 10% distortion. ASTM C-726 standard, with the following characteristics;
 - .1 Thermal strength at 20°C (ASTM C 518(C 177)): 0.68 RSI / 25.4mm
 - .2 Non-flammability testing methods: CAN4-S114-M80

- .3 Roofing material fire resistance CAN/ULC-S107-0 (class A)
- .4 Moisture absorption: 0.03% (ASTM C 1104)
- .5 Water absorption: < 1.0% (ASTM C 1104)
- .6 RSI making: 0.65 m²k/w for 25.4mm
- .7 Compression strength (ASTM C 165),
 - .1 Full size shingle: 75 kPa at 10% distortion / 105 kPa at 25% distortion
 - .2 Top layer shingle: 140 kPa at 10% distortion / 250 kPa à 25% distortion
- .8 Real density (ASTM C 209),
 - .1 Top layer: 220kg/m³
 - .2 Bottom layer: 160 kg/m³
- .9 Shingle sizes: 1219 x 1219
- .10 Thickness : 50.8mm.

2.6 WATERPROOF MEMBRANE

- .1 Under layer membrane, current portion, surveys and parapets
 - .1 Prefabricated sealing foil sealing torch compatible, ASTM standard and CAN/CGSN-37.56-M, 9⁰ draft, composed of a non-woven polyester reinforced membrane and elastomer bitumen their surface covered with thermofusible plastic film, with the following characteristics;
 - .1 Components:
 - .1 Frame: non-woven polyester
 - Elastomer bitumen: selected bitumen and SBS polymer mixture.
 - .2 Characteristics:
 - .1 Thickness: 3.0mm
 - .2 Creep resistance (L/T): 9,0 / 7,0 kN/m
 - .3 Tensile strength (L/T): 17 / 12,5 kN/m
 - .4 Elongation at rupture (L/T); 60 / 65%
 - .5 Tear strength: 60 N
 - .6 Puncture resistance: 400 N
 - .7 Dimensional stability: (L/T): -0,3 / 0,3%
 - .8 Water vapor permeability (ASTM E96 B method) : 0,21 ng/ Pa.s.m²
 - .9 Creep strength: 105⁰C
 - .10 Cold bending: -30⁰C
 - .2 Cap sheet membrane, current portion, surveys and parapets.
 - .1 Prefabricated sealing foil sealing torch compatible, ASTM standard and CAN/CGSN-37.56-M, 9⁰ draft, composed of a non-woven polyester reinforced membrane and elastomer bitumen their outside surface covered and protected with colored granules and their inside surface covered with a thermofusible plastic film, with the following characteristics;
 - .1 Components:
 - .1 Frame: non-woven polyester 250g/m²
 - .2 Elastomer bitumen: selected bitumen and SBS polymer mixture.

- .3 Auto protection: light grey colored granules
- .2 Characteristics:
 - .1 Thickness: 4mm
 - .2 Creep resistance (L/T): 10 / 10 kN/m
 - .3 Tensile strength (L/T): 17 / 16 kN/m
 - .4 Elongation at rupture (L/T); 60 / 65%
 - .5 Tear strength: 75 N
 - .6 Puncture resistance : 420 N
 - .7 Dimensional stability: (L/T): -0,8 / -0,2%
 - .8 Creep strength: 110⁰C
 - .9 Cold bending: -30⁰C

2.7 SEALING TORCH COMPATIBLE MEMBRANE ADHESIVE

- .1 Bitumen based volatile solvent and adhesion improving additive primer, made to improve adhesion of heat-welded membranes on metal or concrete supports with the following characteristics;
 - .1 Bulk density at 20⁰C: 0,91 kg/L
 - .2 Solid contents: 35%
 - .3 Viscosity, Brookfield, 25⁰C: 50 cP
 - .4 Drying time: 1 to 12 hours
 - .5 Coming from same manufacturer as membranes

2.8 ADHESIVE PRIMER FOR SELF-ADHERING MEMBRANES

- .1 Primer made to improve self-adhesive membranes characteristics on porous supports at temperatures in excess of -10⁰C, composed with SBS synthetic rubber, epoxy resin, notorious for its adhesive power and volatile solvent with the following characteristics;
 - .1 Bulk density at 20⁰C: 0.79
 - .2 Solid contents: 24
 - .3 Viscosity, Brookfield, 25⁰C: 200 cP
 - .4 Drying time: 15 to 60 minutes
 - .5 Coming from same membrane's manufacturer.

2.9 BITUMEN

- .1 Type 2 asphalt CAN/CSA A123-.4-04 (R2013) standards.
 - .1 Full coverage adhesive layers hot-applied on vapour retarder and between each roof insulation panel layers.
 - .2 Identity: Black bituminous varnish.
 - .3 Composition: Thermoplastic polymers and volatile solvents modified petroleum pitch.

2.10 INSTALLATION

- .1 Roof support panel installation to galvanized steel decking.
- .2 Flat-headed self-drilling conical screws, of the required length, as recommended by panel manufacturer.

2.11 SEALANTS AND MASTICS

- .1 Aluminium coloured elastomer bitumen solvent based jointing mastic, formulated with high polymer content, giving superior resistance creep strength.

PARTIE 3 IMPLEMENTATION**3.1 WORKMANSHIP**

- .1 Examine support and parapets, carry out preliminary work and install roof in compliance with manufacturer's estimate, materials and products, and to the manual and specifications AMCQ, for roofing, especially related to fire safety.
- .2 Walls and roof interface must consist of steel plate or plywood, as indicated by drawings, to ensure waterproof membrane airtightness is continuous.

3.2 SUPPORT INSPECTION

- .1 Audit supports parapets, isolation joints, roof drains, vent pipes, ventilation outlets to make sure whether work can begin or not. Inform Departmental Representative of defects without delay, in writing.
- .2 Before proceeding, make sure:
 - .1 That roof support is solid, leveled, even, dried and without snow, ice or rime ice, that it has been swept clean from dust or waste, with a broom. It is forbidden to use calcium or de-icing salt in order to remove ice and snow.
 - .2 That curbs and base frames for apparatus are well-placed.
 - .3 That the prescribed spillage slopes of the decking are correctly given by roof framing.
 - .4 That plywood or softwood lumber nailing plates were installed on walls and/or parapets, as indicated.
- .3 It is strictly forbidden to install roofing while it is raining or snowing.

3.3 PROTECTION MEASURES

- .1 Protect walls, travel paths and works, next to places where pull up or set up material while work is being done.
- .2 Provide and install safety posters and safety barriers. Maintain in good working condition until end of work.
- .3 Remove bitumen drops or stains rapidly.
- .4 Make sure rain water is evacuated toward edge of roof, as far as possible from the front of buildings, until roof drains or funnels are installed and connected.
- .5 Protect roof from circulation damages. Take all necessary precaution measures that Departmental Representative finds necessary.
- .6 Avoid walking around on completed surfaces. Build plywood paths over materials used, in order to allow traffic for people and materials. Ask Departmental Representative beforehand.
- .7 After every working day or when closing down work because of bad weather, protect finished surfaces and materials that were taken out from storage rooms.
- .8 Install insulation at once, to prevent condensation under vapour retarder.
- .9 When metal connectors are used, these and support metal elements must be galvanized or treated against rust.

3.4 STEEL SHEATING

- .1 Must only use moisture-free, dry panels.
- .2 Inform Departmental Representative of degree of humidity, using a Humidistat.
- .3 Mechanically install concrete support panels to steel decking with screws, according to Factory Mutual standards.
- .4 Place concrete support panel lengthwise, perpendicular to decking ribs, so that end joint be lagged and completely laid on ribs.

3.5 SELF-ADHESIVE MEMBRANE PRIMER APPLICATION

- .1 Before beginning works, check roofs that are meant to be primed. All surfaces must be dust, residue and rust-free, to prevent adhesion problems.
- .2 Apply primer on modified bituminous membranes cover, in accordance with CGSB 37 - GP - 15M standards.
- .3 Apply self-adhesive membrane primer on concrete, metal or plywood surfaces used from 0.30 to 0.50 L/m².
- .4 Must not accelerate primer drying using sealing torch. Follow manufacturer's recommendations.
- .5 Cover primed surface the same day. Respect application temperature limits.

3.6 SELF-ADHESIVE VAPOUR RETARDANT INSTALLATION

- .1 Begin at the base, going perpendicularly to roof pitch. Roll out and align vapour retardant, ease it out, then wind from both edges.
- .2 Stick vapour retardant directly to support, removing paper sheet.
- .3 Override sheets at least 90mm on sides and 150mm on edges.
- .4 Vapour retardant must present neither blisters nor wrinkles.
- .5 Make sure vapour retardant is continuous.

3.7 APPLY COAT OF PRIMER FOR WELDED MEMBRANES

- .1 Ascertain, before beginning work, what roofs need to be primed. All surfaces must be dust, residue and rust-free, to prevent adhesion problems.
- .2 Apply primer on roof modified bitumen membrane in accordance with CGSB 37 - GP - 15M standards.
- .3 Apply on concrete or metal surfaces, one coat of bitumen primer accounting for 0.20 to 0.30 L/m².
- .4 Must not accelerate primer drying using sealing torch, follow manufacturer's recommendations.
- .5 Must cover primed surface on the same day. Must respect application temperatures required.

3.8 WELDED VAPOUR RETARDER INSTALLATION

- .1 Primer coat must be dry by the time to install vapour retarder.
- .2 manufacturer's recommendations. Roll out dry vapour retardant on support to facilitate alignment. Every selvedge must override previous selvedge by 75mm, following alignment provided for, override will be 150mm at the edges. Space out cross-cutting joints at least 300mm. Begin work from roof pitch base. In order to apply, melt membrane

bitumen so that bitumen bead is visible as membrane is rolled out, making sure vapour retardant membrane is totally bonded.

- .3 Vapour retardant must not present either blisters or wrinkles.
- .4 Roofing vapour retarder must join and override self-adhesive vapour retarder at the edges of roof making sure of a perfect continuity between the two surfaces.
- .5 At insulation edges, opposite to every part crossing through, pull up vapour retardant in order to allow impervious connection to under layer measured drawing.
- .6 Must not install more insulation on the same day than actual covered surface.

3.9 INSULATING BOARD INSTALLATION

- .1 Cover vapour retardant surface with hot asphalt according to manufacturer's recommendations.
- .2 Place panels next to each other, in close parallel rows, without strain or empty spaces. Fill the gaps left that are more than 5mm wide.
- .3 Install insulation according to industrial drawing and manufacturer's recommendations.
- .4 Cover hot bitumen insulation first layer according to manufacturer's recommendation.
- .5 Install insulation second layer, breaking joints with first layer.
- .6 Must not install more insulation on the same day than actual covered surface.

3.10 WATERPROOF MEMBRANE REALISATION

- .1 Install layer on underlay:
 - .1 Begin at the base, going perpendicularly to roof pitch. Roll out and align vapour retardant, ease it out, then wind from both edges.
 - .2 Roll out underlay membrane and weld using sealing torch on support panel; avoid burning either the membrane or its reinforcement.
 - .3 Overlap sheets by at least 90mm on the sides, 150mm to the edges. Overlap parapet underlay on current layer 100mm minimum.
 - .4 Underlay must not show either blistering or wrinkling.
 - .5 Pull membrane up at a height of 50mm on parapet and anchor with screws and washers at 300mm center.
- .2 Underlay installation on parapets and measured drawings.
 - .1 Roll out underlay by 1 meter wide layers perpendicularly to parapet axis on parapet vertical and horizontal parts. Pinch back underlay on external part.
 - .2 Override current part underlay 100mm. Override longitudinal joints 90mm. Space them out at least 100mm against current part underlay ones.
 - .3 Weld underlay directly to parapet support and drawings. Begin from bottom to top.
 - .4 Nail underlay at parapet top at every 300mm, middle part to middle part, using nails and washers, screw anchoring strip to parapet and current part junction.
- .3 Finishing membrane installation on current part:
 - .1 Begin at the base, going perpendicularly to axis of roof pitch. Roll out and align finishing membrane, then wind from both edges.
 - .2 Roll out finishing membrane and weld using sealing torch on under layer; avoid burning either the membrane or its reinforcement.

- .3 Overlap sheets by at least 90mm on the sides, 150mm to the edges. Finishing membrane joints must overlap the under layer by at least 300mm. Overlap parapet underlay on current layer 100mm minimum.
- .4 Finishing membrane must not present either blisters or wrinkles.
- .4 Finishing membrane installation on parapet and measured drawings:
 - .1 Roll out finishing membrane by 1 meter wide layers perpendicularly to parapet axis on vertical and horizontal parts. Overlap longitudinal joints 90mm and offset 100mm, against current part.
 - .2 Draw a line at 150mm on current part, parallel to measurement edge, parapet and scant strip.
 - .3 Proceed to current part finishing membrane degranulation between chalk line and parapet.
 - .4 Beginning from bottom part to top part, weld finishing membrane; must not overheat membrane nor make burr at joints.

3.11 AS-BUILT PROTECTION

- .1 Before installing protection panels, make sure waterproof membrane was not damaged.
- .2 Use protection panels to cover membrane that could be damaged by circulation, result of the work or any other source of damage.
- .3 Must not apply load or weight on membrane or insulant that could cause damage.

3.12 CLEANING

- .1 Clean in accordance with instructions section 01 74 11, Cleaning
- .2 Remove asphalt stains from finished surfaces.
- .3 In present section, when finished surfaces are stained, contact and consult appropriate manufacturer in order to find out counselling on how to follow cleaning instructions. Clean soiled or splashed surfaces to the satisfaction of the departmental representative, as in section hereunder.
- .4 Repair or replace damaged or altered finished surfaces as a result of the work covered by the contract.
- .5 Check whether roof drains are free and work correctly.
- .6 Remove inventory overage, remaining parts or equipment from construction site.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 01 35 29.06 – Health and security
- .2 07 52 00 – Modified bituminous membrane roofing
- .3 07 92 00 – Joint sealants.
- .4 08 11 00 – Metal doors and frames.
- .5 08 36 13 – Sectional metal doors.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A526-80, Standard Specification for Steel Sheet, Zinc-Coated (Galvanised) by Hot-Dip Process, Commercial quality.
 - .2 ASTM A653/A653M-[07], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement
- .3 Canadian Standards Association (CSA International)
 - .1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
 - .2 CSA B111-[1974(R2003)], Wire Nails, Spikes and Staples.
- .4 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI S8-08, Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 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 Shop Drawings:
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in province of Quebec, Canada.
- .4 Samples:
 - .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

- .5 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.4 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.1 PREFINISHED STEEL SHEET

- .1 Prefinished steel sheet, for exterior use, commercial quality, to ASTM A526-80 et ASTM A653/A653M-99a, zinc coating Z275, with silicone polyester coating to CSSBI S8-08.
 - .1 Gauge; as indicated on drawings.
 - .2 Color: as indicated on drawings.

2.2 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
- .3 Underlay for metal flashing: asphalt laminated 3.6 to 4.5 kg kraft paper.
- .4 Sealants: as defined in section 07 92 00 – Joint sealants..
- .5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.
- .6 Fasteners:
 - .1 Hidden fasteners: galvanized steel, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
 - .2 Exposed fasteners: #14, AB type Cadmium plated pre-painted hexagon head thread cutting screw, the same colour as flashing or molding, with incorporated support washer. Washers: 1mm thick in same material as sheeting, with EPDM rubber trimming.
- .7 Touch-up paint: as recommended by prefinished material manufacturer.

2.3 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work as indicated.
- .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.

2.4 METAL FLASHINGS

- .1 Form flashings, copings and fascias to profiles indicated with prefinished steel sheet, color and gauge as indicated.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install sheet metal work as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal.
 - .1 Secure in place and lap joints 100 mm.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
- .5 Lock end joints and caulk with sealant.
- .6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .7 Insert metal flashing under cap flashing to form weather tight junction.
- .8 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.
- .9 Caulk flashing at cap flashing with sealant.
- .10 Install pans, where shown around items projecting through roof membrane.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 61 00 - Common Product Requirements
- .3 Section 07 62 00 – Sheet metal flashing and trim.
- .4 Section 08 11 00 – Metal doors and frames

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C679 -03(2009), Standard Test Method for Tack-Free Time of Sealants.
 - .2 ASTM C719-14 Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
 - .3 ASTM C919-[02], Standard Practice for Use of Sealants in Acoustical Applications.
 - .4 ASTM D412-06a(2013), Standard Test Method for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .5 ASTM D624-00(2012), Standard Test Method for Tear Strength of Vulcanized Rubber and Thermoplastics Elastomers.
 - .6 ASTM D2240-05(2010), Standard Test Method for Rubber Property-Durometer Hardness.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.13-M87, Sealing Compound, One Component, Elastomeric, Chemical Curing.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's product to describe.
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Backup materials.
 - .4 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Submit duplicate samples of each type of material and colour.

- .5 Cured samples of exposed sealants for each color where required to match adjacent material.
- .6 Submit manufacturer's instructions in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Instructions to include installation instructions for each product used.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departemental representative.
- .8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .9 Fold up metal banding, flatten, and place in designated area for recycling.

1.6 PROJECT CONDITIONS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.
 - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
 - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:

- .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Engineer will arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of caulking and sealants. On request, ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

1.8 ACCEPTABLE MATERIALS AND PRODUCTS

- .1 When materials and products are prescribed by their commercial names, refer to Bidders Instructions for appropriate method to submit a demand for an equivalent product.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.
- .3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Primer: as recommended by manufacturer of sealant material.
- .2 Back-up materials. Compatible with primer and sealant material and oversized up to 30% @ 50%.
 - .1 Compressible closed-cell polyethylene or polyolefin. Backup materials must be compatible with the type of sealant and approved by the manufacturer of sealant.
- .3 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.
- .4 Sealant material designations: all products must be approved by CGSB ratification commission. When product has been tested for approval with a specific primer, only this primer must be use.

- .1 **Sealant, type 5:** Silicones One Part, to CAN/CGSB-19.13-M, colour by Departmental Representative choice, within the chart of manufacturer, and with these following characteristics:
 - .1 Silicone based one component high strength sealant.
 - .2 Content : 100% silicone.
 - .3 Workability : 30 – 40 minutes.
 - .4 Superficial drying time (24°C) (ASTM C679) : 3 - 4 hours.
 - .5 Hardness (ASTM D2240) : 24
 - .6 Tensile strength (ASTM D412) : 2.35 MPa.
 - .7 Movement capacity (ASTM C719) : $\pm 50\%$
 - .8 Curing time (6mm thickness) @ 24°C 50% R.H.: 3 – 4 days.
 - .9 Operating temperature : -48°C à 121°C.
- .2 **Sealant, type 7 :** Urethanes One Part, Non-Sag; complying to CAN/CGSB-19.13, Type 2, MCG-2-40-B-N, colour, by Departmental Representative choice, within the chart of manufacturer, and with following characteristics:
 - .1 Superficial drying time : 3 hours.
 - .2 Tack-free time : 3 - 6 hours.
 - .3 Curing time : 7 - 10 days.
 - .4 Hardness, Shore A (ASTM D2240) : 20 (± 5).
 - .5 Tensile strength (ASTM D412) at 21 days : 0,86 MPa.
 - .6 Elongation at break (ASTM D412) at 21 days : 700%.
 - .7 Elasticity modulus (ASTM D412) at 21 days : 25% = 0,13 MPa / 50% = 0,24 MPa / 100% = 0,34 MPa.
 - .8 Weathering resistance : Excellent.
 - .9 Operating temperature : -40 à 77°C.
- .3 **Sealant, type 9:** Urethanes One Part., Non-Sag, complying to CAN/CGSB 19.13-M87, Classification MCG-2-25-B-N, colours to Departmental Representative's choice, within the chart of manufacturer, and with following characteristics :
 - .1 Superficial drying time : 3 hours.
 - .2 Drying time (TT-S-00230C) : 4 hours.
 - .3 Curing time : 4 - 7 days.
 - .4 Tear resistance (ASTM D624) : 8.5 N/mm
 - .5 Tensile strength (ASTM D412) at 21 days : 1,37 MPa.
 - .6 Elongation at break (ASTM D412) at 21 days : 500%.
 - .7 Elasticity modulus (ASTM D412) at 21 days : 25% = 0,24 MPa / 50% = 0,41 MPa / 100% = 0,59 MPa.
 - .8 Weathering resistance : Excellent.
 - .9 Operating temperature : -40 - 77°C.

2.3 SEALANT SELECTION

- .1 Apply sealant according to following instructions, and as indicated on drawings. Refer to related sections for sealants installed by these sections. Apply sealant to other locations as indicated thereafter if not specified in other sections.

- .2 Type 5 sealant: for exterior use, in metal works. Section 07 62 00 – Sheet metal flashing and trim use this type of sealant.
- .3 Type 7 sealant: Interior perimeters of exterior wall openings, as detailed and itemized.
- .4 Type 9 sealant: Under aluminum threshold.

2.4 JOINT CLEANER

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .2 Primer: as recommended by manufacturer.

PART 3 EXECUTION

3.1 PROTECTION

- .1 Protect installed Work of other trades from staining or contamination.

3.2 SURFACE PREPARATION

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter 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.

3.3 PRIMING

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

3.4 BACKUP MATERIAL

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

3.5 MIXING

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

3.6 APPLICATION

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 01 33 00 – Submittal procedures.
- .2 06 10 01 – Rough carpentry.
- .3 07 92 00 – Joint sealants.
- .4 08 71 00 – Door hardware.
- .5 09 91 99 – Painting for minor works.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S704-01, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.
 - .2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

1.4 SUBMITTALS

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

- .2 Provide product data: in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware and fire rating and finishes.
 - .2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing or fire rating finishes.
 - .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
 - .4 Submit test and engineering data, and installation instructions.
- .4 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
- .5 Submit one 300 x 300 mm corner sample of each type of frame.
 - .1 Show butt cutout with hinge reinforcement.

1.5 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A653M, Z,275, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
- .2 Reinforcement: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653M, Z275.

2.2 DOOR CORE MATERIALS

- .1 Exterior door: stiffened: face sheets laminated, insulated core.
 - .1 Polyurethane: to CGSB 51-GP-21M rigid, modified poly/isocyanurate, closed cell board. Density 32 kg/m3.

2.3 ADHESIVES

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement. Use low VOC content adhesive.
- .2 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.

2.4 PRIMER

- .1 Zinc chromate touch-up prime CAN/CGSB-1.132-M90.

2.5 ACCESSORIES

- .1 Metallic paste filler: to manufacturer's standard.
- .2 Sealant: to section 07 92 00 – Joint sealants.

2.6 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Exterior frames: 2.0 mm welded, thermally broken type construction.
- .4 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
 - .1 Steel reinforcement :
 - .1 Mortised hinge : 3.6 mm thick.
 - .2 Mortised strike body: type ASA 125 X 32 mm, 1.8 mm thick.
 - .3 Imbed deadbolt : 1.8 mm thick.
 - .4 Surface door hardware: 2.6 mm thick.
- .5 Protect mortised cutouts with steel guard boxes.
- .6 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .7 Manufacturer's nameplates on frames and screens are not permitted.
- .8 Conceal fastenings except where exposed fastenings are indicated.
- .9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .10 Insulate exterior frame components with polyurethane insulation.

2.7 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.8 FRAMES: THERMALLY BROKEN TYPE

- .1 Frames must be totally welded.
- .2 Welding in accordance with CSA W59.

- .3 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .4 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .5 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .6 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .7 Thermally broken type frames, to be filled with insulation.
- .8 Securely attach floor anchors to inside of each jamb profile.
- .9 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.9 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush, with provision for glass openings as indicated.
- .2 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.
- .3 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware in accordance with ASTM E330.
- .4 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.
- .5 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .6 Reinforce doors where required, for surface mounted hardware. Provide flush top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .8 Manufacturer's nameplates on doors are not permitted.

2.10 THERMALLY INSULATED DOORS

- .1 Form face sheets for exterior doors from 1.6 mm sheet steel with polyurethane core laminated under pressure to face sheets.
- .2 Doors will have vertical reinforcement profile welded to each face at 150mm C/C.
- .3 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.
- .4 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION GENERAL

- .1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
- .2 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material
- .6 Maintain continuity of air barrier and vapour retarder.

3.4 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latchside and head: 1.5 mm.
 - .3 Finished floor : 13 mm.
- .3 Adjust operable parts for correct function.

3.5 PRIMER TOUCH UP

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 78 00 - Closeout Submittals.
- .4 Section 09 91 99 - Painting for minor works.
- .5 Division 26 – Electrical (Electrical Engineer sections)

1.2 REFERENCES

- .1 Door and Access Systems Manufacturers Association, International (DASMA)
 - .1 ANSI/DASMA 108-2012, Standard Method For Testing Sectional Garage Doors And Rolling Doors: Determination Of Structural Performance Under Uniform Static Air Pressure Difference.
 - .2 ANSI/DASMA 102-2004, American National Standard Specifications for Sectional Doors.
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A653M-97, Standard Specification for Steel Sheet, Zinc-Coated (Galvanised or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM C518-91, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .3 ASTM E283-04(2012), Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .3 Canadian Standards Association (CSA International).
 - .1 CSA G164-M92 (C1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Canadian General Standards Board (CGSB).
 - .1 CGSB 51-GP-21M, Thermal Insulation, Urethane, and Isocyanurate, Unfaced.
 - .2 CGSB 51.26-M86, Thermal Insulation, Urethane, and Isocyanurate, Faced.

1.3 SYSTEM DESCRIPTION

- .1 Design Requirements.
 - .1 Design exterior door assembly to withstand windload of 1 kPa with a maximum horizontal deflection of 1/360 of opening width.
 - .2 Design door panel assemblies with thermal insulation factor 2.8 RSI.

- .3 Design door assembly to withstand minimum 20 000 cycles per annum, and 10 years total life cycle.

1.4 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
 - .1 For caulking materials during application and curing.
 - .2 For door materials and adhesives.
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate sizes, service rating, types, materials, operating mechanisms, glazing locations and details, hardware and accessories, required clearances and electrical connections.
 - .3 Structural frame shop drawings approved by an engineer practicing in province of Quebec.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .4 Manufacturers' Field Reports: submit copies of manufacturers field reports.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for overhead door hardware for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.6 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.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal, and with Waste Reduction Workplan.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Dispose of corrugated cardboard, polystyrene, plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

- .5 Divert unused paint material from landfill to official hazardous material collections site approved by Departmental Representative.
- .6 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.
- .7 Unused or damaged glazing materials are not recyclable and must not be diverted to municipal recycling programs.

1.8 MAINTENANCE INSTRUCTIONS

- .1 Provide maintenance instructions necessary to ensure effective operation and good maintenance of doors hardware and electric operators and join these informations to Operating and Maintenance Manual described in Section 01 78 00 – Closeout submittals.

1.9 QUALIFICATIONS

- .1 Installation for works of this section have to be performed by experimented manufacturer's approved company employing qualified and experimented personnel for that kind of installation with necessary licenses and being in order with regulatory authorities (RBQ, CCQ, CSST).

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Galvanized steel sheet: commercial quality Z275 zinc coating.
- .2 26 gauge galvanized steel sheet in accordance with ASTM A653-97 & ASTM 653M-97, has G.60 coating, in manufacturers standard colour. The galvanized steel sheet has a zinc coating with a minimum of 180 g/m² (0.04 lb/in²). The surface of the steel sheet is woodgrain with decorative horizontal grooves. The polyester paint finish, 2 layers, conforms to standard A.S.T.M. A653-97 & A.S.T.M. A653M-97 and has a thickness of 1.0 mils.
- .3 Aluminum extrusions: Aluminum Association alloy AA6063-T5.
- .4 Insulation: High-pressure, CFC-Free, polyurethane foam has been injected between the walls of each panel. Its density is 40.4 kg/m³ (2.5 lb/ft³) with a thermal resistance factor of RSI 1.6 per 25 mm (1") of thickness. The total insulation factor is R-16, RSI 2.8 (k = 0.357 W/m²K) (A.S.T.M. standard C-518-91). This insulation is in accordance with standards ONGC 51-GP-21M and 51.26-M86.
- .5 Reinforcements : Hinge fasteners, panel reinforcement fastener for mechanical lifting device and handles: steel reinforcement 14 gauge.
- .6 Panels ends: A block of dry pine (grade 4) is inserted at both ends of each insulated garage door section for the fastening of the lateral hinges.
- .7 Glazing: Clear double thermo pane windows shall have a total thickness of 22.2 mm (7/8"). The 3 mm (1/8") panes are sealed in aluminum extrusions. The windows are inserted in an expanded PVC frame and factory installed by the manufacturer.
- .8 Cable: multi-strand galvanized steel aircraft cable.

2.2 DOORS

- .1 The panels are shaped with 26 gauge steel and electronically injected with high-pressure polyurethane for a total minimum thickness of 44.5 mm (1 3/4").
 - .1 Acceptable products :
 - .1 Model G-5000, manufactured by Garaga Inc.
 - .2 Model BM-175 (Barimax), manufactured by Portes Baril Inc.
 - .3 Model GX-175S manufactured by Garex Inc.
 - .4 Replacement materials or products: approved by addenda to bidders instructions.
- .2 The doors shall have sizes and features specified on drawings.
- .3 Fabricate panel frames in a continuous box frame with vertical stiffeners at 600 mm centres.
- .4 Install glazing for vision panels. Sizes and number of vision panels as indicated.
- .5 Assemble components by means of spot or arc welding or coated rivet system or adhesive and self tapping screws to manufacturer's recommendations.
- .6 Fabricate doors from prepainted steel stock, color choice by Departemental Representative.

2.3 WEATHER TIGHTNESS

- .1 Provide and install continuous weatherstripping at the bottom of the lower panel. The weatherstripping shall be made of a U-shape black PVC extrusion as well as a semi-circular E.P.D.M. rubber tubing.
- .2 Inset weatherstripping of flexible and rigid PVC shall be found at the intersection of each panel. This type of weatherstripping will ensure an efficient thermal barrier as well as double weather tightness in accordance with the following standards: when submitted to a pressure of 0.075 kPa, which is equivalent to winds of 40 km/h, the air infiltration rating as measured using standard A.S.T.M. E-283 shall be of 0.033 liter/second per meter of joint between the door sections.
- .3 Provide and install, on the exterior side of the door jambs and lintel, weatherstripping made up of an aluminum extrusion as well as a double-edged strip of arctic vinyl. This weatherstripping shall be adjustable and come with rigid PVC screw cover.

2.4 HARDWARE WITH TORSION SPRINGS

- .1 Track: standard hardware with 76 mm size 2.66 mm core thickness galvanized steel track.
- .2 Track Supports: 2.3 mm core thickness continuous galvanized steel angle track supports.
- .3 Spring counter balance: heavy duty oil tempered torsion spring with manufacturers standard brackets.
 - .1 Drum: 200 mm diameter die cast aluminum.
 - .2 Shaft: 32 mm diameter galvanized steel.
- .4 Top roller carrier: galvanized Steel 3.04 mm thick adjustable.
- .5 Rollers: full floating grease packed hardened steel, ball bearing 75 mm diameter solid steel tire.

- .6 Roller brackets: adjustable, minimum 2.5 mm galvanized steel.
- .7 Hinges: heavy duty, 3.04 mm thick stainless steel as recommended by manufacturer.
- .8 Cable: 6 mm diameter galvanized steel aircraft cable.

2.5 ACCESSORIES

- .1 Overhead horizontal track and operator supports: galvanized steel, type and size to suit installation.
- .2 Track guards: 5 mm thick formed sheet 1500 mm high track guards.
- .3 Pusher springs.
- .4 Locking and operating devices :
 - .1 Horizontal bars locking device with night latch and electric locking contact.
 - .2 Key operable exterior operation switch and buttons operable switch inside.
- .5 One horizontal sliding lock bolts on interior.
- .6 Weather stripping.
 - .1 Sills: double contact full width extruded neoprene weatherstrip.
 - .2 Jambs and head: extruded aluminum and arctic grade vinyl weatherstrip to manufacturer's standard.
- .7 Finish ferrous hardware items with minimum zinc coating of 300 g/m² to CSA G164.

2.6 ELECTRICAL OPERATOR

- .1 Jack shaft electrical door operators.
- .2 Electrical motors, controller units, remote pushbutton stations, relays and other electrical components: to CSA approval with CSA enclosure type.
- .3 Industrial class jack shaft electric operator with electric brake (with manual chain operation) :
 - .1 Heavy duty construction for 50 cycles per day operation :
 - .2 Motor : 1/2 HP, 115V, 1 phase.
- .4 Controller units with integral motor reversing starter, solenoid operated brake 3 heater elements for overload protection, including pushbuttons and control relays as applicable.
- .5 Operation: NEMA 1, Electric box.
 - .1 Remote pushbutton stations : mounted at prescribed locations and provided with identified pushbutton : OUVRIR-ARRÊT-FERMER, VERROUILLAGE DE SÉCURITÉ, key operated.
- .6 Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom section of door, to reverse door to open position when coming in contact with object on closing cycle.
- .7 For jack shaft operators:

- .1 Provide floor level disconnect device to allow for manual operation in event of power failure.
- .2 Equip Operator with:
 - .1 Electrical interlock switch to disconnect power to operator when in manual operation.
 - .2 Built-in chain hoist for manual operation in event of power failure.
- .8 Door speed: 300 mm per second.
- .9 Control transformer: for 24 VAC control voltage.
- .10 Mounting brackets: galvanized steel, size and gauge to suit conditions.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION OR DISPLACEMENT

- .1 Install doors and hardware in accordance with manufacturer's instructions.
- .2 Rigidly support rail and operator and secure to supporting structure.
- .3 Touch-up steel doors with primer where galvanized finish damaged during fabrication.
- .4 Install operator including electrical motors, controller units, pushbutton stations, relays and other electrical equipment required for door operation.
- .5 Lubricate and adjust door operating components to ensure smooth opening and closing of doors.
- .6 Adjust weatherstripping to form a weather tight seal.
- .7 Adjust doors for smooth operation.

3.3 FIELD QUALITY CONTROL

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract.
- .2 Manufacturer's field services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits to review Work at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.

- .2 Upon completion of Work, after cleaning is carried out.
- .4 Obtain reports within three days of review and submit.

3.4 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking; clean doors and frames.
- .3 Clean glass and glazing materials with approved non-abrasive cleaner.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Section 01 61 00 - Common Product Requirements.
- .3 Section 01 78 00 - Closeout Submittals.
- .4 Section 08 11 00 - Metal doors and frames.
- .5 Section 09 91 99 – Painting for minor works.

1.2 REFERENCES

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

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .3 After approval samples will be returned for incorporation in the Work.
- .3 Hardware List:
 - .1 Submit contract hardware list in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .4 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .5 Closeout Submittals
 - .1 Provide operation and maintenance data for door closers, locksets, door holders electrified hardware and fire exit hardware for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements:

- .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .2 Storage and Protection:
 - .1 Store finishing hardware in locked, clean and dry area.

1.6 WASTE DISPOSAL AND MANAGEMENT

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

1.7 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

1.8 ACCEPTABLE MATERIALS AND PRODUCTS

- .1 When materials and products are prescribed by their commercial names, refer to Bidders Instructions for appropriate method to submit a demand for an equivalent product.

PART 2 PRODUCTS

2.1 HARDWARE ITEMS

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

2.2 DOOR HARDWARE

- .1 Refer to list of door hardware.

2.3 FASTENINGS

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

2.4 KEYING

- .1 Permanent lock cores will be provided by Departmental Representative and installed by Contractor.
- .2 Provide and install temporary lock cores until work is accepted.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
 - .2 Where door stop contacts door pulls, mount stop to strike bottom of pull.
 - .3 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
 - .4 Remove construction cores when directed by Departmental Representative; install permanent cores and check operation of locks.
-

3.3 ADJUSTING

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to provide tight fit at contact points with frames.

3.4 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacture's instructions.
- .3 Remove protective material from hardware items where present.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.5 DEMONSTRATION

- .1 Maintenance Staff Briefing:
 - .1 Brief maintenance staff regarding:
 - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
 - .2 Description, use, handling, and storage of keys.
 - .3 Use, application and storage of wrenches for door closers, locksets and fire exit hardware.
- .2 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.6 SCHEDULE

- .1 Replacement materials or products: approved by addenda to bidders instructions.

- Groupe 01

QTY	DESCRIPTION	FINI	FABRICANT
1	CONTINUOUS HINGE # A156.26 GR1 X H.R.	630	voir liste
1	PANIC BOLT A156.3 X F08	630	voir liste
1	DOOR CLOSER CO2021	689	voir liste
1	KICK PLATE J102-200 X L.R.	630	voir liste
1	WEATHERSTRIPPING # R3B164 X L.R.	628	voir liste
1	ALUMINUM THRESHOLD # J12190 X L.R.	628	voir liste
1	DOOR BOTTOM # R3A536 X L.R.	628	voir liste

Continuous hinge :

FM300 x H.R. FINI 630 from **MARKAR** or;
MCK-FM300 X H.R. FINI 630 from **McKINNEY** or;
#651 X H.R. FINI 630 from **STANLEY**

Panic bolt :

ED5200 x L955 x fini 630 from **CORBIN** or;
7100 x cr626F x fini 630 from **YALE** or;
98TP x 996L-03 X FINI 630 de **VON DUPRIN**

Door closer :

CPS7500 X FINI 689 de **NORTON** or;
DC6200 X A14 X FINI 689 from **CORBIN** or;
4040-SP-CUSH FINI 689 from **LCN**

Kick plate :

K0050-200 X L.R. FINI 630 from **TRIMCO** or;
K1050-200 X L.R.FINI630 from **ROCKWOOD** or;
GSH80-200 X L.R. FINI 630 from **GALLERY**

Weatherstripping :

W-16n x l.r. Fini 628 from **KNC** or;
1650 x l.r. Fini 628 from **UNIQUE** or;
296CR x l.r. Fini 628 from **PEMKO**

Aluminum threshold :

Ct-44-1 x CT-41-1 x CT-41-1 x CT-42-1 x ± 1050 mm, Fini 628 from **KNC** or;
AB2 x ABBT x AB33 x ABBT x AB5 x ± 1050 mm, Fini 628 from **UNIQUE** or;
355 x 5AFG x 184AT x ± 1050 mm, Fini 628 from **PEMKO**

Door bottom :

8198A x l.r. Fini 628 from **ZERO** or;
345ANB x l.r. Fini 628 from **PEMKO** or;
R480 x l.r. Fini 628 from **UNIQUE**

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal procedures.
- .2 Section 05 41 00 – Structural metal stud framing.
- .3 Section 07 21 13 – Board insulation.
- .4 Section 07 21 16 – Blanket insulation.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C840-13, Standard Specification for Application and Finishing of Gypsum Board.
 - .2 ASTM C1002-14, Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .3 ASTM C1177-01, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .4 ASTM C1280-99, Specification for Application of Gypsum Sheathing Board.
 - .5 ASTM E84-15, Standard Test Method for Surface Burning Characteristics of Building Material.
 - .6 ASTM E136-12, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-1988(R2000), Surface Burning Characteristics of Building Materials and Assemblies.

1.3 SUBMITTALS

- .1 Submit technical data and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Technical data must contain description and dimensions of each component.
- .3 Submit any additional samples requested by Departmental Representative.
- .4 Submit duplicate 300 x 300 mm size samples of gypsum board.

1.4 STORAGE AND HANDLING

- .1 Handle materials to prevent any damage to wrapping, strapping, brand name and product identification.
 - .2 Store materials inside, level, under cover. Protect from weather, damage from construction operations and other causes, in accordance with manufacturer's printed instructions.
-

- .3 Handle the drywall in order not to damage their surfaces or ends. Also protect the metal parts and fittings for damage or twisting that can damage them to edges or surfaces.

1.5 SITE CONDITIONS

- .1 Maintain room temperature at least 10 degrees Celsius and a maximum of 21 degrees Celsius for 48 hours before and during installation and grouting of plasterboard, and for at least 48 hours after completion of the joints.
- .2 Install gypsum boards on dry and frost free surfaces.

1.6 WASTE DISPOSAL AND MANAGEMENT

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal and place in appropriate on-site bins for recycling..
- .3 Dispose of gypsum board and unused gypsum materials to recycling facility.

PART 2 PRODUCTS

2.1 MATERIALS AND PRODUCTS : GENERAL

- .1 Boards dimensions: unless otherwise indication, use maximum practical width and length available to minimize joints and fit indicated supports spacing.

2.2 REINFORCED EXTERIOR GYPSUM BOARD (Exterior sheathing board)

- .1 Paperless gypsum panels, sealed core reinforced on each side with an integrated glass fiber mat and having the following characteristics:
 - .1 Homologation: ASTM C1177, ASTM E84, ASTM E 136 and CAN/ULC-S102M
 - .2 Width : 1220 mm.
 - .3 Thickness : 12,7 mm.
 - .4 Edges : square.
- .2 Acceptable products:
 - .1 GLASROC from CERTAINTEED;
 - .2 DENS GLASS from GEORGIA-PACIFIC;
 - .3 SECUROCK from CGC;
 - .4 Replacement materials or products: approved by addenda to bidders instructions.

2.3 ACCESSORIES

- .1 Self-drilling steel screws: to ASTM C1002. Buggle head screw (S type, S-12) self drilling with rustproofing treatment, for exterior use. For gypsum boards fastening to metal studs; drilling capacity and size as recommended by gypsum boards manufacturer.
- .2 Self-adhesive joint sealing tape: as recommended by gypsum boards manufacturer.

PART 3 EXECUTION

3.1 QUALITY OF WORK

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Install gypsum board wall finishes in accordance with ASTM C1280, except where specified otherwise.
- .3 Install components leveled ; permitted deviation 1:1200.

3.2 APPLICATION

- .1 Do not apply gypsum boards measuring less than 300mm wide.
- .2 Cut boards carefully around other materials: 3 mm maximum joint width.
 - .1 Respect manufacturer's requirements.
- .3 Apply gypsum board with finishing face on exterior side.
- .4 Do not apply damaged (broken or chipped) gypsum boards.

3.3 INSTALLATION

- .1 Make deflection joints under spandrel beam level, as indicated on drawings.
- .2 Seal joints with self-adhesive tape.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal procedures.
- .2 Section 01 74 11 – Cleaning.
- .3 Section 03 30 00 – Cast in place concrete (Structural engineer specifications).

1.2 REFERENCES

- .1 American Society for Testing and Materials, (ASTM).
 - .1 ASTM D 635 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position (vitesse de combustion ou étendue et délais de combustion des plastiques autoportants dans une position horizontale).
 - .2 ASTM E84 – Surface Burning Characteristics of Building Materials (caractéristiques de combustion superficielle des matériaux de construction).
- .2 ACI Committee no. 503.

1.3 QUALITY ASSURANCE

- .1 Application contractor for this section must have a minimum 5 years' experience in the application of the type of system specified and have all the tools and equipment needed to execute complete work.
- .2 Manufacturer's technical representative must be on site to check condition of concrete and surfaces, work conditions, application materials and techniques to ensure compliance to manufacturer's requirements and to this section.
- .3 Convene Manufacturer's technical representative at least 72 hours prior to make application sample. He must be on site for sample application.
- .4 Application contractor must hire, at its own expense, an independent building materials testing laboratory to check humidity and alkalinity of concrete slab prior to execute application sample. This laboratory must confirm in writing to Departmental Representative that concrete is complying to manufacturer's requirements for coating application.

1.4 SUBMITTALS

- .1 Submit documents and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit technical data in accordance with Section 01 33 00 – Submittal procedures.
 - .1 Product datasheets, including materials description, storage and implementation conditions, recommended installation materials and instructions for each type of epoxy coating specified.
 - .2 Submit three (3) copies of manufacturer's datasheet for each specified material or product.

- .3 Keep at site office one copy of technical data.
- .3 Submit full color palette for Departmental Representative's selection.
- .4 Submit two (2) representative samples of specified coating material on hardboard with specified texture and color as selected by Departmental Representative for verification.
- .5 Submit any supplemental sample of product or accessory material requested by Departmental Representative.

1.5 MOCK-UP

- .1 Prior to mock-up preparation make sure that both, manufacturer's technical representative and materials laboratory are present and have checked substrate condition (humidity and alkalinity).
- .2 Departmental Representative will determine mock-up location and scope. Departmental Representative may ask any other mock-up specified in this section.
 - .1 Make any correction or adjustment asked by Departmental Representative.
 - .2 Mock-up, once approved, may be part of final work.
 - .3 Protect appropriately approved mock-up until final acceptance of works.
 - .4 Approved mock-up represent the standard for final work quality.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and store materials within manufacturer's recommended temperatures (between 16° and 30°C).
- .2 Store materials in original undamaged packaging with manufacturer's labels in a dry closed room protected from moisture.

1.7 SITE CONDITIONS

- .1 Unless otherwise specified in datasheets maintain constant ambient room and substrate surface temperature between 16°C and 30°C for 24 hours before installation, during installation and at least 48 hours after installation or until cured.
- .2 Concrete substrate must be clean and complying to epoxy coating manufacturer's requirements.
 - .1 Moisture content of concrete substrate must be within manufacturer's requirements.
 - .2 Alkalinity : Ensure that concrete substrate alkalinity is complying to manufacturer's requirements before coating application.
 - .3 Both concrete substrate moisture and alkalinity have to be checked and measured by independent building materials testing laboratory as indicated under article 1.3.4.
 - .4 Ensure adequate and continuous ventilation and air flow during application and whole curing period.
 - .5 Do not apply epoxy coatings where dust-generating works are ongoing. Isolate application area from other works during substrate preparation and coating application.

- .6 Comply to any other requirement from manufacturer's technical data.

1.8 SECURITY AND ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

PART 2 PRODUCTS

2.1 MANUFACTURER

- .1 Get all coating materials including primers, resins, hardening agents, finishing or protection coatings from the same manufacturer. All the coating materials have to be from unique manufacturer.

2.2 EPOXY COATING

- 1. Resinous Flooring System with slip-free finish:
 - .1 Resinous Flooring System two component, solid colour, high solids, silicone free, low viscosity, self-priming, smooth, glossy epoxy finish complying to ASTM C579 and as follows:
 - .1 **Prime coat** : one coat of two components self-priming epoxy coating to: ASTM D695
 - .1 thickness: 8 mils (w.f.t.)
 - .2 Reference product : Sikafloor 261^{CA} or approved equivalent.
 - .2 **Finishing coat** : one coat of two components self-priming epoxy coating to: ASTM D695
 - .1 thickness: 15 mils (w.f.t.)
 - .2 Reference product : Sikafloor 261^{CA} or approved equivalent.
 - .3 **Anti-slip material** : crushed quartz grains.
 - .1 Grains size and density to comply Departmental Representative's approved mock-up.

2.3 SUBSTRATE REPAIR MATERIAL

- .1 Cementitious one component mortar for concrete repair, high initial compressive strength, fast hardening, recommended by epoxy coating manufacturer and as follows:
 - .1 Initial set (ASTM C266) : 45-65 min.
 - .2 Final set (ASTM C266) : 55-100 min.
 - .3 Compressive strength (ASTM C109) : 1 day=30 MPa / 7 days=40 MPa / 28 days = 50 MPa.
 - .4 Flexural strength, 28 days (ASTM C78) : 8,0 MPa.
 - .5 Bonding resistance, 28 days (ASTM C882, modified) : 15,5 MPa.
 - .6 Direct tension resistance, 28 days (ACI 503) : >2 MPa (substrate rupture).

2.4 MIXTURES

- .1 Mix and prepare every product in strict compliance to manufacturer's instructions. Unless otherwise indicated, follow manufacturer's technical data instructions regarding; dosage, mixing, resting period prior to application. Do not agitate mixtures too strongly to avoid including air bubbles in mixture.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

- .1 Prepare surface to receive flooring systems in accordance with manufacturer's written instructions and to manufacturer's representative satisfaction.
- .2 Protect adjacent surfaces and material against damages.
- .3 Prior to any application work, prepare substrate using blasting machine (Blastrac), surface grinder (orbital) and/or any other manufacturer's approved mechanical method. Mechanical preparation must be sufficient to create a porous surface suitable for coating application.
- .4 Preparation:
 - .1 Wash and decontaminate surfaces, pressure rinse well with clear water and allow to dry . Prepare surfaces (mechanical blasting and grinding) to open cells matte finish (no lustre at all).
 - .2 Pressure rinse well with clear water and allow to dry. Vacuum clean surfaces.
 - .3 Coordinate with Departmental Representative protection means to avoid dust spreading to existing occupied building. Isolate installation area from the rest of building with air/dust-tight separation and provide temporary ventilation system to evacuate stale air.

3.2 EPOXY COATING APPLICATION

- .1 Do not apply coating on concrete slab less than 28 days from concrete pouring.
- .2 Fill any void and repair substrate surface defects with substrate repair mortar complying with manufacturer's recommendations and instructions.
 - .1 Allow to dry at least 6 hours (or more, as recommended) prior to apply epoxy coating.
- .3 **Prime coat** : Apply epoxy coating first coat with roller to indicated thickness;
 - .1 8 mils (wet film thickness).
- .4 **Anti-slip finishing coat** : Respecting manufacturer's recommended wait time between coats, apply second coat with roller to indicated thickness then sprinkle quartz grains to realise approved texture (mock-up) and embed grains in coating with roller.
 - .1 15 mils (wet film thickness).

- .5 Apply resinous floor coating with care complying with manufacturer's documents and representative's instructions to ensure that no laps, voids, or other marks or irregularities are visible. Apply to achieve appearance of uniform colour, sheen and texture.
- .6 Apply each component of coating system strictly complying with written manufacturer's instructions to obtain monolithic coating of specified thickness. Use manufacturer's recommended equipments and methods to obtain approved texture and finish. Follow manufacturer's instructions regarding application ambient and substrate temperatures, substrate moisture, cure and wait time. Apply coating to construction joints cavity, then fullfill cavity.
- .7 Prohibit access to installation area during manufacturer's recommended period of time. Protect finished floors until final inspection. Provide relevant instructions to workers who have to work over freshly finished floors. If required, cover floors completely with manufacturer's recommended protection sheet, at the expense of Contractor from this section.

3.3 MATERIALS TESTING LABORATORY

- .1 Departmental Representative retains the right to hire at his own fees a materials inspection and testing laboratory to monitor coating materials and installation.
- .2 This laboratory will be allowed to perform tests to assess manufacturer's published materials characteristics with appropriate testing methods.
- .3 If tests results show that implemented materials are not complying to specifications from this section, Departmental Representative may require removal and replacement of installed materials at the expense of Contractor from this section.

3.4 CLEANING

- .1 Remove any stain, dirt, splash or foreign matter from finished floors. Remove masking tape.
- .2 Clean finished floors with manufacturer's recommended cleaner.
- .3 Remove temporary protections.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, 2004.
 - .2 MPI - Maintenance Repainting Manual, 1998.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 85-GP-16M, Galvanised Steel Painting.

1.2 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit product data and instructions for each paint and coating product to be used.
 - .2 Submit product data for the use and application of paint thinner.
 - .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application and curing.
 - .4 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .5 Submit manufacturer's installation and application instructions.

1.3 STORAGE AND HANDLING

- .1 Storage and Protection:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well ventilated area within temperature as recommended by manufacturer.
- .2 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Place materials defined as hazardous or toxic waste, including tubes and containers, in containers or areas designated for hazardous waste.
- .4 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

1.5 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces.
 - .2 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .3 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.
 - .2 Test concrete, masonry and plaster surfaces for alkalinity as required.
 - .3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.
- .3 Additional application requirements:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

PART 2 PRODUCTS

2.1 MATERIALS AND PRODUCTS

- .1 Paint products and sealants listed in MPI "Approved Products Listing" can be used in the framework of the work to be done.
- .2 All products included in the paint system must come from the same manufacturer.
- .3 Must comply with the MPI most recent version of paint coating requirements, including different surfaces preparation and wash primer or primer sealer application.
- .4 Must only use products listed on MPI "Approved Products Listing", whether they are wash primers, primer sealers, paints, sealants, varnish, dyes, lacquers, grain filler, thinner, paint remover or others. The list can be found in MPI – Architectural Painting Specification Manual and MPI – Maintenance Repairing Manual.

2.2 METAL CONDITIONER AND RUST REMOVER:

- .1 1. Phosphoric acid cleaner and remover designed to improve paint adherence on any metal surface and delay the spread of rust under paint coats.
 - .1 CAN/ONGC 31-GP-107, Type 2 standard

2.3 PRIMER FOR GALVANIZED STEEL:

- .1 Ultra adhering, ultra-hiding and ultra-resistant latex primer made for aluminium surfaces and galvanized metal whether corroded or new, with the following characteristics:
 - .1 Composition
 - .1 Thinner: Water
 - .2 Binding agent: Acrylic polymer emulsion
 - .3 Volatile organic compounds ASTM D3960-05: <100 g/L
 - .4 % Solid by volume: 37%
 - .2 Film Minimum Thickness
 - .1 Damp: 3,2 mils
 - .2 Dry: 1,2 mils

2.4 ANTI-RUST ENAMEL

- .1 Alkyd resin, urethane and silicone based anti-rust and plastic enamel paint, made for metal surfaces only. Ultra-resistant, ultra-hiding and high-gloss finish with the following characteristics:
 - .1 Gloss level: High-gloss, reflection 60°: 85 – 100%;
 - .2 Composition
 - .1 Thinner: Hydrocarbon
 - .2 Binding agent: Polyurethane-fortified alkyd based
 - .3 Volatile organic compounds ASTM D3960-05: <400 g/L
 - .4 % Solid by volume: 50%
 - .3 Film Minimum Thickness
 - .1 Damp: 3,2 mils
 - .2 Dry: 1,6 mils

2.5 COLORS

- .1 Summit at less 5 colors choice for the Departmental Representative.

2.6 MIXING AND APPLICATION COLOR

- .1 Some diluent may, if necessary, be added to the paint according to the manufacturer's recommendations. Kerosene or similar organic solvent should not be used to dilute the water-based paints.
- .2 Dilute the paint to be applied to the gun according to manufacturer's instructions

- .3 Before and during application, mix thoroughly the paint in the container to break up clumped materials to ensure complete dispersion of pigments deposited, and to preserve the uniformity of color and gloss of the paint applied.

2.7 PAINT SYSTEMS

.1 System 1 : System galvanized metal surfaces (doors, frames and bollards)

- .1 Prepare surfaces in accordance with CAN / CGSB-85.10-99 standard and according to the instructions of the manufacturer of the primer.
- .2 Surface treatment with a metal cleaner and rust.
- .3 Rinse with clear water under pressure.
- .4 Primary: a primer for galvanized steel.
- .5 Topcoat: two layers of rust alkyd gloss enamel for metal.

.2 System 2 : System exposed structural columns

- .1 Preparation of structural steel: welds and touch up areas where the primer applied workshop was damaged with a primer paint to CAN / CGSB-1.10-97 standard.
- .2 Topcoat: two layers of rust alkyd gloss enamel for metal.

PART 3 EXECUTION

3.1 GENERAL

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.
- .2 Perform preparation and operations for interior painting in accordance with MPI - Architectural Painting Specifications Manual and MPI - Maintenance Repainting Manual except where specified otherwise.

3.2 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions and do not proceed before conditions have been corrected.
- .2 Except otherwise specified, prepare substrates and realize painting works complying to MPI - Architectural Painting Specifications Manual and MPI – Maintenance Repainting Manual.

3.3 PREPARATION

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by 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 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
- .3 Before applying the primer or printing and between subsequent layers, prevent the cleaned surfaces are not contaminated with salts, acids, alkalis, corrosive chemicals, grease, the oil and solvents. Apply the primer or the print product, paint or any other prior treatment product as soon as possible after cleaning, before the surface is contaminated again. SPEC NOTE: Use water blasting only when necessary for extreme cases of contamination by oily residue and where hand washing is impractical.
- .4 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.
- .5 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements.
- .6 Touch up of shop primers with primer as specified.
- .7 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.4 APPLICATION

- .1 Method of application to be as approved by Departmental Representative. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .3 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .4 Sand and dust between coats to remove visible defects.

3.5 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Do not paint over nameplates.
- .2 Keep sprinkler heads free of paint.
- .3 Paint fire protection piping red.
- .4 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .5 Paint natural gas piping yellow.

END OF SECTION

Approved: 2006-09-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 032000 – Concrete reinforcing
- .2 033000 – Cast in place concrete
- .3 033500 – Concrete finishing

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-O86S1, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
 - .3 CSA O121 Douglas Fir Plywood.
 - .4 CSA O151, Canadian Softwood Plywood.
 - .5 CSA O153, Poplar Plywood.
 - .6 CAN/CSA-O325.0, Construction Sheathing.
 - .7 CSA O437 Series, Standards for OSB and Waferboard.
 - .8 CSA S269.1, Falsework for Construction Purposes.
 - .9 CAN/CSA-S269.3, Concrete Formwork, National Standard of Canada
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for recycling.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Divert wood materials from landfill to a recycling facility as approved by ministry Representative.
 - .4 Divert plastic materials from landfill to a recycling facility as approved by ministry Representative.
 - .5 Divert unused form release material from landfill to an official hazardous material collections 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 to CSA-O121 and CAN/CSA-O86.

- .2 Form ties:
 - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
 - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .3 Form release agent: non-toxic, biodegradable, and low VOC.
- .4 Falsework materials: to CSA-S269.1.

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.
- .2 Obtain Departmental Representative approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Do not place shores and mud sills on frozen ground.
- .5 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .6 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .7 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .8 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .10 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 Lining is included in price of concrete for corresponding portion of Work.
- .11 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 3 days for walls and sides of beams.
 - .2 3 days for columns.
 - .3 7 days for slabs and catch drain.

- .4 3 days for footings and abutments.
- .2 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 031000 – Concrete Forming and Accessories.
- .2 033000 – Cast in place concrete
- .3 033500 – Concrete finishing

1.2 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International
 - .1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- .3 CSA International
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A23.3, Design of Concrete Structures.
 - .3 CSA-G30.18, Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Québec.
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by ministry Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
 - .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3

1.4 QUALITY ASSURANCE

- .1 Submit in accordance with PART 2 - SOURCE QUALITY CONTROL.

- .1 Mill Test Report: provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
- .2 Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.5 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .4 Cold-drawn annealed steel wire ties.
- .5 Deformed steel wire for concrete reinforcement
- .6 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .7 Mechanical splices: subject to approval of Departmental Representative.
- .8 Plain round bars: to CSA-G40.20/G40.21.
- .9 Adhesive for bars anchored to hardened concrete:
 - .1 Acceptable products:
 - .1 Model *Adhesive system HIT HY-200* from the company Hilti
 - .2 Model *Injection adhesive FLO-ROK FR5MAX* from the company UCAN
 - .3 Model *Qwik hardening adhesive Epcon S7* from the company Red Head

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Departmental Representative written approval for locations of reinforcement splices other than those shown on placing drawings.

- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Upon request inform Departmental Representative of proposed source of material to be supplied.

Part 3 Execution

3.1 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
 - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
 - .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Departmental Representative approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

3.3 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Waste Management: separate waste materials for recycling.

END OF SECTION

Approved: 2011-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 031000 – Concrete forming and accessories
- .2 032000 – Concrete reinforcing
- .3 033500 – Concrete finishing

1.2 REFERENCES

- .1 Abbreviations and Acronyms:
 - .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
 - .1 Type GU, GUb and GUL - General use cement.
- .2 Reference Standards:
 - .1 ASTM International
 - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C494/C494M-10a, Standard Specification for Chemical Admixtures for Concrete.
 - .3 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-[M86(R1988)], Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .3 CSA International
 - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283, Qualification Code for Concrete Testing Laboratories.
 - .3 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: convene pre-installation meeting one week prior to beginning concrete slab works.
 - .1 Ensure key personnel, site supervisor, Departmental Representative, contractor of floor finishing and testing laboratory representatives attend.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide testing results and reports for review by Departmental Representative conformément à la section 01 33 00 – Documents et échantillons à soumettre and do not proceed without written approval when deviations from mix design or parameters are found.

- .2 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.
- .3 Concrete hauling time: provide for review by to Departmental Representative each deviation exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.5 QUALITY ASSURANCE

- .1 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .2 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Hot weather concrete.
 - .2 Cold weather concrete.
 - .3 Curing.
 - .4 Finishes.
 - .5 Formwork removal.
 - .6 Joints.
- .3 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from ministry Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by Departmental Representative.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant according to CSA A23.1/A23.2.

Part 2 Products

2.1 DESIGN CRITERIA

- .1 According to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in drawings and specification and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

- .1 Portland Cement: to CSA A3001, Type GU.
- .2 Blended hydraulic cement: Type GU_b
- .3 Water: to CSA A23.1.
- .4 Aggregates: to CSA A23.1/A23.
- .5 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to ASTM C494/ASTM C1017. Ministry Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .6 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
 - .1 Compressive strength: 50 MPa at 28 days.
- .7 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
- .8 It is forbidden to use Silica fume in concrete mixture.

2.4 MIXES

- .1 Concrete: to meet performance criteria définined in this document to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
 - .2 Provide concrete mix to meet following plastic state requirements:
 - .1 Uniformity
 - .2 Workability: free of surface blemishes, loss of mortar, colour variations or segregation.
 - .3 Provide concrete mix to meet following hard state requirements:
 - .1 Slabs on grade
 - .1 Exposition class: C-1
 - .2 Compressive strength at 28 days: 25 MPa.
 - .3 Aggregate size: 20 mm.
 - .4 Air content: 1% - 3%
 - .5 Slump at point and time of discharge: 80 mm ± 30 mm
 - .2 Walls and footings
 - .1 Exposition class: N
 - .2 Compressive strength at 28 days: 25 MPa.
-

- .3 Aggregate size 20 mm.
- .4 Air content : 4% - 7%
- .5 Slump at point and time of discharge: 80 mm \pm 30 mm

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Departmental Representative written approval before placing concrete.
 - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Departmental Representative approval of proposed method for protection of concrete during placing and curing.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through columns, except where indicated.
 - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - .3 Sleeves and openings greater than 100 x 100 mm not indicated must be reviewed by Departmental Representative.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.

- .5 Confirm locations and sizes of sleeves and openings shown on drawings.
- .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts:
 - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
 - .2 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
- .4 Finishing and curing:
 - .1 Finish concrete to CSA A23.1/A23.2.
 - .2 Use procedures as reviewed by ministry Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
 - .3 Finish concrete floor to CSA A23.1/A23.2.
 - .4 Provide screed finish unless otherwise indicated.
 - .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.
- .5 Joint fillers:
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.
 - .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .3 Locate and form expansion joints as indicated.
 - .4 Install joint filler.
 - .5 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to finished slab surface unless indicated otherwise.

3.3 SURFACE TOLERANCE

- .1 Concrete tolerance to CSA A23.1.

3.4 FIELD QUALITY CONTROL

- .1 Site tests: conduct tests as follows and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .1 Concrete pours.
 - .2 Slump.
 - .3 Air content.
 - .4 Compressive strength at 7 and 28 days.
 - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory is certified to CSA A283.
- .3 Ensure test results are distributed to Departmental Representative.

- .4 Departmental Representative will pay for costs of tests.
- .5 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .7 Inspection or testing by Laboratory will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.5 CLEANING

- .1 Waste Management: separate waste materials for reuse or recycling.
 - .1 Divert unused concrete materials from landfill to local facility after receipt of written approval from Departmental Representative
 - .2 Provide appropriate area on job site where concrete trucks and be safely washed.
 - .3 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.
 - .4 Prevent admixtures and additive materials from entering drinking water supplies or streams.
 - .5 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
 - .6 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

Approved: 2009-12-31

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 031000 – Concrete forming and accessories
- .2 032000 – Concrete reinforcing
- .3 033000 – Cast in place concrete

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20, Surface Sealer for Floors.
- .2 CSA International
 - .1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete.
- .3 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168, Adhesives and Sealants Applications.
- .4 ASTM INTERNATIONAL
 - .1 ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Provide 1 copy of WHMIS MSDS. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.
 - .2 Include application instructions for concrete floor treatment.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m 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 Safety:

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 CHEMICAL HARDENERS

- .1 Industrial type liquid densifying and sealer for concrete floors, water based, with abrasion and wear resistance in accordance with ASTM C779.
- .2 Water: potable

2.2 MIXES

- .1 Mixing ratios in accordance with manufacturer's written instructions.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that slab surfaces are ready to receive work and elevations are as indicated on shop drawings.

3.2 PREPARATION OF EXISTING SLAB

- .1 Saw cut control joints to CAN/CSA-A23.1, 24 hours maximum after placing of concrete.

3.3 APPLICATION

- .1 Apply concrete finishing floor hardener in accordance with manufacturer's written instructions.
- .2 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
- .3 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
- .4 Clean over spray. Clean sealant from adjacent surfaces.

3.4 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.5 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

END OF SECTION

Approved: 2009-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 052100 – Steel Joist Framing.
- .2 053100 – Steel Decking

1.2 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM A36/A36M, Standard Specification for Carbon Structural Steel.
 - .2 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - .4 ASTM A325M, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10, Protective Coatings for Metals.
- .3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
 - .1 Handbook of the Canadian Institute of Steel Construction.
 - .2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16, Limit States Design of Steel Structures.
 - .4 CAN/CSA-S136, North American Specifications for the Design of Cold Formed Steel Structural Members.
 - .5 CSA W47.1, Certification of Companies for Fusion Welding of Steel.
 - .6 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
 - .7 CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .8 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .5 Master Painters Institute
 - .1 MPI-INT 5.1, Structural Steel and Metal Fabrications.
 - .2 MPI-EXT 5.1, Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International
 - .1 NACE No. 3/SSPC SP-6, Commercial Blast Cleaning.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals to ministry Representative, in accordance with section 01 33 00.
- .2 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Quebec and member of the OIQ.
- .3 Erection drawings:
 - .1 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.
- .4 Fabrication drawings:
 - .1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Province of Québec, Canada.
- .5 Fabricator Reports:
 - .1 Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.

Part 2 Products**2.1 DESIGN REQUIREMENTS**

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16 and CAN/CSA-S136 with CSA-S136.1 to resist forces, moments, shears and allow for movements indicated.
- .2 Shear connections:
 - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
 - .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.
- .3 For composite construction select or design minimum end connection to resist reaction resulting from factored movement resistance as tabulated in the "Handbook of the Canadian Institute of Steel Construction" assuming 100% shear connection with depth of steel deck and/or slab shown on drawings.

2.2 MATERIALS

- .1 Structural steel: to CSA-G40.20/G40.21 Grade 300W for plates, C shapes and angles; grade 350W for Hollow sections (HSS) and W shapes.
- .2 Anchor bolts: to CSA-G40.20/G40.21, Grade 300W.
- .3 Bolts, nuts and washers: to ASTM A325M.
- .4 Welding materials: to CSA W48 Series and CSA W59, and certified by Canadian Welding Bureau.
- .5 Shop paint primer: to CISC/CPMA2-75 solvent reducible alkyd, grey.
- .6 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m

2.3 FABRICATION

- .1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with approved shop drawings.

2.4 SHOP PAINTING

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16 except where members to be encased in concrete.
- .2 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.
- .3 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .4 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .5 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

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 GENERAL

- .1 Structural steel work: in accordance with CAN/CSA-S16.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.3 CONNECTION TO EXISTING WORK

- .1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Departmental Representative for direction before commencing fabrication.

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.

3.5 ERECTION

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with approved erection drawings.
- .2 Field cutting or altering structural members: to approval of Departmental Representative.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

3.6 FIELD PAINTING

- .1 Touch up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual.

3.7 OPENINGS IN HSS PROFILES FOR SPRAYED INSULATION

- .1 All HSS profiles must be drilled in workshop to allow infield urethane spray injection. Drill 20mm holes @ 610mm c/c on the centre of HSS's interior faces (towards interior of building). For insulation details, refer to architectural documents.

END OF SECTION

Approved: 2010-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 052123 – Structural steel for buildings.
- .2 053100 – Steel Decking

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10, Protective Coatings for Metals.
- .2 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
 - .1 CISC/CPMA 2-75, Quick-Drying, Primer for Use on Structural Steel.
 - .2 CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.
- .3 CSA International
 - .1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA S16, Design of Steel Structures.
 - .3 CSA S136, North American Specification for the Design of Cold Formed Steel Structural Members.
 - .4 CSA W47.1, Certification of Companies for Fusion Welding of Steel.
 - .5 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings of steel joist to ministry Representative, in accordance with section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for steel joist and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
 - .2 Indicate on erection drawings, relevant details such as joist mark, depth, spacing, bridging lines, bearing, anchorage and details.
 - .3 Indicate particulars, on shop drawings, relative to joist geometry, framed openings, splicing details, bearing and anchorage. Include member size, properties, specified and factored member loads, and stresses under various loadings, deflection and camber.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products**2.1 DESIGN CRITERIA**

- .1 Design steel joists and bridging to carry loads indicated in joist schedule shown on drawings to CSA S16.
- .2 Design joists and anchorages for uplift forces as indicated.
- .3 Ensure joists are manufactured to consider load effects due to fabrication, erection and handling.
- .4 Limit roof joist deflection due to specified live load to (1/360) maximum of span.

2.2 MATERIALS

- .1 Open web steel joists: to CSA S16.
- .2 Structural steel: to CSA G40.20/G40.21.
- .3 Welding materials: to CSA W59.
- .4 Shop paint primer: to CISC/CPMA-1.

2.3 FABRICATION

- .1 Fabricate steel joists and accessories as indicated in accordance with CSA S16 and in accordance with approved shop drawings.
- .2 Weld in accordance with CSA W59.
- .3 Provide bottom chord extensions where indicated.
- .4 Provide diagonal and horizontal bridgings and anchorages as indicated.

2.4 SHOP PAINTING

- .1 Clean, prepare and shop prime surfaces of steel joists to CSA S16 and SSPC SP6.
- .2 Clean members of loose mill scale, rust, oil, dirt and other foreign matter. Prepare surfaces to SSPC SP1 brush blast.
- .3 Apply one coat of CISC/CPMA 2 primer to steel surfaces to achieve dry film thickness of .065 mm to .080 mm maximum except:
 - .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.
- .4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 10 degrees C.
- .5 Maintain dry condition and 10 degrees C minimum temperature until paint is thoroughly dry.
- .6 Strip paint bolts, nuts, sharp edges and corners before prime coat is dry.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for steel joist framing 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.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Do structural steel work: to CSA S16.
- .2 Do welding: in accordance with CSA W59.
- .3 Ensure installers are certified to CSA W47.1 for fusion welding and CSA W55.3 for resistance welding.
- .4 Submit certification that welded joints are qualified by Canadian Welding Bureau.

3.3 ERECTION

- .1 Erect steel joists and bridging as indicated to CSA S16 and in accordance with approved shop drawings.
- .2 Complete installation of bridging and anchorages before placing construction loads.
- .3 Field cutting or altering joists or bridging that are not shown on shop drawings: to approval of Departmental Representative.
- .4 Clean and touch up shop primer to bolts, welds, burned or scratched surfaces at completion of erection.

3.4 FIELD PAINTING

- .1 Touch up all damaged surfaces and surfaces without shop coat CISC/CPMA-1 in accordance with manufacturers' recommendations.

3.5 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.6 PROTECTION

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

END OF SECTION

Approved: 2010-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 051223 – Structural steel for buildings.
- .2 052100 – Steel Joist Framing

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.
- .3 CSA International
 - .1 CSA S16, Design of Steel Structures.
 - .2 CSA S136, North American Specification for the Design of Cold Formed Steel Structural Members.
 - .3 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
 - .4 CSA W55.3, Certification of Companies for Resistance Welding of Steel and Aluminum.
 - .5 CSA W59, Welded Steel Construction, (Metal Arc Welding).
- .4 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI 10M, Standard for Steel Roof Deck.
- .5 Green Seal Environmental Standards (GS)
 - .1 GS-11, Paints and Coatings.
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113, Architectural Coatings.
 - .2 SCAQMD Rule 1168, Adhesives and Sealants Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings to Departmental Representative
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for steel decking and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.

- .2 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 MATERIALS

- .1 Zinc-iron Alloy (ZF) coated steel sheet: to [ASTM A653/A653M] structural quality Grade 230, with ZF75 coating, for interior surfaces not exposed to weather, unpainted finish, 0.76 mm minimum base steel thickness.
- .2 Closures: as indicated in accordance with manufacturer's recommendations.
- .3 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.76 mm minimum. Metallic coating same as deck material.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for steel decking 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 INSTALLATION

- .1 Structural steel work: in accordance with CSA S136.
- .2 Welding: in accordance with CSA W59, except where specified otherwise.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1.

3.3 ERECTION

- .1 Erect steel deck as indicated and in accordance with CSA S136 and in accordance with approved erection drawings.
- .2 Lap ends: to 50 mm minimum.
- .3 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.
- .4 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mil scale and other foreign matter.

3.4 CLOSURES

- .1 Install closures in accordance with approved details.

3.5 OPENINGS AND AREAS OF CONCENTRATED LOADS

- .1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.
- .2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer, except as otherwise indicated.
- .3 For deck openings with any one dimension greater than 300 mm and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.

3.6 CONNECTIONS

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

3.7 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.8 PROTECTION

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

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 21 13 13: Wet Pipe Sprinkler Systems

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Shop drawings and product data accompanied by:
 - .1 Manufacturer to certify current model production.
 - .2 Certification of compliance to applicable codes.
- .2 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .3 Operation data to include:
 - .1 Description of actions to be taken in event of equipment failure.
 - .2 Valves schedule and flow diagram.
 - .3 Colour coding chart.
 - .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .5 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.
 - .6 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
 - .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

- .8 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .9 As-Built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 MAINTENANCE

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
 - .1 One set of packing for each pump.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE, AND HANDLING

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

Part 2 Products

2.1 MATERIALS

- .1 Non applicable.

Part 3 Execution**3.1 PAINTING REPAIRS AND RESTORATION**

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 21 05 05: Common Work Results for Fire Suppression

1.2 REFERENCES

- .1 National Fire Prevention Association (NFPA)
 - .1 NFPA 13-2013, Standard for the Installation of Sprinkler Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate:
 - .1 Materials.
 - .2 Finishes.
 - .3 Method of anchorage
 - .4 Number of anchors.
 - .5 Supports.
 - .6 Reinforcement.
 - .7 Assembly details.
 - .8 Accessories.
- .4 Samples:
 - .1 Submit samples of following:
 - .1 Each type of sprinkler head.
 - .2 Signs.
- .5 Test reports:
 - .1 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

- .7 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00.
- .2 Manufacturer's Catalog Data, including specific model, type, and size for:
 - .1 Pipe and fittings.
 - .2 Valves, including gate, check, and globe.
 - .3 Sprinkler heads.
 - .4 Pipe hangers and supports.
 - .5 Mechanical couplings.
- .3 Drawings:
 - .1 Sprinkler heads and piping system layout.
 - .1 Prepare 760 mm by 1050 mm detail working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)".
 - .2 Show data essential for proper installation of each system.
 - .3 Show details, plan view, elevations, and sections of systems supply and piping.
 - .4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.
 - .2 Electrical wiring diagrams.
- .4 Field Test Reports:
 - .1 Preliminary tests on piping system.
- .5 Records:
 - .1 As-built drawings of each system.
 - .1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.
 - .2 Submit 760 mm by 1050 mm drawings on reproducible Mylar film with title block similar to full size contract drawings.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in wet sprinkler systems with documented experience.
- .2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

- .2 Provide spare sprinklers and tools in accordance with NFPA 13.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Store materials indoors.
 - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Furnish and install automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, by hydraulic calculations for uniform distribution of water over design area ordinary group 2.
- .2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
- .3 Install and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
- .4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.
- .5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- .6 Install systems for earthquake protection for buildings in seismic zones 3 and 4, and only essential and high risk buildings in seismic zone 2.
- .7 Location of Sprinkler Heads:
 - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13 for ordinary hazard occupancy group 2.
 - .2 Uniformly space sprinklers on branch.

2.2 ABOVE GROUND PIPING SYSTEMS

- .1 Provide fittings for changes in direction of piping and for connections.
 - .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.
- .2 Perform welding in shop; field welding will not be permitted.

2.3 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 13.
- .2 Fittings and joints to NFPA 13:

- .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
- .2 Provide welded, threaded, grooved-end type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
- .3 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
- .4 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
- .5 Fittings: ULC approved for use in wet pipe sprinkler systems.
- .6 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
- .7 Side outlet tees using rubber gasketed fittings are not permitted.
- .8 Sprinkler pipe and fittings: metal.
- .3 Valves:
 - .1 ULC listed for fire protection service.
 - .2 Gate valves: open by counterclockwise rotation.
- .4 Pipe hangers:
 - .1 ULC listed for fire protection services in accordance with NFPA.

2.4 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type:
 - .1 See drawings.
- .3 Provide nominal 1.2 cm orifice sprinkler heads.
 - .1 See drawings.

2.5 ESCUTCHEON PLATES

- .1 Provide one piece type metal plates for piping passing through walls, in exposed spaces.
- .2 Provide chrome plated copper plates in finished spaces.
- .3 Provide paint finish on metal plates in unfinished spaces.

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, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.

3.3 PIPE INSTALLATION

- .1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.
- .2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.
- .3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
- .4 Inspect piping before placing into position.

3.4 ELECTRICAL CONNECTIONS

- .1 Provide electrical work associated with this section under Section 26 05 00 - Common Work Results for Electrical.
- .2 Provide fire alarm system under Section 28 31 00 - Fire Detection and Alarm.
- .3 Provide control and fire alarm wiring, including connections to fire alarm systems, in accordance with National Electrical Code.
- .4 Provide wiring in rigid metal conduit or intermediate metal conduit.

3.5 DISINFECTION

- .1 Disinfect new piping and existing piping.
- .2 Fill piping systems with solution containing minimum of 50 parts per million of chlorine and allow solution to stand for minimum of 24 hours.
- .3 Flush solution from systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply.
- .4 Obtain at least two consecutive satisfactory bacteriological samples from piping, analyzed by certified laboratory, and submit results prior to piping being placed into service.

3.6 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

- .1 Notify Contracting Officer in writing at least 15 days prior to connection date.
- .2 Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure.
- .3 Bolt sleeves around main piping.
- .4 Bolt valve to branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service.
- .5 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.

3.7 FIELD QUALITY CONTROL

- .1 Site Test, Inspection:
-

- .1 Perform test to determine compliance with specified requirements in presence of Departmental Representative.
- .2 Test, inspect, and approve piping before covering or concealing.
- .3 Preliminary Tests:
 - .1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.
 - .2 Flush piping with potable water in accordance with NFPA 13.
- .2 Cleaning
 - .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
 - .2 Waste Management: separate waste materials for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Approved: 2006-03-31

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 35 29.06 – Health and Safety Requirements
- .3 Section 01 45 00 – Quality Control
- .4 Section 01 74 21 - Construction Demolition Waste Management and Disposal
- .5 Section 01 78 00 - Closeout Submittals
- .6 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
- .3 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .4 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.
- .5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection. Building owner will keep the final copies.
 - .3 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.

-
- .7 Colour coding chart.
 - .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .5 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.
 - .6 Approvals:
 - .1 Submit 1 copie of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
 - .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
 - .8 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
 - .9 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
-

- .10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 MAINTENANCE

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE, AND HANDLING

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

Part 2 Execution

2.1 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

2.2 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

2.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

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 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.

2.5 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Approved: 2009-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 61 00 - Common Product Requirements
- .3 Section 01 74 11 - Cleaning
- .4 Section 01 74 21 - Construction Demolition Waste Management And Disposal
- .5 Section 01 78 00 - Closeout Submittals
- .6 Section 23 05 05 - Installation Of Pipework

1.2 REFERENCES

- .1 Except if indicated otherwise, perform the work accordingly to the supplying, the installation and the connection of domestic water supply piping in accordance to the newest codes and standards listed below.
- .2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .3 ASTM International Inc.
 - .1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).
 - .3 ASTM A778, Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.
 - .4 ASTM A774, Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures
- .4 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
 - .1 ANSI/AWWA C111/A21.11-[07], Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.
- .6 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-67, Butterfly Valves.
 - .2 MSS-SP-70, Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
- .9 National Research Council (NRC)/Institute for Research in Construction
 - .1 NRCC 38728F, National Plumbing Code of Canada (NPC).
- .10 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems, within building and having a pipe diameter smaller than 2 inches.
 - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
 - .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.
- .2 Domestic hot, cold and recirculation systems, within building and having a pipe diameter larger than 2 inches.
 - .1 Above ground: stainless steel tube, type 304L, 11 gauge with welded ends: to ASTM A774 and A778.

2.2 FITTINGS

- .1 Copper fittings:
 - .1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.
 - .2 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.
 - .3 Cast copper, solder type: to ANSI/ASME B16.18.
 - .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .2 Stainless steel fittings:
 - .1 Solder type

2.3 JOINTS

- .1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: 95/5 tin copper alloy.
- .4 Teflon tape: for threaded joints.
- .5 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.
- .6 Gaskets for stainless steel flanges: EDPM 3.2 mm thick

2.4 SWING CHECK VALVES

- .1 NPS 2 and under, soldered:
 - .1 To MSS-SP-139, NSF/ANSI-61-8 and NSF/ANSI-372, Class 125
 - .2 Bronze body, bronze swing disc, screw in cap, regrindable seat and disc.

2.5 BALL VALVES

- .1 NPS 2 and under, soldered:
 - .1 To MSS-SP-110, NSF/ANSI-61-8 and NSF/ANSI-372, Class 125.
 - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, stainless steel lever handle.

2.6 DRAIN VALVE

- .1 NPS ½ or ¾, soldered:
 - .1 To MSS-SP-110, NSF/ANSI-61-9 and NSF/ANSI-372, Class 125.
 - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, stainless steel lever handle, ¾ threaded with cap and chain.

Part 3 Execution**3.1 APPLICATION**

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

3.2 INSTALLATION

- .1 Install in accordance with local authority having jurisdiction and National Plumbing Code (NPC).
- .2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .6 Buried tubing:
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
 - .2 Bend tubing without crimping or constriction. Minimize use of fittings.

3.3 VALVES

- .1 Isolate equipment, fixtures and branches with ball valves.
- .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.4 PRESSURE TESTS

- .1 Conform to requirements of Section 23 05 05 - Installation of Pipework.
- .2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.5 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.
- .3 Ensure that pressure booster systems are operating properly.

3.6 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for [reuse] [recycling] in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Approved: 2008-12-31

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section related
 - .1 Section 01 33 00 - Submittal Procedures.
 - .2 Section 01 61 00 - Common Product Requirements.
 - .3 Section 01 74 11 - Cleaning.
 - .4 Section 01 74 21 - Construction Demolition Waste Management And Disposal.
 - .5 Section 01 78 00 - Closeout Submittals.
 - .6 Section 23 05 05 - Installation Of Pipework

1.2 REFERENCES

- .1 Except if indicated otherwise, perform the work accordingly to the supplying, the installation and the connection of drainage and cast iron and/or copper vent systems in accordance to the newest codes and standards listed below.
- .2 ASTM International Inc.
 - .1 ASTM B32, Standard Specification for Solder Metal.
 - .2 ASTM B306, Standard Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C564, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .3 Canadian Standards Association (CSA International).
 - .1 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
 - .2 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .3 CAN/CSA-B125.3, Plumbing Fittings.
- .4 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36, Commercial Adhesives.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for cast iron and copper drainage system, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

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

- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary, storm and vent Type DWV to: ASTM B306.

- .1 Fittings.

- .1 Cast brass: to CAN/CSA-B125.3.

- .2 Wrought copper: to CAN/CSA-B125.3.

- .2 Solder: tin-lead, 50:50, type 50A, to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Above ground sanitary, storm and vent: to CAN/CSA-B70.

- .1 Joints:

- .1 Mechanical joints:

- .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 In accordance with Section 23 05 05 - Installation Of Pipework.
- .2 Install in accordance with National Plumbing Code and local authority having jurisdiction.
- .3 As much as possible (see also plan views), install the above ground piping parallel and near to the walls and ceiling to keep the useful room volume to its maximum.
- .4 Observe the slopes and levels while indicated. Otherwise, piping with a diameter equal or smaller than 3 inches must have a slope of 1:50 and the piping larger than 4 inches must have a slope of 1:100.
- .5 Install a copper piping (dimension as indicated) to join the drainage pipes (with deep u-bend) of drain pan, to the nearest floor drain such as the indications on the plans and diagrams.
- .6 Always use fire retardant device and sealant when piping go through fire retardant walls and partitions.
- .7 During the construction work, plug water tightly pipes and fittings with caps such as the construction debris do not enter these tubes.

- .8 It is prohibited to execute the installation/connection work of the new piping when it is in water or when the building owner or the Departmental Representative judge that the conditions are unfavorable.

3.3 TESTING

- .1 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify that cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Storm water drainage:
 - .1 Verify domes are secure.
 - .2 Ensure weirs are correctly sized and installed correctly.
 - .3 Verify provisions for movement of roof system.
- .4 Ensure that fixtures are properly anchored, connected to system and effectively vented.
- .5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for [reuse] [recycling] in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Approved: 2005-06-30

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Section 01 33 00 - Submittal Procedures
 - .2 Section 01 74 21 - Construction Demolition Waste Management And Disposal
 - .3 Section 01 78 00 - Closeout Submittals
 - .4 Section 23 05 05 - Installation Of Pipework

1.2 REFERENCES

- .1 The following references will apply at the time of the work in accordance to the codes, laws and regulations in force.
- .2 American Society of Mechanical Engineers (ASME)
 - .1 ASME Boiler and Pressure Vessel Code Section VIII Pressure Vessels.
 - .1 BPVC-VIII B - [2004], BPVC Section VIII - Rules for Construction of Pressure Vessels Division 1.
 - .2 BPVC-VIII-2 B - [2004], BPVC Section VIII - Rules for Construction of Pressure Vessels Division 2 - Alternative Rules.
 - .3 BPVC-VIII-3 B - [2004], BPVC Section VIII - Rules for Construction of Pressure Vessels Division 3 - Alternative Rules High Press Vessels.
 - .2 ASME B16.5, Pipe Flanges and Flanged Fittings.
 - .3 ASME B16.11, Forged Fittings, Socket-Welding and Threaded.
 - .4 ASME B31.1, Power Piping
 - .5 ASME B31.3, Process Piping
- .3 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A181/A181M, Standard Specification for Carbon Steel Forgings for General Purpose Piping.
 - .3 ASTM B241, Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
- .4 Canadian Standards Association (CSA International)
 - .1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.
- .2 Submit WHMIS MSDS in accordance with Workplace Hazardous Materials Information System (WHMIS), which must conform to this system. Indicate VOC's for adhesive and solvents during application and curing.
- .3 Shop Drawings:
 - .1 Submit shop drawings to indicate project layout including layout, dimensions and extent of piping system.
 - .1 Vertical and horizontal piping locations and elevations and connections details.
 - .2 Include other relevant details.
 - .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
 - .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .5 Instructions: submit manufacturer's installation instructions.
 - .6 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meeting.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 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 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
 - .4 Separate for reuse/recycling and place in designated containers Steel, Metal and Plastic waste in accordance with Waste Management Plan (WMP).
 - .5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA and Regional and Municipal regulations.
 - .6 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

Part 2 Products**2.1 PIPING**

- .1 Piping: to ASTM B241, extruded aluminum, without longitudinal joints, complying with a 200 psi minimum working pressure.
- .2 Fittings:
 - .1 NPS 2 and smaller: nickel plated brass, slip-on type.
 - .2 NPS 2 1/2 and larger: aluminum, grooved.
- .3 Couplings: galvanised ductile cast iron, grooved.
- .4 Flanges:
 - .1 NPS 3 1/2 and larger: to ASME B16.5, galvanised ductile cast iron, raised-face flange assemblies, grooved.
- .5 Joints:
 - .1 NPS 2 1/2 and smaller: slip-on type.
 - .2 NPS 3 and larger: butt weld type.

2.2 BALL VALVES

- .1 Three piece design or top entry for ease of in-line maintenance.
 - .1 Grooved couplings, carbon steel body, carbon steel ball and associated trim suitable for compressed air application.
 - .2 To withstand 200 psi maximum pressure.

2.3 COUPLERS/CONNECTORS

- .1 Industrial interchange series, full-bore.
- .2 Maximum inlet pressure: 200 psi.
- .3 Body: zinc plated steel.
- .4 Threads: NPT.

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 COMPRESSED AIR PIPING CONNECTIONS AND INSTALLATION

- .1 Install shut-off valves at outlets, major branch lines and in locations as indicated.
- .2 Install quick-coupler chucks and pressure gauges on drop pipes.
- .3 Install unions to permit removal or replacement of equipment.
- .4 Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.
- .5 Grade piping at 1% slope minimum.

- .6 Install compressed air trap and pressure equalizing pipe at moisture collecting points. Drain pipe to nearest floor drain.
- .7 Make branch connections from top of main.
- .8 Install compressed air trap at bottom of risers and at low points in mains, piped to nearest drain. Distance between drain points to be 30 m maximum.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
 - .1 Testing: pressure test in accordance with requirements of Section 23 05 05 - Installation Of Pipework, for 4 h minimum, to 1.1 times the maximum working pressure, with outlets closed and with compressor isolated from system. Pressure drop not to exceed 1.5 psi.
- .2 Obtain reports within 3 days of review and submit immediately to Departmental Representative.

3.4 CLEANING

- .1 Cleaning: blow out piping to clean interior thoroughly of oil and foreign matter.
- .2 Check entire installation is approved by authority having jurisdiction.
- .3 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Approved: 2012-12-31

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 29.06 - Health and Safety Requirements
- .3 Section 01 61 00 - Common Product Requirements
- .4 Section 01 74 11 - Cleaning
- .5 Section 01 74 21 - Construction Demolition Waste Management And Disposal
- .6 Section 01 78 00 - Closeout Submittals

1.2 REFERENCES

- .1 Except if indicated otherwise, perform the work accordingly to the supplying, the installation and the connection of plumbing specialties and accessories in accordance to the newest codes and standards listed below.
- .2 ASTM International
 - .1 ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 American Water Works Association (AWWA)
 - .1 ANSI/AWWA C700, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 ANSI/AWWA C702, Standard for Cold Water Meters-Compound Type.
- .4 CSA International
 - .1 CSA-B64, Backflow Preventers and Vacuum Breakers.
 - .2 CSA B79, Commercial and Residential Drains and Cleanouts.
 - .3 CAN/CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .5 Efficiency Valuation Organization (EVO)
 - .1 International Performance Measurement and Verification Protocol (IPMVP).
 - .1 IPMVP.
- .6 Plumbing and Drainage Institute (PDI)
 - .1 PDI-G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.
 - .2 PDI-WH201, Water Hammer Arresters Standard.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements. Indicate VOC's.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed to practice in the province of Québec.
 - .2 Indicate on drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories for the described materials.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: manufacturers' field reports specified.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
 - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect plumbing materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 CLEANOUTS

- .1 End of line cleanouts:

- .1 Heavy cast iron male ferrule with bronze plug, neoprene gasket.
- .2 Floor cleanouts:
 - .1 Round cast iron body and frame with adjustable secured nickel bronze top with neoprene gasket.
 - .2 Specified product: **Watts**, model **CO-200-RX-6**; **Zurn**, model **ZXN-1612-VP**; **Mifab**, model **C1100-XR-6** or approved equivalent.
- .3 Wall cleanouts:
 - .1 Cast iron body, brass plug, polished nickel bronze square cover.
 - .2 Specified product: **Watts**, model **CO-460** (lid **CO-300-S**); **Zurn**, model **Z1447-SC**, **Mifab**, model **C1460** (lid **C1300-1**) or approved equivalent.
- .4 Tee line's cleanout:
 - .1 Cast iron body and brass plug with gasket
 - .2 Specified product: **Watts**, model **CO-460**; **Zurn**, model **Z1445**, **Mifab**, model **C1460** or approved equivalent.

2.2 NON-FREEZE WALL HYDRANTS (RA-1)

- .1 Recessed type with integral vacuum breaker, NPS 3/4 hose outlet, removable operating key. Polished bronze body and lid with key.
- .2 Specified product: **Watts**, model **HY-725**; **Zurn**, model **Z1320**, **Mifab**, model **MHY-25** or approved equivalent.

2.3 BACK FLOW PREVENTERS

- .1 Preventers: to CSA-B64 Series, with a diameter 2 inches or under, application as indicated, reduced pressure principle type.
- .2 Each backflow preventer will be installed with a DWV copper drain pipe with soldered fitting between the safety valve and the funnel floor drain near it.
- .3 Supply and install a strainer for each device.
- .4 Specified product: **Watts**, model **LF919**; **Zurn**, model **Wilkins 375XL**; **Mifab**, model **RPLF4A** or approved equivalent.

2.4 VACUUM BREAKERS

- .1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric with hose connection.

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 plumbing specialties and accessories installation in accordance with manufacturer's written instructions.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Install in accordance with National Plumbing Code of Canada and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.4 CLEANOUTS

- .1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
- .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

3.5 NON-FREEZE WALL HYDRANTS

- .1 Install 600 mm above finished grade and as indicated.

3.6 WATER HAMMER ARRESTORS

- .1 Install on branch supplies to fixtures or group of fixtures where indicated.

3.7 BACK FLOW PREVENTERS

- .1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.
- .2 Pipe discharge to terminate over nearest funnel floor drain.

3.8 TESTING AND ADJUSTING

- .1 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
- .2 Application tolerances:
 - .1 Pressure at fixtures: +/- 70 kPa.
 - .2 Flow rate at fixtures: +/- 20%.
- .3 Adjustments:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
- .4 Vacuum breakers, backflow preventers, backwater valves:
 - .1 Test tightness, accessibility for O M of cover and of valve.
 - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.

- .3 Verify visibility of discharge from open ports.
- .5 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .6 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .7 Wall hydrants:
 - .1 Verify complete drainage, freeze protection.
 - .2 Verify operation of vacuum breakers.

3.9 CLEANING

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

3.10 PROTECTION

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

END OF SECTION

Approved: 2005-09-30

Part 1 General

1.1 USE OF SYSTEMS

- .1 Use of permanent heating and ventilating systems for supplying temporary heat or ventilation is not permitted.
- .2 Filters specified in this Section are over and above those specified in other Sections of this project.
- .3 Exhaust systems are not included in approvals for temporary heating ventilation.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Approved: 2009-06-30

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 61 00 - Common Product Requirements.
- .3 Section 01 74 11 - Cleaning.
- .4 Section 01 74 21 - Construction Demolition Waste Management And Disposal.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .2 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-11-2008, 2nd Edition, Environmental Standard for Paints and Coatings.
- .3 National Fire Code of Canada (NFCC 2005)
- .4 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 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:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products**2.1 MATERIAL**

- .1 Paint: to ISO 12 944.
 - .1 Primer: maximum VOC limit 250 g/L to Standard GS-11.
 - .2 Paints: maximum VOC limit 150 g/L to Standard GS-11 and to SCAQMD Rule 1113.
- .2 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Sealants: maximum VOC limit to SCAQMD Rule 1168 and to GSES GS-36.
- .3 Adhesives: maximum VOC limit to SCAQMD Rule 1168 and to GSES GS-36.

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 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer, BNQ 3650-900 (Boiler, Pressure Vessel and Pressure Piping Code) and National Fire Code of Canada, using the most restraining method.
- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer without interrupting operation of other system, equipment or components.

3.4 DIELECTRIC COUPLINGS

- .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.

3.5 PIPEWORK INSTALLATION

- .1 Screwed fittings jointed with Teflon tape.
 - .2 Protect openings against entry of foreign material.
-

- .3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .4 Assemble piping using fittings manufactured to ANSI standards.
- .5 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.
- .6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.
- .8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .9 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .10 Group piping wherever possible and as indicated on plans.
- .11 Ream pipes, remove scale and other foreign material before assembly.
- .12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .13 Provide for thermal expansion as indicated.
- .14 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 gate, ball or butterfly valves at branch take-offs for isolating purposes except where specified. The valve type vary according to whether the type of piping system is steam or hydronic (see respective sections).
 - .7 Install butterfly valves between weld neck flanges to ensure full compression of liner.
 - .8 Use chain operators on valves NPS 8 and larger where installed more than 2400 mm above floor in Mechanical Rooms.

3.6 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.
- .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 firestopping.
 - .2 Maintain fire rating integrity.
 - .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.

3.7 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.

3.8 PREPARATION FOR FIRE STOPPING

- .1 Uninsulated unheated pipes not subject to movement: no special preparation.
- .2 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging fire stopping material or installation.
- .3 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

3.9 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

- .1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.
- .2 Pipework: test the new piping sections to the more restraining pressure between 2 times the working pressure or 860 kPa (125 psig).
- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
- .4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- .5 Conduct tests in presence of Departmental Representative.
- .6 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.

- .7 Insulate or conceal work only after approval and certification of tests by Departmental Representative.

3.10 EXISTING SYSTEMS

- .1 The specialised company must realise a water test before the beginning of the work at many places on the network (sampling) with the attendance of the Departmental Representative or authorised personnel such as the building operating staff. Those tests must be accomplished when the systems are in operation.
- .2 Provide the water test results to the Departmental Representative. If the water test shows a high level of soiling, inform the Consultant as promptly as possible.
- .3 Connect into existing piping systems at times approved by Departmental Representative.
- .4 Request written approval by Departmental Representative 10 days minimum, prior to commencement of work.
- .5 Be responsible for damage to existing plant by this work.
- .6 Test the new piping sections to the more restraining pressure between 2 times the working pressure or 860 kPa (125 psig). Isolate the new piping sections and provide the required devices such as pumps and butterfly valves to accomplish the test, even if not shown on plans.

3.11 CLEANING

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

END OF SECTION

Approved: 2008-12-31

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ANSI/ASME B31.1-2014, Power Piping.
 - .2 ANSI/ASME B31.3-2010, Process Piping.
 - .3 ANSI/ASME Boiler and Pressure Vessel Code-2013:
- .2 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA C206-11, Field Welding of Steel Water Pipe.
- .3 American Welding Society (AWS)
 - .1 AWS C1.1M/C1.1-2012, Recommended Practices for Resistance Welding.
 - .2 AWS Z49.1-2012, Safety in Welding, Cutting and Allied Process.
 - .3 AWS W1-2000, Welding Inspection Handbook..
- .4 Canadian Standards Association (CSA International)
 - .1 CSA W47.2-2011, Certification of Companies for Fusion Welding of Aluminum.
 - .2 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
 - .3 CSA B51-F09(C2014), Boiler, Pressure Vessel and Pressure Piping Code.
 - .4 CSA-W117.2-12, Safety in Welding, Cutting and Allied Processes.
 - .5 CSA W178.1-2014, Certification of Welding Inspection Organizations.
 - .6 CSA W178.2-2014, Certification of Welding Inspectors.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Welders:
 - .1 Welding qualifications in accordance with CSA B51.
 - .2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.
 - .3 Submit welder's qualifications Departmental Representative.
 - .4 Each welder to possess identification symbol issued by authority having jurisdiction.
 - .5 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.
 - .2 Inspectors:
 - .1 Inspectors qualified to CSA W178.2.
 - .3 Certifications:

- .1 Registration of welding procedures in accordance with CSA B51.
- .2 Copy of welding procedures available for inspection.
- .3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 ELECTRODES

- .1 Electrodes: in accordance with CSA W48 Series.

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 QUALITY OF WORK

- .1 Welding: in accordance with ANSI/ASME B31.3, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.1, and applicable requirements of provincial authority having jurisdiction.

3.3 INSTALLATION REQUIREMENTS

- .1 Identify each weld with welder's identification symbol.
- .2 Backing rings:
 - .1 Where used, fit to minimize gaps between ring and pipe bore.
 - .2 Do not install at orifice flanges.
- .3 Fittings:
 - .1 NPS 2 and smaller: install welding type sockets.
 - .2 Branch connections: install welding tees or forged branch outlet fittings.

3.4 INSPECTION AND TESTS - GENERAL REQUIREMENTS

- .1 Formulate "Inspection and Test Plan" in co-operation with Departmental Representative.

- .2 Do not conceal welds until they have been inspected, tested and approved by inspector.
- .3 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

3.5 SPECIALIST EXAMINATIONS AND TESTS

- .1 General:
 - .1 Perform examinations and tests by specialist qualified to CSA W178.1 and CSA W178.2 and approved by Departmental Representative.
 - .2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction.
 - .3 Inspect and test 10 % of welds in accordance with "Inspection and Test Plan" by non-destructive visual examination.
- .2 Hydrostatically test welds to ANSI/ASME B31.1.
- .3 Visual examinations: include entire circumference of weld externally.

3.6 DEFECTS CAUSING REJECTION

- .1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code.

3.7 REPAIR OF WELDS WHICH FAILED TESTS

- .1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

3.8 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Approved: 2009-12-31

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 11 - Cleaning.
- .3 Section 01 74 21 - Construction Demolition Waste Management And Disposal.
- .4 Section 01 78 00 - Closeout Submittals.
- .5 Section 23 05 49.01 - Seismic Restraint Systems (SRS).

1.2 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.1-07, Power Piping.
- .2 ASTM International
 - .1 ASTM A125-1996(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Factory Mutual (FM)
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material safety data sheets (MSDS)
- .5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .6 Underwriter's Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Quebec, province of Québec.
 - .2 Submit shop drawings for:

- .1 Bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.
- .4 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 Performance Requirements:
-

- .1 Design supports, platforms, catwalks, hangers to withstand seismic events as specified Section 23 05 49.01 - Seismic Restraint Systems (SRS).

2.2 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP58.
- .2 Items of the present section must be used for supporting only. They cannot be used to rise, lift or mount other devices.

2.3 PIPE HANGERS

- .1 Finishes:
 - .1 Pipe hangers and supports: galvanized or painted with zinc-rich paint after manufacture.
 - .2 Use electro-plating galvanizing process or hot dipped galvanizing process.
 - .3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.
- .2 Upper attachment structural: suspension from lower flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut carbon steel retaining clip.
 - .2 Rod: 9 mm UL listed.
 - .3 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed.
- .3 Upper attachment structural: suspension from upper flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed.
 - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed.
- .4 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.
 - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed and to MSS SP69.
- .5 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.
- .6 Pipe attachments: material to MSS SP58:
 - .1 Attachments for steel piping: carbon steel galvanized.
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.

- .7 Adjustable clevis: material to MSS SP69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
- .8 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
- .9 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
 - .1 Finishes for steel pipework: galvanized.
 - .2 Finishes for copper, glass, brass or aluminum pipework: galvanized.

2.4 RISER CLAMPS

- .1 Steel or cast iron pipe: galvanized carbon steel to MSS SP58, type 42, UL listed.
- .2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
- .3 Bolts: to ASTM A307.
- .4 Nuts: to ASTM A563.

2.5 INSULATION PROTECTION SHIELDS

- .1 To be used for all piping 1 1/2 and larger.
- .2 Insulated cold piping:
 - .1 Insulation protection shield with a volumetric mass of 64 kg/m, to MSS SP69, galvanised carbon sheet metal; calculated length for a reach of 3 m or less.
- .3 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 CONSTANT SUPPORT SPRING HANGERS

- .1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).
- .2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
- .3 Provide upper and lower factory set travel stops.
- .4 Provide load adjustment scale for field adjustments.
- .5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
- .6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.7 VARIABLE SUPPORT SPRING HANGERS

- .1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
- .2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with springs in series in single casing.
- .3 Variable spring hanger complete with factory calibrated travel stops.

- .4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.8 EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 23 - Structural Steel for Buildings. Submit calculations with shop drawings.

2.9 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- .1 Provide templates to ensure accurate location of anchor bolts.

2.10 HOUSE-KEEPING PADS

- .1 Concrete: to Section 03 30 00 - Cast-in-Place Concrete.

2.11 OTHER EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports from structural grade steel meeting requirements of Section 05 12 23 - Structural Steel for Buildings.
- .2 Submit structural calculations with shop drawings.

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 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- .3 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.
- .4 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .6 Use approved constant support type hangers where:

- .1 Vertical movement of pipework is 13 mm or more,
- .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .7 Use variable support spring hangers where:
 - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
 - .2 Variation in supporting effect does not exceed 25 % of total load.
- .8 Provide means to allow contraction and dilatation movements of the supported items and prevent excessive constraints on the pipeline and the devices to which they are connected.

3.3 HANGER SPACING

- .1 Plumbing piping: to Canadian Plumbing Code or authority having jurisdiction.
- .2 Fire protection: to applicable fire code.
- .3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.
- .4 Copper piping: up to NPS 1/2: every 1.5 m.
- .5 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.
- .6 Within 300 mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1 1/2	2.7 m	2.4 m
2	3.0 m	2.4 m
2 1/2	3.6 m	3.0 m
3	3.6 m	3.0 m
3 1/2	3.9 m	3.3 m
4	4.2 m	3.6 m
5	4.8 m	-
6	5.1 m	-
8	5.7 m	-
10	6.6 m	-
12	6.9 m	-

- .7 Pipework greater than NPS 12: to MSS SP69.

3.4 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .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.

3.7 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests [in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

3.8 CLEANING

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

END OF SECTION

Approved: 2005-09-30

Part 1 General

1.1 SUMMARY

- .1 Related Requirements
- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 61 00 - Common Product Requirements
- .3 Section 01 74 11 - Cleaning

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 13-2010, Standard for the Installation of Sprinkler Systems.
- .3 National Building Code of Canada (NBC) - 2010

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .1 Submit one copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Québec, Canada.
 - .2 Provide system shop drawings complete with performance and product data.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .3 Manufacturer's Field Reports: manufacturer's field reports specified.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 Products**2.1 GENERAL**

- .1 Size and shape of bases type and performance of vibration isolation as indicated.

2.2 ELASTOMERIC PADS

- .1 Type EP1 - neoprene waffle or ribbed; 9 mm minimum thick; 50 durometer; maximum loading 350 kPa.
- .2 Type EP2 - rubber waffle or ribbed; 9 mm minimum thick; 30 durometer natural rubber; maximum loading 415 kPa.
- .3 Type EP3 - neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.
- .4 Type EP4 - rubber-steel-rubber; 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

2.3 ELASTOMERIC MOUNTS

- .1 Type M1 - colour coded; neoprene in shear; maximum durometer of 60; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.

2.4 SPRINGS

- .1 Design stable springs: ratio of lateral to axial stiffness is equal to or greater than 1.2 times ratio of static deflection to working height. Select for 50% travel beyond rated load. Units complete with levelling devices.
- .2 Ratio of height when loaded to diameter of spring between 0.8 to 1.0.
- .3 Cadmium plate for outdoor or 100% relative humidity installations.
- .4 Colour code springs.

2.5 SPRING MOUNT

- .1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.
- .2 Type M2 - stable open spring: support on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad.
- .3 Type M3 - stable open spring: 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad, bonded under isolator and on isolator top plate; levelling bolt for rigidly mounting to equipment.

- .4 Type M4 - restrained stable open spring: supported on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.
- .5 Type M5 - enclosed spring mounts with snubbers for isolation up to 950 kg maximum.

2.6 HANGERS

- .1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30 degrees arc without metal to metal contact.
- .2 Type H1 - neoprene - in-shear, moulded with rod isolation bushing which passes through hanger box.
- .3 Type H2 - stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.
- .4 Type H3 - stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.
- .5 Type H4 - stable spring, elastomeric element with precompression washer and nut.

2.7 ACOUSTIC BARRIERS FOR ANCHORS AND GUIDES

- .1 Acoustic barriers: between pipe and support, consisting of 25 mm minimum thick heavy duty duck and neoprene isolation material.

2.8 HORIZONTAL THRUST RESTRAINT

- .1 Spring and elastomeric element housed in box frame; assembly complete with rods and angle brackets for equipment and ductwork attachment; provision for adjustment to limit maximum start and stop movement to 9 mm.
- .2 Arrange restraints symmetrically on either side of unit and attach at centerline of thrust.

2.9 STRUCTURAL BASES

- .1 Type B1 - Prefabricated steel base: integrally welded on sizes up to 2400 mm on smallest dimension, split for field welding on sizes over 2400 mm on smallest dimension and reinforced for alignment of drive and driven equipment; without supplementary hold down devices; complete with isolation element attached to base brackets arranged to minimize height; pre-drilled holes to receive equipment anchor bolts; and complete with adjustable built-in motor slide rail where indicated.
- .2 Type B2 - Steel rail base: structural steel, positioned for alignment of drive and driven equipment; without supplementary hold down devices; complete with isolation element attached to base brackets arranged to minimize height; and pre-drilled holes to receive equipment anchor bolts.
- .3 Bases to clear housekeeping pads by 25 mm minimum.

2.10 INERTIA BASE

- .1 Type B3 - Full depth perimeter structural or formed channels, frames: welded in place reinforcing rods running in both directions; spring mounted, carried by gusseted height-saving brackets welded to frame; and clear housekeeping pads by 50 mm minimum.

- .2 Pump bases: "T" shaped, where applicable, to provide support for elbows.
- .3 Concrete: to Section 03 30 00 - Cast-in-Place Concrete.

2.11 ROOF CURB ISOLATION RAILS

- .1 General: complete factory assembled.
- .2 Lower member: continuous rectangular galvanised steel tube.
- .3 Upper member: continuous rectangular galvanised steel tube to provide continuous support for equipment, complete with all-directional neoprene snubber bushings 6 mm thick to resist wind and seismic forces.
- .4 Springs: steel, adjustable, removable, selected for 25 mm maximum static deflection plus 50% additional travel to solid, cadmium plated, sized and positioned to ensure uniform deflection.
- .5 High frequency isolation: 6 mm minimum thick continuous gasket on top and bottom of complete assembly or pads on top and bottom of each spring. Material: closed cell neoprene.
- .6 Weatherproofing: continuous flexible counterflashing to curb and providing access to springs. Material: aluminum.
- .7 Hardware: cadmium plated or galvanized.

2.12 SEISMIC CONTROL MEASURES

- .1 General:
 - .1 Following systems and/or equipment to remain operational during and after earthquakes.
 - .2 Seismic control systems to work in every direction.
 - .3 Fasteners and attachment points to resist same maximum load as seismic restraint.
 - .4 Drilled or power driven anchors and fasteners not permitted.
 - .5 No equipment, equipment supports or mounts to fail before failure of structure.
 - .6 Supports of cast iron or threaded pipe not permitted.
 - .7 Seismic control measures not to interfere with integrity of firestopping.
- .2 Static equipment:
 - .1 Anchor equipment to equipment supports. Anchor equipment supports to structure.
 - .2 Suspended equipment:
 - .1 Use one or more of following methods depending upon site conditions as indicated:
 - .1 Install tight to structure.
 - .2 Cross brace in every direction.
 - .3 Brace back to structure.
 - .4 Cable restraint system.
 - .3 Seismic restraints:
 - .1 Cushioning action gentle and steady.
 - .2 Never reach metal-like stiffness.

- .3 Vibration isolated equipment:
 - .1 Seismic control measures not to jeopardize noise and vibration isolation systems. Provide 6 to 9 mm clearance during normal operation of equipment and systems between seismic restraint and equipment.
 - .2 Incorporate seismic restraints into vibration isolation system to resist complete isolator unloading.
 - .3 As indicated.
- .4 Piping systems:
 - .1 Fire protection systems: to NFPA 13.
 - .2 Piping systems: hangers longer than 300 mm; brace at each hanger.
 - .3 Compatible with requirements for anchoring and guiding of piping systems.
- .5 Bracing methods:
 - .1 Approved by Departmental Representative.
 - .2 Structural angles or channels.
 - .3 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

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 Seismic control measures to meet requirements of NBC.
- .2 Install vibration isolation equipment in accordance with manufacturer's instructions and adjust mountings to level equipment.
- .3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.
- .4 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm minimum static deflection as follows:
 - .1 Up to NPS4: first 3 points of support. NPS5 to NPS8: first 4 points of support. NPS10 and Over: first 6 points of support.
 - .2 First point of support: static deflection of twice deflection of isolated equipment, but not more than 50 mm.
- .5 Where isolation is bolted to floor use vibration isolation rubber washers.
- .6 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.3 FIELD QUALITY CONTROL**.1 Manufacturer's Field Services:**

- .1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.
- .2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:
 - .1 After delivery and storage of Products.
 - .2 After preparatory work is complete but before installation commences.
 - .3 Upon completion of installation.
- .3 Submit manufacturer's reports to Departmental Representative within 3 days of manufacturer representative's review.
- .4 Make adjustments and corrections in accordance with written report.

.2 Inspection and Certification:

- .1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start up and TAB of systems to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .2 Provide Departmental Representative with notice 24 h in advance of commencement of tests.
- .3 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations (including sound curves).
- .4 Submit complete report of test results.

3.4 CLEANING

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

END OF SECTION

Approved: 2005-09-30

Part 1 General

1.1 INSPECTION

- .1 At the end of the work, the Engineer specializes will proceed to the seismic restraint system inspection. The Consultant must issue a report that confirm that the installation comply to Quebec Construction Code and manufacturer's written recommendations.

1.2 SUMMARY

- .1 Section Includes:
 - .1 The present section apply to divisions 21, 22, 23, 25, 26, 27 and 28
- .2 The present section aims to the calculations, the supplying and the installation of the seismic restraint systems and devices for the entire technical material and the material isolated against the vibrations included in the present work. The contractor bears the responsibility of the seismic restraint installation.
- .3 For the conception of the seismic restraint system and the acceptance of the seismic restraint work required for the present project, each contractor must employ, to its own fees, an engineer specialised in seismic restraint systems. The engineer must be a member of the OIQ. If requested, the contractor must provide the CV of the employed engineer to the Departmental Representative.
- .4 Calculations, specifications, sketch and seismic restrain system certification for all the equipment installed must be done by an engineer, member of the OIQ and specialised in seismic restraint systems.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 National Building Code of Canada (NBC) – 1995
- .4 Seismic Restraint Manuel, Guidelines for Mechanical Systems, SMACNA.
- .5 ANSI/NFPA 13-2002, Installation of Sprinkler Systems.

1.4 DEFINITIONS

- .1 Priority Two (P2) Buildings: buildings in which life safety is of paramount concern. It is not necessary that P2 buildings remain operative during or after earthquake activity.
- .2 SRS: acronym for Seismic Restraint System.

1.5 RESPONSIBILITY

- .1 Each contractor bears the responsibility of the installation of all the seismic restraint systems and devices for all the technical material included in their work. Each contractor must provide shop drawings of the seismic restraint systems and, following the end of the work, a report that confirm that the works are conform, sign and sealed by an engineer.

1.6 DESCRIPTION

- .1 SRS fully integrated into, and compatible with:
 - .1 Noise and vibration controls specified elsewhere.
 - .2 Structural, mechanical, electrical design of project.
- .2 Systems, equipment not required to be operational during and after seismic event.
- .3 During seismic event, SRS to prevent systems and equipment from causing personal injury and from moving from normal position.
- .4 Designed by Professional Engineer specializing in design of SRS and registered in Province of Quebec.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit the required samples and submittals.
- .2 Before the work, submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada. Submit design data including:
 - .1 Project title and the identification of the system (ventilation, plumbing, fire protection, etc.)
 - .2 Full details of design criteria.
 - .3 Working drawings (prepared to same standard of quality and size as documents forming these tender documents), materials lists, schematics, full specifications for components of each SRS to be provided.
 - .4 Design calculations (including restraint loads resulting from seismic forces in accordance with National Building Code, detailed work sheets, tables).
 - .5 Separate shop drawings for each SRS and devices for each system, equipment.
 - .6 Identification of location of devices.
 - .7 Schedules of types of SRS equipment and devices.
 - .8 Details of fasteners and attachments to structure, anchorage loadings, attachment methods.
 - .9 Installation procedures and instructions.
 - .10 Detailed work sheets, simplified tables. Conservative assumptions may be acceptable.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.

.4 At the end of the work and before the provisory acceptance can be issued, the contractor must provide to the Departmental Representative a report that confirm the compliance of the seismic restraint system to the design drawings. This report must include:

- .1 The project title and number as it is indicated in the specifications.
- .2 The specialty at which it refer
- .3 The title of the design report to which the conformity apply.
- .4 The analysis of the fixation of each technical component for which the design report ask for a seismic protection.
- .5 Pictures that show the seismic restraint system applied to each component.
- .6 A conclusion that confirm that the installed seismic restraint system comply with the design report and with the codes and requirements in force.
- .7 The signature of the engineer who realised the design report as well as his OIQ number, his professional address, his phone number and his electronic address.
- .8 The design and conformity report must be signed by the same engineer, provided with his OIQ number, his professional address, his phone number and his electronic address. Otherwise, the report will be rejected.

Part 2 Products

2.1 MANUFACTURERS

- .1 Materials and products for the seismic restraint system must be supplied by only one manufacturer which possesses knowledge in the field
- .2 The conception engineer of the seismic restraint system must provide enough information in his design report to allow the contractor to supply the required material for the seismic restraint system of the project. The engineer must assure that the contractor supplies the required material and equipment for the seismic restraint system of the project.

2.2 GENERAL

- .1 SRS to provide gentle and steady cushioning action and avoid high impact loads.
- .2 SRS to restrain seismic forces in every direction.
- .3 Fasteners and attachment points to resist same load as seismic restraints.
- .4 SRS of Piping systems compatible with:
 - .1 Expansion, anchoring and guiding requirements.
 - .2 Equipment vibration isolation and equipment SRS.
- .5 SRS utilizing cast iron, threaded pipe, other brittle materials not permitted.
- .6 Attachments to RC structure:
 - .1 Use high strength mechanical expansion anchors.
 - .2 Drilled or power driven anchors not permitted.
 - .3 Only chemical anchors are permitted.
- .7 Seismic control measures not to interfere with integrity of firestopping.

2.3 SRS FOR STATIC EQUIPMENT, SYSTEMS

- .1 Floor-mounted equipment, systems:
 - .1 Anchor equipment to equipment supports.
 - .2 Anchor equipment supports to structure.
 - .3 Use size of bolts scheduled in approved shop drawings.
- .2 Suspended equipment, systems:
 - .1 Use one or combination of following methods:
 - .1 Install tight to structure: installation at less than 300 mm of the framework
 - .2 Cross-brace in every direction.
 - .3 Brace back to structure.
 - .4 Slack cable restraint system.
 - .2 SCS to prevent sway in horizontal plane, "rocking" in vertical plane, sliding and buckling in axial direction.
 - .3 Hanger rods to withstand compressive loading and buckling.
 - .4 Hang the installed equipment to the ceiling or in the inter-ceiling space by the following method:
 - .1 Components less than 9.1 kg (20 lbs):
 - .1 The components must be attach or fixed to the main or secondary suspensions of the ceiling.
 - .2 Components from 9.1 kg (20 lbs) to 23.3 kg (56 lbs):
 - .1 The components must be fixed such as the preceding paragraph and must be attached with two cables n°12 to the structure. The cables do not need to be tightened.
 - .3 Components heavier than 23.3 kg (56 lbs):
 - .1 Supply the calculus and appropriate hangers

2.4 SRS FOR VIBRATION ISOLATED EQUIPMENT

- .1 Floor mounted equipment, systems:
 - .1 Use one or combination of following methods:
 - .1 Vibration isolators with built-in snubbers.
 - .2 Vibration isolators and separate snubbers.
 - .3 Built-up snubber system approved by Departmental Representative, consisting of structural elements and elastomeric layer.
 - .2 SRS to resist complete isolator unloading.
 - .3 SRS not to jeopardize noise and vibration isolation systems. Provide 4-8 mm clearance between seismic restraint snubbers and equipment during normal operation of equipment and systems.
 - .4 Cushioning action: gentle and steady by utilizing elastomeric material or other means in order to avoid high impact loads.
- .2 Suspended equipment, systems:
 - .1 Use one or combination of following methods:
 - .1 Slack cable restraint system.
 - .2 Brace back to structure via vibration isolators and snubbers.

2.5 SLACK CABLE RESTRAINT SYSTEM (SCS)

- .1 Use elastomer materials or similar to avoid high impact loads and provide gentle and steady cushioning action.
- .2 SCS to prevent sway in horizontal plane, "rocking" in vertical plane, sliding and buckling in axial direction.
- .3 Hanger rods to withstand compressive loading and buckling.

2.6 SERVICE UTILITIES ENTRANCE INTO BUILDING

- .1 Provide flexibility to prevent breakage in the event of earthquake activity.
- .2 Concerned networks: buried water piping and sanitary and storm drain piping.

Part 3 Execution**3.1 GENERAL**

- .1 The conception engineer of the seismic restraint system must make sure that the installation of the system by the contractor comply the requirements of his design report.

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

- .1 Attachment points and fasteners:
 - .1 To withstand same maximum load that seismic restraint is to resist and in every direction.
- .2 Slack Cable Systems (SCS):
 - .1 Connect to suspended equipment so that axial projection of wire passes through centre of gravity of equipment.
 - .2 Use appropriate grommets, shackles, other hardware to ensure alignment of restraints and to avoid bending of cables at connection points.
 - .3 Piping systems: provide transverse SCS at 10 m spacing maximum, longitudinal SCS at 20 m maximum or as limited by anchor/slack cable performance.
 - .4 Small pipes may be rigidly secured to larger pipes for restraint purposes, but not reverse.
 - .5 Orient restraint wires on ceiling hung equipment at approximately 90 degrees to each other (in plan), tie back to structure at maximum of 45 degrees to structure.
 - .6 Adjust restraint cables so that they are not visibly slack but permit vibration isolation system to function normally.
 - .7 Tighten cable to reduce slack to 40 mm under thumb pressure. Cable not to support weight during normal operation.
- .3 Install SRS at least 25 mm from equipment, systems, services.

- .4 Miscellaneous equipment not vibration-isolated:
 - .1 Bolt through house-keeping pad to structure.
- .5 Co-ordinate connections with other disciplines.
- .6 Vertical tanks:
 - .1 Anchor through house-keeping pad to structure.
 - .2 Provide steel bands above centre of gravity.
- .7 Horizontal tanks:
 - .1 Provide at least two straps with anchor bolts fastened to structure.

3.4 REALISATION OF PROJECT

- .1 During installation of SRS, the seismic engineer shall ensure that contractor completes installation according to design report.
- .2 To this end, the contractor shall keep abreast the seismic engineer of the work progress and issues met.

3.5 END OF PROJECT INSPECTION

- .1 At the end of the work, the contractor must notify the engineer responsible of the seismic restraint system's installation that the works are completed.
- .2 The engineer responsible of the seismic restraint system's installation must make sure that the installation of the system by the contractor comply the requirements of his design report.
- .3 The engineer responsible of the seismic restraint system's installation must provide to the contractor a list of deficiencies to be corrected by the contractor.
- .4 The contractor must correct the deficiencies and inform the engineer responsible of the seismic restraint system's installation.
- .5 When the deficiencies will be corrected to the satisfaction of the engineer responsible of the seismic restraint system's installation, the engineer will provide a conformity report of the seismic restraint system's installation.

3.6 NECESSARY DOCUMENTS FOR THE START-UP

- .1 The contractor must provide to the Consultant a copy of the conformity report of the seismic restraint system's installation signed by the engineer who produce it before the start-up of the electromechanical system.
- .2 Every deficiency in the installation of the seismic restraint system must be corrected and a report confirming the end of the works must be provided to the Consultant before the start-up.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 Except if indicated otherwise, perform the work accordingly to the identification of the networks and mechanical equipment in accordance to the newest codes and standards listed below.
- .2 Canadian Gas Association (CGA)
 - .1 CSA/CGA B149.1 2010, Natural Gas and Propane Installation Code.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.60 1997, Interior Alkyd Gloss Enamel.
 - .2 CAN/CGSB-24.3 1992, Identification of Piping Systems.
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA 13 2010, Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 14 2010, Standard for the Installation of Standpipe and Hose Systems.
- .5 ACNOR, CSA and ULC : Certification plate to the requirements of those agency.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data to include paint colour chips, other products specified in this section.
- .3 Submit the complete list of the labels of the components, such as valves, automatic regulation's valves, pumps, circulators, heat exchangers, reservoirs, etc.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers raised or recessed.
- .3 Information to include, as appropriate:
 - .1 Equipment: manufacturer's name, model, size, serial number, capacity.
 - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 EQUIPMENT NAMEPLATES

- .1 Use:
 - .1 Identification of the ventilators, air treatment units, fan coils, etc.
- .2 Use bronze or brass nameplates to resist heat, with recessed lettering and black painted, at least 90 x 40 x 2.5 mm of nominal depth. The lettering must have a minimum of 25 mm height and will indicate the equipment's tag.

2.3 EXISTING IDENTIFICATION SYSTEMS

- .1 Apply existing identification system to new work.
- .2 Before starting work, obtain written approval of identification system from Departmental Representative .
- .3 The equipment's and accessories' tag such as boilers, pumps, heat exchangers, reservoir, etc. refer to the ones on the mechanical plans. This list of equipment could interfere with the one already in place. Therefore the contractor must rename the equipment and accessories appropriately with the help of the Owner.

2.4 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.
 - .4 The direction of the flow is shown on plans.
- .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 plastic-coated cloth or 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:
 - .3 Background colour marking and legends for piping systems:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.8

Contents	Background colour marking	Legend	Identification on drawings (construction)
Chilled water supply	Green	CH. WTR. SUPPLY	AER
Chilled water return	Green	CH. WTR. RETURN	RER
Hot water heating supply	Yellow	HEATING SUPPLY	AEC
Hot water heating return	Yellow	HEATING RETURN	REC
High temp HW Htg. supply	Yellow	HTHW HTG. SUPPLY++	AEG
High temp HW Htg. return	Yellow	HTHW HTG. RETURN++	REG
Boiler feed water	Yellow	BLR. FEED WTR	EFD
Steam (x) kPa	Yellow	(x) kPa STEAM	VXXX
Steam condensate (gravity)	Yellow	ST.COND.RET (GRAVITY)	C
Steam condensate (pumped)	Yellow	ST.COND.RET (PUMPED)	CP
Domestic hot water supply	Green	DOM. HW SUPPLY	ECD
Dom. HWS recirculation	Green	DOM. HW CIRC	ECR
Domestic cold water supply	Green	DOM. CWS	EFD
Storm water	Green	STORM	S
Sanitary	Green	SAN	P
Plumbing vent	Green	SAN. VENT	EVE
Natural gas	to Codes		
Sprinklers	Red	SPRINKLERS	

2.5 IDENTIFICATION DUCTWORK SYSTEMS

- .1 Identify the content of the duct: Supply, Return or else.
- .2 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
- .3 Colours: black, or co-ordinated with base colour to ensure strong contrast.

2.6 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.
- .3 Control valves and actuators: in each room, identify the position of the control valves and actuators on the cross-tee of the ceiling with a sticker.

2.7 LANGUAGE

- .1 Identification in French.

Part 3 Execution**3.1 START OF THE WORK**

- .1 Provide identification only after insulation work has been completed.

3.2 TIMING

- .1 Provide identification only after painting has been completed.

3.3 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC, CSA registration plates as required by respective agency.

3.4 NAMEPLATES

- .1 Locations:
 - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
 - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection:
 - .1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
 - .2 Adjacent to each change in direction.
 - .3 At least once in each small room through which piping or ductwork passes.
 - .4 On both sides of visual obstruction or where run is difficult to follow.
 - .5 On both sides of separations such as walls, floors, partitions.
 - .6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
 - .7 At beginning and end points of each run and at each piece of equipment in run.
 - .8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.
 - .9 Identification easily and accurately readable from usual operating areas and from access points.
-

- .1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 VALVES, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively.
- .4 Control components: in each room, identify the position of the control components (such as actuators, coils, control valves, etc.) on the cross-tee of the ceiling with a sticker.

END OF SECTION

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Part 1 General

1.1 SUMMARY

- .1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.
- .3 Standards of reference:
 - .1 Perform TAB of mechanical systems in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
 - .1 Associated Air Balance Council, (AABC)
 - .2 National Environmental Balancing Bureau (NEBB)
 - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .4 Instructions in this section and other parts of the contract.
- .4 TAB work to begin only once:
 - .1 Ductwork is free of debris and other obstruction.
 - .2 Coil fins are straight and clean.
 - .3 Access doors and traps are closed, and ductwork ends are capped.
 - .4 Filters are clean and properly installed.
 - .1 Coordinate filter replacement with sheet metal (ventilation) contractor.
 - .5 Fire, smoke and balancing dampers are installed and open.
 - .6 Diffusers, grilles and registers are installed.
 - .7 Test holes are closed.
 - .8 Thermal protection of electrical materials is installed.
 - .9 Measuring equipment is calibrated; according to the standards of reference and done within 3 months of the beginning of TAB work.
 - .1 Provide to the departmental representative a certification of calibration of the measuring equipment before the beginning of TAB work, as early as the contract award.
- .5 Performance:
 - .1 Balance air systems so that the maximum allowable offset between designed air flows and actual air flows is no more than +10% at the grilles and registers and no more than +5% at the system level. The offset may be positive but may not be negative.
- .6 Setting:
 - .1 Once the work is complete, setting devices will be locked in place and operating setpoints will be marked permanently according to the standards of reference.
- .7 Shop Drawings:

- .1 TAB contractor is responsible to obtain from sheet metal contractor all shop drawings of equipment and components to balance. These documents shall be obtained before TAB work can begin.
- .8 Coordination of work:
 - .1 Allow sufficient time in schedule to complete TAB work (including verification of TAB work) before substantial completion of project.

Part 2 Products

2.1 AIR SYSTEMS

- .1 Report
 - .1 Submit samples of report formulas. These formulas must meet AABC standards.
 - .2 Submit to departmental representative 3 copies of test results and all formulas approved and include in 3-ring binder.
 - .3 Report must be signed by a qualified person.
 - .4 Departmental representative retains the right to have report verified and witnessed by him, in part or entirely, any test that does not meet the requirements of this specification.
- .2 General: readings required by the standards of reference shall be included in report and include the following as a minimum:
 - .1 TAB work required
 - .1 Ductwork surface in square feet
 - .2 Nominal air speed and measures in fpm, including the sum of the measures speeds and average speed. Motor and fan RPM
 - .3 HP of each fan measured by an **electric measuring device**. HP, power factor, motor voltages and Amp draw on each phase of current at full charge shall be measured for each application.
 - .4 Minimum and maximum air flows of outside air and exhaust air.
 - .5 Configuration, manufacturer's name and model number, dimensions, arrangement and rating of motors, fans and other ancillary equipment.
 - .6 Design calculations: nominal total flow, make-up air flow, total static pressure, motor HP and voltage, number of phases and amp draw, rpm for all motors and fans.
 - .2 Test point locations on equipment
 - .1 At the inlet and outlet of the following equipment
 - .1 Fans, registers, filters, heating and cooling coils, and any other device that change air conditions.
 - .3 Test point locations on systems
 - .1 Main supply and return ductwork
 - .2 Secondary supply and return ductwork
 - .3 Others installed ductwork such as exhaust from washrooms, etc.
 - .5 Supply and return grilles and diffusers.

- .3 After TAB work is complete, verify a second time, at random, 4% of make-up and exhaust air measurements.
- .4 Once the second verification is complete and the report is accepted, mark with indelible markers the settings of all balancing dampers, registers and other balancing devices.

2.2 EQUIPMENT

- .1 As required, replace and adjust belts and pulleys of fans. These belts and pulleys will be provided by TAB contractor.

Part 3 Execution

3.1 AIR SYSTEM PROCEDURES

- .1 Preliminary
 - .1 Use manufacturers' data on all equipment to perform calculations required, unless tests show that data can only be obtain by installation.,
- .2 Supply and return grilles and diffusers
 - .1 Ensure that air flow settings of all diffusers or grilles match what is specified by drawings using balancing devices

3.2 EXECUTION

- .1 Perform TAB work without affecting occupant comfort.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
 - .1 SMACNA HVAC Air Duct Leakage Test Manual, [1985].

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Test Reports: Include pressure test information and results as follows:
 - .1 Prepare report of results and submit to Departmental Representative within hours of completion of tests. Include:
 - .1 Schematic of entire system.
 - .2 Schematic of section under test showing test site.
 - .3 Required and achieved static pressures.
 - .4 Orifice differential pressure at test sites.
 - .5 Permissible and actual leakage flow rate (L/s) for test sites.
 - .6 Witnessed certification of results.
 - .2 Include test reports in final TAB report.

Part 2 Products**2.1 TEST INSTRUMENTS**

- .1 Test apparatus to include:
 - .1 Fan capable of producing required static pressure.
 - .2 Duct section with calibrated orifice plate mounted and accurately located pressure taps.
 - .3 Flow measuring instrument compatible with the orifice plate.
 - .4 Calibration curves for orifice plates used.
 - .5 Flexible duct for connecting to ductwork under test.
 - .6 Smoke bombs for visual inspections.
 - .2 Test apparatus: accurate to within +/- 3 % of flow rate and pressure.
 - .3 Submit details of test instruments to be used to Departmental Representative at least one month before anticipated start date.
 - .4 Test instruments: calibrated and certificate of calibration deposited with Departmental Representative no more than 28 days before start of tests.
 - .5 Re-calibrated every six months thereafter.
-

2.2 EQUIPMENT LEAKAGE TOLERANCES

- .1 Equipment and system components such as VAV boxes or duct heating leakage, acceptable rate of leakage is indicated in appropriate specification's section if applicable.

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 TEST PROCEDURES

- .1 Maximum lengths of ducts to be tested consistent with capacity of test equipment.
- .2 Section of duct to be tested to include:
 - .1 Fresh air ducting, from exterior wall to the new air handling units.
 - .2 Evacuation ducting, from new air handling units to exterior wall.
 - .3 Air supply ducting from ventilation units, taking care to plug end at diffuser and units.
 - .4 Same thing apply to the return ducting of those units
 - .5 All evacuation ducting toward exterior (hoods, restroom, etc.)
- .3 Repeat tests until specified pressures are attained. Bear costs for repairs and repetition to tests.
- .4 Base partial system leakage calculations on SMACNA HVAC Air Duct Leakage Test Manual.
- .5 Seal leaks that can be heard or felt, regardless of their contribution to total leakage.

3.3 SITE TOLERANCES

- .1 System leakage tolerances specified are stated as percentage of total flow rate handled by system. Pro-rate specified system leakage tolerances. Leakage for sections of duct systems: not to exceed total allowable leakage.
- .2 Leakage tests on following systems not to exceed specified leakage rates.
 - .1 Small duct systems up to 250 Pa: leakage 2%.
 - .2 VAV box / fan coils and duct on downstream side of VAV box: leakage 2%.
 - .3 Large low pressure duct systems up to 500 Pa: leakage 1%.
 - .4 HP duct systems up to 1000 Pa pressure classification, including upstream side of VAV boxes: leakage 0.5%.
- .3 Evaluation of test results to use surface area of duct and pressure in duct as basic parameters.

3.4 TESTING

- .1 Test ducts before installation of insulation or other forms of concealment.
 - .2 Test after seals have cured.
-

- .3 Test when ambient temperature will not affect effectiveness of seals, and gaskets.

END OF SECTION

Approved: 2008-12-31

Part 1 General

1.1 REFERENCES

.1 Definitions:

.1 For purposes of this section:

- .1 "CONCEALED"** - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
- .2 "EXPOSED"** - means "not concealed" as previously defined.
- .3 Insulation systems** - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:

- .1 CRD:** Code Round Ductwork,
- .2 CRF:** Code Rectangular Finish.

.3 TIAC Codes to define finish coats

.1 CRF/1 : Interior

- .1 Use rigid insulation with integrated vapor barrier.** Install a continuous metal angle on each corner. Apply a vapor barrier strip on every joints and abutments of vapor barrier, and on every corner.
- .2 Install a treated fabric jacket on insulation in an adhesive layer coat and finish utilizing and second adhesive layer coat.**

.2 CRF/2 : Interior

- .1 Use rigid insulation with integrated vapor barrier.** Install a continuous metal angle on each corner. Apply a vapor barrier strip on every joints and abutments of vapor barrier, and on every corner.

.3 CRF/3 : Exterior

- .1 Glue a vapor barrier strip on every joint and abutment of vapor barrier and on every corner of the ducting for chill or mixed temperature application.**
- .2 On top of insulated surface, apply a dented aluminum jacket fixed with rivet. All joints are sealed to permit water flow.**

.4 CRF/4 : Exterior

- .1 On insulation surface, apply a layer (minimum 1 liter for every 1.5 m²) of weatherproofing coat. While still humid, embed a layer of reinforcing membrane and finish by applying a final layer (minimum 1 liter for every 1.5 m²) of weatherproofing coat.**

.5 CRD/1 : Interior

- .1 Use rigid isolation with integrated vapor barrier. Cover all joints and abutments with a vapor barrier strip.**

-
- .2 Install a treated fabric jacket on insulation in a layer of adhesive coating and finish by installing a second layer of adhesive coating.
 - .6 CRD/2 : Interior
 - .1 Use rigid insulation with integrated vapor barrier on duct less or equal to 200 mm in diameter. Use semi-rigid insulation with integrated vapor barrier on duct greater or equal to 250 mm in diameter. On every joints and abutments, apply a vapor barrier strip.
 - .2 Apply a treated fabric jacket on insulation using adhesive coating and finish by installing a layer of canvas coating.
 - .7 CRD/3 : Interior
 - .1 Use flexible insulation with integrated vapor barrier.
 - .2 Cover all joints and abutments with a vapor barrier strip.
 - .8 CRD/4 : Exterior
 - .1 Apply a vapor barrier strip on every joint and abutment of vapor barrier and on every corner of the ducting for chill or mixed temperature application.
 - .2 On top of insulated surface, apply a dented aluminum jacket fixed with rivet. All joints are sealed to permit water flow.
 - .9 CRD/5 : Exterior
 - .1 On insulation surface, apply a layer (minimum 1 liter for every 1.5 m²) of weatherproofing coat. While still humid, embed a layer of reinforcing membrane and finish by applying a final layer (minimum 1 liter for every 1.5 m²) of weatherproofing coat.
 - .10 CRD/6 : Exterior or in lean-to
 - .1 Apply a vapor barrier strip on every joint and abutment of vapor barrier and on every corner of the ducting for chill or mixed temperature application.
 - .2 On top of insulated surface, apply a stainless steel jacket such as described in the present specifications. All joints are sealed to permit water flow.
 - .2 Reference Standards:
 - .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE/IESNA 90.1-[04], SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
 - .2 Canada National Research Council
 - .1 National Energy Code for Buildings (NECB).
 - .3 ASTM International Inc.
 - .1 ASTM B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
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- .2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C547, Standard Specification for Mineral Fiber Pipe Insulation.
 - .6 ASTM C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .7 ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .8 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .9 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
 - .10 ASTM E2336, Standard Test Methods for Fire Resistance Rated Grease Duct Enclosures
 - .11 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
 - .12 ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials
 - .13 ASTM E136, Standard Test Method for Noncombustibility
 - .14 ASTM E518, Standard Test for Durability
 - .15 ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
 - .4 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-[89], Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .5 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC, 2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.
 - .6 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36-[00], Commercial Adhesives.
 - .7 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-[A2005], Adhesive and Sealant Applications.
 - .8 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
 - .9 National Fire and Protection Association (NFPA)
 - .1 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
 - .10 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-[03], Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
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- .2 CAN/ULC-S701-[05], Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
- .3 Manufacturers' Instructions:
 - .1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 FIRE AND SMOKE RATING

- .1 To CAN/ULC-S102:
 - .1 Maximum flame spread rating: [25].
 - .2 Maximum smoke developed rating: [50].
- .2 Materials must comply to NFPA 90A.
- .3 Materials must be tried and tested to ASTM C411.

2.2 INSULATION

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).
 - .1 Use
 - .1 Air supply ducting from ventilation units, excluding duct with interior sound insulation.

- .2 Fresh air ducting, up to air handling units or heating coil.
- .3 Evacuation ducting on a distance of 5 m (15 ft) from the outside of building or from heated room.
- .4 Conditioned air ducts, excluding duct with interior sound insulation.
- .5 Conduits d'air climatisé, excluant les conduits avec revêtement intérieur de type isolant acoustique.
- .6 Duct on roof.
- .2 Description
 - .1 TIAC code C-1 insulation for chill or heated rectangular air ducts with operation temperature equal or less than 65°C (149°F).
- .3 Material
 - .1 Rigid mineral fibre board with a density of 36 kg/m³; (2,25 lb/pi³) and a thermal conductivity of 0,035 W/m °C (0,24 Btu-po/h-pi² °F) at 24°C (75°F), in compliance to ONGC-51-GP-10A and vapor barrier, jacket and surfacing material in compliance to ONGC 51-GP-52M.
- .4 Insulation thickness

Nominal thickness	Service temperature
25 mm (1 po)	0 °C à 65 °C (32 °F à 149 °F)
50 mm (2 po)	-40 °C à 0 °C (-40 °F à 32 °F)

Roof ducting

TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).

- .5 Use
 - .1 Air supply ducting of ventilation units.
 - .2 Fresh air ducting, up to air handling units or heating coil.
 - .3 Evacuation ducting on a distance of 5 m (15 ft) from the outside of building or from heated room.
 - .4 Conditioned air ducts.
- .6 Description
 - .1 TIAC code C-2 insulation for chill or heated rectangular air ducts with operation temperature equal or less than 65°C (149°F).
- .7 Material
 - .1 Rigid mineral fibre board with a density of 24 kg/m³; (1,5 lb/pi³) and a thermal conductivity of 0,035 W/m °C (0,24 Btu-po/h-pi² °F) at 24°C (75°F), in compliance to ONGC-51-GP-10A and vapor barrier, jacket and surfacing material in compliance to ONGC 51-GP-52M.

2.3 JACKETS

- .1 Canvas:
 - .1 Cotton with area density of 220 gm/m, plain weave, coated with fireproof or insulating glue, diluted, in compliance to ASTM C921.
- .2 Lagging adhesive: compatible with insulation.

- .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .3 Aluminum:
 - .1 To ASTM B209 with moisture barrier as scheduled in PART 3 of this section.
 - .2 Thickness: 0.50 mm sheet.
 - .3 Finish: Stucco embossed.
 - .4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.
- .4 Stainless steel:
 - .1 Type: 304.
 - .2 Thickness: 0.50 mm sheet.
 - .3 Finish: Smooth.
 - .4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.

2.4 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
 - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .2 Indoor Vapour Retarder Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: setting on mineral wool, to ASTM C449.
- .4 Outdoor Vapour Retarder Mastic:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
 - .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m
- .5 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.
- .6 Contact adhesive: quick-setting
 - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .7 Canvas adhesive: washable.
 - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .8 Tie wire: 1.5 mm stainless steel.
- .9 Banding: 19 mm wide, 0.5 mm thick stainless steel.
- .10 Facing: 25 mm stainless steel hexagonal wire mesh stitched on one face of insulation with expanded metal lath on other face of insulation.
- .11 Fasteners: 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

2.5 METAL CORNERS

- .1 Supply and install metal corners to protect insulation corners for every rectangular duct or equipment installed 3 m (10 ft) from the ground.

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 Clean insulation material and all surfaces to be insulated before the installation.
- .3 Ensure surfaces are clean, dry and free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and as indicated.
- .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 31 13.01.
 - .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 FASTENERS

- .1 For rectangular ducts, partially cover 50% of insulated surface with insulating cement and apply, on each face, at least 2 rows of welding stud with a maximum of 200 mm (8 in) between.
- .2 For round ducts, cover entirely the insulated surface with insulating cement and seal joints with auto-adhesive tape.

3.5 INSULATING AND FIREPROOFING GLUES AND COATING

- .1 Apply a fireproofing coating on fabric jacket.
- .2 Fireproofing coating to be approved by Departmental Representative before the installation. The Departmental Representative can sample of the coating to analyse and testing purpose.
- .3 Coat the fabric jacket of apparent ducts localised in finished rooms with a layer of diluted insulating glue in compliance with manufacturer's recommendations.
- .4 Install aluminum jacket on insulation localised outside the building.

3.6 DUCT INSULATION

- .1 Joints must be made on top surface of ducts.
 - .2 Glue and seal the vapor barrier with the help of vapor barrier adhesive.
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3.7 DUCTWORK INSULATION SCHEDULE

- .1 Thermal insulation to be obtained in function of the temperature difference in design conditions between the space in which the duct goes through and the designed temperature of the chimney. If a duct is use for heating and cooling, use the higher temperature difference:
- .1 Difference from 5°C to 22°C: Minimal thermal resistance of 0.58 m²C/W.
- .2 Difference greater than 22°C: Minimal thermal resistance of 0.88 m²C/W
- .2 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	[C-1]	[yes]	[50]
Round cold and dual temperature supply air ducts	[C-2]	[yes]	[50]
Rectangular warm air ducts	[C-1]	[no]	[25]
Round warm air ducts	[C-1]	[no]	[25]
Supply, return and exhaust ducts exposed in space being served	[none]		
Outside air ducts to mixing plenum	[C-1]	[yes]	[25]
Mixing plenums	[C-1]	[yes]	[25]
Exhaust duct between 5m to outside	[C-1]	[no]	[25]
Rectangular ducts outside	[C-1]	[special]	[50]
Round ducts outside	[C-1]	[special]	[50]
Acoustically lined ducts	[none]		

- .3 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:
- .1 Use TIAC code C-1 insulation, scored to suit diameter of duct.
- .1 Finishes: conform to following table:

	TIAC Code	
	Rectangular	Round
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

Approved: 2005-12-31

Part 1 General

1.1 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1-[01], Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).
- .2 Canada National Research Council
 - .1 National Energy Code for Buildings (NECB) 2011
- .3 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B209M-[04], Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate [Metric].
 - .2 ASTM C335-[04], Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411-[04], Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M-[00], Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C533-[2004], Calcium Silicate Block and Pipe Thermal Insulation.
 - .6 ASTM C547-[2003], Mineral Fiber Pipe Insulation.
 - .7 ASTM C795-[03], Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .8 ASTM C921-[03a], Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .4 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-[89], Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .2 CAN/CGSB-51.53-[95], Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts
- .5 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).
- .8 Underwriters' Laboratories of Canada (ULC)

- .1 CAN/ULC-S102-[03], Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC-S701-[01], Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .3 CAN/ULC-S702-[1997], Thermal Insulation, Mineral Fibre, for Buildings
- .4 CAN/ULC-S702.2-[03], Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.2 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Shop drawings must include materials, performance data, joints, coating, etc.
- .4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

- .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions required by manufacturer.
- .3 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse /recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Place excess or unused insulation and insulation accessory materials in designated containers.
 - .3 Divert unused metal materials from landfill to authorise metal recycling facility.
 - .4 Dispose of unused adhesive material at approved official hazardous material collections site.

1.6 COMPONENT'S COMPATIBILITY

- .1 All metallic fasteners, adhesive, sealing products, vapor barrier adhesive, putty, insulation and sealing compounds must be compatible with the materials to be insulated. Consequently, they must not soften nor corrode or attack those materials, either humid or dry. Apply those products in the limits of temperature recommended by manufacturer.

Part 2 Products

2.1 QUALITY

- .1 Only materials and products in accordance with ULC are acceptable for the present works.

2.2 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.3 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 Use: **hot distribution network** with service temperature between 15°C and 315°C (60°F to 600°F) including:
 - .1 Steam and condensate for humidification.
 - .2 Heating water, whether with or without glycol.

- .3 Domestic hot water, including circulation.
- .2 Mineral fibre: to CAN/CGSB-51.9.
- .3 Maximum "k" factor: to CAN/CGSB-51.9 and NECB, 0.035 W/m-°C to 0,040 W/m-°C.
- .4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Use: **cold distribution network** with service temperature between -14°C and 15°C (7°F to 60°F) including:
 - .1 Domestic cold water.
 - .2 Plumbing vent 3m from exterior wall or roof.
 - .3 Storm drainage, on all length until the slab-on-ground.
 - .4 Refrigerant with diameter larger than ¾"
 - .2 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
 - .3 Vapour retarder jacket: to CGSB 51-GP-52Ma.
 - .4 Maximum "k" factor: to CAN/ULC-S702 and ASTM C547.
 - .5 Maximum "k" factor: 0,035 W/m °C (0,0202 Btu/hpi °F) to 24 °C (75 °F)
 - .6 Insulation thickness: see table section 3.
- .5 TIAC Code A-6: flexible unicellular tubular elastomer.
 - .1 Use: Refrigerant system. Pipes and fittings with service temperature between -40°C (-40°F) and 95°C (203°F) and with diameter equal or less than ¾"
 - .2 Insulation: to CAN/CGSB-51.40, with vapour retarder jacket.
 - .3 Vapor barrier: to CGSB 51-GP- 52Ma.
 - .4 Maximum "k" factor: to CAN/ULC-S702, ASTM C547 and NECB, 0.035 W/m-°C to 0,040 W/m-°C
 - .5 Certified by manufacturer: free of potential stress corrosion cracking corrodants.
 - .6 Insulation thickness
 - .1 Suction pipe: 19 mm (3/4 in).
 - .2 Discharge pipe: 12 mm (1/2 in).
 - .3 Liquid pipe: 19 mm (3/4 in).
 - .4 Piping subject to weather is coated with two waterproofing and ultraviolet rays resistant layers.

2.4 INSULATION SECUREMENT

- .1 For insulation TIAC Code A-1:
 - .1 Tape: aluminum, auto-adhesive, reinforced, at least 50 mm wide and insulating glue used to cover entirely the insulated surface.
 - .2 Vapor barrier:
 - .1 Quick setting contact adhesive used to seal joints and overlaps of vapor barrier, flame spread rating of 10 and smoke development rating of 0.
 - .3 Canvas adhesive: washable.
 - .4 Tie wire: 1.5 mm diameter stainless steel.
 - .5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.
- .2 For insulation TIAC Code A-6:
 - .1 Tape: aluminum, auto-adhesive, reinforced, at least 50 mm wide, flame spread .

- .2 Vapor barrier:
 - .1 Quick setting contact adhesive used to seal joints and overlaps of vapor barrier, flame spread rating of 25 and smoke development rating of 50, aluminum bands 12mm x 0.05mm (1/2 in x 0.002 in), with locking fasteners.
 - .3 Contact adhesive: quick setting.
 - .4 Canvas adhesive: washable.
 - .5 Tie wire: 1.5 mm diameter stainless steel.
 - .6 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.5 CEMENT

- .1 Thermal insulating and finishing cement:
 - .1 Air drying on mineral wool, to ASTM C449/C449M.

2.6 VAPOUR RETARDER LAP ADHESIVE

- .1 Water based, fire retardant type, compatible with insulation.
 - .1 Maximum VOC limit 50 g/L, to SCAQMD Rule 1168.

2.7 INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.

2.8 OUTDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: fibrous glass, untreated 305 g/m

2.9 POLYVINYL CHLORIDE (PVC) JACKETS

- .1 Use: Apparent pipes for domestic water distribution (EFD, ECD, ECR), chilled water (AER/RER), heating water (AEC/REC), refrigerant.
- .2 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type [and sheet] to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 In compliance with CAN/CGSB-51.53, performed as needed.
 - .3 Minimum service temperatures: -18°C (-0.5°F).
 - .4 Maximum service temperature: 66°C (150°F).
 - .5 Moisture vapour transmission: 0.02 perm.
 - .6 Thickness: minimum 0.5 mm (20 thousandth of inches)
 - .7 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.

2.10 CANEVAS JACKET

- .1 Jacket used on all steam apparent piping (high and low pressure steam), condensate (gravity-fed or pumped), and vent.

- .2 Canevas:
 - .1 Cotton with area density of 220 g/m² (for piping) and 120 g/m² (for elbows and valves), plain weave, fire retardant and insulating glue coated, diluted, to ASTM C921.
 - .2 Maximum VOC limit 50 g/L, to SCAQMD Rule 1168.
 - .3 Fasteners:
 - .1 Washable glue used to glue the fabric jacket on the insulation materials.
 - .2 Maximum VOC limit 50 g/L, to SCAQMD Rule 1168.

2.11 ALUMINUM JACKET

- .1 Jacket used on all exterior insulated pipe length.
- .2 Thickness: 0.060 inches sheet (1.52 mm).
- .3 Finish: smooth.

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 manufacturer's 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.
- .6 Fastener installer must take in consideration the insulation work.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

- .1 Application: at expansion joints, valves, primary flow measuring elements, flanges and unions at equipment.

.2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:

.1 Insulation, fastenings and finishes: same as system.

.2 Jacket: PVC resisting to high temperature

3.5 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-1.

.1 Securements: Tape at 300 mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Maximum VOC limit 50 g/L, to SCAQMD Rule 1168.

.4 Installation:

.1 Piping: Pipe insulation without integrated jacket must be held in place with fasteners 300 mm on center or less. Pipe insulation with integrated jacket must be held in place by stapling the slap every 75 mm on center. Insulation with integrated auto-sealing jacket does not require further fasteners.

.2 Fittings : Insulate fittings with piping insulation with tight-fit pipes or with insulating cement, or with a tight-fit flexible insulation and wrapped with a reinforcing membrane stapled into place. Alternatively, insulate fittings with a tight-fit flexible insulation and wrapped with PVC (or canvas cloth – based on the piping's use).

.3 Taps and strainers : Insulated the body of taps and strainers with insulating cement or tight fitting sections of pipe insulation, at the same thickness of adjacent insulation, or with a tight fitting flexible insulation, wrapped in reinforcing membrane stapled into place. Drains and caps must not be wrapped in insulation. Alternatively, insulate taps and strainers with tight-fit flexible insulation and wrapped with PVC (or canvas cloth – based on the piping's use).

.4 Mechanical joints : Insulate mechanical joints with oversized pipe insulation or with cut blocks of the same thickness as the adjacent insulation. Alternatively, insulate using tight-fit flexible insulation and wrapped with PVC (or canvas cloth – based on the piping's use).

.5 Insulation ends : Stop insulation at 50mm from connections to allow space to work or to bevel insulation at an angle of 45 deg. Systematically enclose the insulating wool exposed with a PVC cap (or canvass). Do not leave exposed any insulating wool that may be in contact with the pipe.

.6 Alternative : Where the above methods are not applicable, a flexible foam or closed cell insulation may be used and shall be used according to the manufacturers' recommendations. In this case, advise the Departmental Representative before work begins.

.3 TIAC Code: A-3.

- .1 Securements: Tape at 300 mm on centre.
- .2 Seals: VR lap seal adhesive, VR lagging adhesive.
- .3 3.Maximum VOC limit 50 g/L, to SCAQMD Rule 1168.
- .4 Installation:
 - .1 Piping: Pipe insulation without integrated jacket must be held in place with fasteners 300 mm on center or less. Pipe insulation with integrated jacket must be held in place by stapling the slap every 75 mm on center. Insulation with integrated auto-sealing jacket does not require further fasteners.
 - .2 Fittings : Insulate fittings with piping insulation with tight-fit pipes or with insulating cement, or with a tight-fit flexible insulation and wrapped with a reinforcing membrane stapled into place. Alternatively, insulate fittings with a tight-fit flexible insulation and wrapped with PVC (or canvas cloth – based on the piping's use).
 - .3 Taps and strainers : Insulated the body of taps and strainers with insulating cement or tight fitting sections of pipe insulation, at the same thickness of adjacent insulation, or with a tight fitting flexible insulation, wrapped in reinforcing membrane stapled into place. Drains and caps must not be wrapped in insulation. Alternatively, insulate taps and strainers with tight-fit flexible insulation and wrapped with PVC (or canvas cloth – based on the piping's use).
 - .4 Mechanical joints : Insulate mechanical joints with oversized pipe insulation or with cut blocks of the same thickness as the adjacent insulation. Alternatively, insulate using tight-fit flexible insulation and wrapped with PVC (or canvas cloth – based on the piping's use).
 - .5 Alternative : Where the above methods are not applicable, a flexible foam or closed cell insulation may be used and shall be used according to the manufacturers' recommendations. In this case, advise the Departmental Representative before work begins.

.4 TIAC Code: A-6.

- .1 Insulation securements: in compliance with ACIT recommendations.
- .2 Seals: lap seal adhesive, lagging adhesive.
- .3 Maximum VOC limit 50 g/L, to SCAQMD Rule 1168.
- .4 Installation: in compliance with ACIT recommendations.
- .5 Supply piping for equipment must not be longer than 4000mm.
- .6 Apparent piping for sanitary equipment and piping, sanitary fittings, chromed fitting must not be insulated.

.7 Thickness of insulation as listed in following table.

Temp. °C (°F)	TIAC Code (See item 3.6)	Nominal diameter (DN) and thermal insulation thickness (mm)					
		Conductivity Range (W/m* C)	Up to NPS 1	NPS 1.25 to NPS 2	NPS 2.5 to NPS 4	NPS 5 and NPS 6	NPS 8 and more
> 177 (350)	A-1	0.046 to 0.049	38	65	65	75	90
122 to 177 (251 to 350)	A-1	0.042 to 0.045	38	50	65	75	90
94 to 121 (201 to 250)	A-1	0.039 to 0.043	25	38	38	50	50
61 to 93 (141 to 200)	A-1	0.036 to 0.042	25	38	38	38	38
41 to 60 (106 to 140)	A-1	0.035 to 0.040	25	25	25	38	38
14 to 40 (56 to 105)	A-1	-	25	25	25	25	38
5 to 13 (41 to 55)	A-3	0.033 to 0.039	25	25	25	25	25
< 5 (< 41)	A-3	0.033 to 0.039	25	25	38	38	38

Piping network (see id. in drawings)	Temperature range for insulation type and thickness (°C (°F))
Heating water (AEC-REC)	41 to 60 (106 to 140)
Chilled water (AER-RER) (AERS-RERS)	5 to 13 (41 to 55)
Heating glycol (AGC-RGC)	41 to 60 (106 to 140)
Domestic cold water (EFD-EFDL)	5 to 13 (41 to 55)
Water tower glycol (AGT-RGT)	14 to 40 (56 to 105)
Water tower water (AET-RET)	14 to 40 (56 to 105)
Domestic hot water (ECD-ECDL)	41 to 60 (106 to 140)
Re-circulated hot water (ECR-ECRL)	41 to 60 (106 to 140)
Mixed water	14 to 40 (56 to 105)
Plumbing vent (EVE)	5 to 13 (41 to 55)
Plumbing storm drain (P)	5 to 13 (41 to 55)
Gas vent (EVG)	5 to 13 (41 to 55)
Vents (Steam)	5 to 13 (41 to 55)
Vents (Coolers)	5 to 13 (41 to 55)
Vents (Anti-acid)	5 to 13 (41 to 55)
Refrigerant	5 to 13 (41 to 55)
Chilled water coil drain	5 to 13 (41 to 55)
Humidifier's steam (Vxxx)	122 to 177 (251 to 350)
Humidifier's condensate (C-CP)	61 to 93 (141 to 200)
Cold Glycol *(GF)	< 5 (< 41)

.8 Particularity:

- .1 For all piping type AGT, RGT, AET et RET, double the insulation thickness on a 3 m distance from exit point of building.

.9 Finishes:

- .1 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
- .2 Outdoors: water-proof [aluminum] [SS] [ABS] jacket.
- .3 Finish attachments: to ACIT recommendations.
- .4 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.7 CLEANING

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

END OF SECTION

Approved: 2005-12-31

Part 1 General

1.1 REFERENCES

- .1 Equipment shall be according to UL and CSA.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

1.3 GENERAL CONDITIONS

- .1 Provide and install all systems, equipment and accessories required or prescribed for a gas detection system
- .2 Works to include all components and pipes required for satisfactory operation of a gas detection system, even if these are not specifically identified in this section.
- .3 All lock-out of system VE-1 are to the responsibility of the sheet metal (ventilation) contractor.
- .4 Control panels, leak sensors, visual and audible alarms, signage, switches (management, controls, auxiliary) will be supplied and installed by sheet metal (ventilation) contractor.
- .5 Transformers 120/24V are supplied by this section, but installed and connected by the electrical contractor division 26.
- .6 Except where indicated, starters, manual/start/stop, fuses, indicator lights, overload switches and a 120V circuit, 15A for each digital regulator will be provided, installed and connected by division 26, electrical.
- .7 Power connection to controls panels (120V wiring with accessories) from the identified circuits in 1.4.6 will be done by division 26 electrical.
- .8 Various connections of automatic controls components to controls panel, of less than 120V, are the responsibility of this section, following the instructions of division 26, electrical.
- .9 All interlock controls wiring (up to 120V) on HVAC equipment (ventilation) are supplied and installed by this section.
- .10 This section includes all calibration and adjustment works as well as electrical and electronic connections of all systems supplied and installed by this section.

Part 2 Products

2.1 DIGITAL CONTROLLER

- .1 Autonomous digital controller to monitor toxic gases and combustibles
- .2 Designed for simple and complete installation and operation
- .3 Controller to have the following features:

- .1 Interchangeability to measurer different gases;
- .2 Up to 4 sensors;
- .3 3 programmable levels of alarm;
- .4 Outputs:
 - .1 4 output relays (2-way) for alarms and defects;
 - .2 3 outputs 24Vcc, 250mA per output;
 - .3 4 outputs 4-20mA;
- .5 Capacity of output relays: 5A, 30Vcc or 250Vca;
- .6 Modbus compatible;
- .7 RFSA option (required in all cases); visual alarm with red strobe light and audible alarm of 105 dBA;
- .8 Continuous alphanumeric display with 122x32 points;
- .9 Max distance between sensor and controller: 60.9 m;
- .10 Auto-diagnostic;
- .11 Operates in 0-95% RH, -20C to 50C;
- .12 Certified CSA C22.2 n205;
- .13 Refrigerant gas detection, when required;
- .14 Compliance:
 - .1 CAN\ULC standard 1244;
 - .2 IEC 61010-1.

2.2 GAS LEAK DETECTION

- .1 CO and NO2 gas detection
 - .1 Transmitter is fed by control panel with a nominal voltage of 24Vca. Fully programmable at the panel.
 - .2 Detection cell shall compensate for fluctuations in relative humidity and temperature to guarantee a high level of accuracy.
 - .3 Transmitter to operate in 0-95% RH, -20C to 40C.
 - .4 Device is certified by ANSI\UL 61010-1 with appropriate tagging and by CSA-C22.2 61010-1.
 - .5 Transmitter to allow insertion of gas cartridge with smart sensor for auto-sensing.
 - .6 Transmitter shall have an electrochemical cell for toxic gases.
 - .7 Accuracy of readings: 3% full scale at 25C
 - .8 Detection range: 0-250 ppm
 - .9 Sensor range radius: 15 m
 - .10 Installation criteria: install sensors where shown on drawings, at 3 to 5 ft above floor.

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 control devices at locations shown on drawings and manufacturers' manual.
- .2 Avoid locating unit near sources of electric noise, vibration or heat.
- .3 Provide a certificate of proper operation following start-up by manufacturer, including at least the name and address of the owner, the name of the device, start-up date, name of employees present, expected and measured results.

Part 4 SEQUENCE OF OPERATIONS**4.1 GAS DETECTION**

- .1 The control panel shall send a signal to system VE-1 and to audible and visual alarm, according to the following alarm levels:
 - .1 Alarm level 1:
 - .1 Energize ventilation: start exhaust fan VE-1
 - .2 Energize yellow visual alarm
 - .2 Alarm level 2:
 - .1 Energize ventilation or ventilation continues to operate
 - .2 Energize red visual alarm and audible alarm.

END OF SECTION

Gestion des déchets et Disposition Approved: 2005-06-30

Part 1 General

1.1 SUMMARY

- .1 Related Requirements
 - .1 Section 23 05 05 – installation of pipework.

1.2 REFERENCES

- .1 Unless shown otherwise, use most recent versions of codes and standards.
- .2 American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.5, Pipe Flanges and Flanged Fittings.
 - .2 ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ASME B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
 - .4 ASME B18.2.1, Square and Hex Bolts and Screws Inch Series.
- .3 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - .3 ASTM B75M, Standard Specification for Seamless Copper Tube [Metric].
 - .4 ASTM B837, Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA W47.1, Certification of Companies for Fusion Welding of Steel.
- .5 Canadian Standards Association (CSA)/Canadian Gas Association (CGA)
 - .1 CAN/CSA B149.1HB, Natural Gas and Propane Installation Code Handbook.
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedure].
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.
 - .2 Indicate on manufacturers catalogue literature following: isolation valves, PRV, safety valves.
- .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

- .5 Instructions: submit manufacturer's installation instructions.
- .6 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan (WMP).
 - .4 Divert unused materials from landfill to recycling approved facility.

Part 2 Products

2.1 PIPE

- .1 Steel pipe: to ASTM A53/A53M, Schedule 40, seamless as follows:
 - .1 NPS 1/2 to 2, screwed.
 - .2 NPS 2 1/2 and over, plain end.
- .2 Copper tube: to ASTM B837.

2.2 JOINTING MATERIAL

- .1 Screwed fittings: pulverized lead paste.
- .2 Welded fittings: to CSA W47.1.
- .3 Flange gaskets: nonmetallic flat.
- .4 Brazing: to ASTM B837.

2.3 FITTINGS

- .1 Steel pipe fittings, screwed, flanged or welded:
 - .1 Malleable iron: screwed, banded, Class 150.
 - .2 Steel pipe flanges and flanged fittings: to ASME B16.5.
 - .3 Welding: butt-welding fittings.
 - .4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47/A47M.
 - .5 Bolts and nuts: to ASME B18.2.1.
 - .6 Nipples: schedule 40, to ASTM A53/A53M.
- .2 Copper pipe fittings, screwed, flanged or soldered:
 - .1 Cast copper fittings: to ASME B16.18.
 - .2 Wrought copper fittings: to ASME B16.22.

2.4 VALVES

- .1 Provincial Code approved, lubricated ball type, lubricated bronze (2 pieces).

2.5 PAINT

- .1 Paint: according to ISO 12944
 - .1 Primer: VOC maximum 250 g/L as per GS-11 Standard.
 - .2 Paints: VOC maximum 150 g/L as per GS-11 Standard.
- .2 All new natural gas pipes and above-ground regulators vents (and all pipes above ceiling) shall be painted yellow.
- .3 Provide one (1) primer coat and two (2) final coats.

2.6 GAS REGULATORS

- .1 All gas regulators shall be approved by CGA and be equipped with a vent to the outside, an integrated safety valve and a spare opening.
- .2 PRV shall conform to ANSI B109.4/CGA 6.18.
- .3 Materials temperature limits: -29C to 71C.
- .4 Pressure setting: screws
- .5 Internal pressure recording
- .6 Locking during normal operation

NPS opening size	Lock above setpoint mbar (in wg)
1/8	2.5 (1)
3/16	2.5 (1)
1/4	5.0 (2)
3/8	6.2 (2.5)
1/2	7.5 (3)

- .7 Spring seat vent connection: NPS3/4 or 1.
- .8 Medium pressure regulator (138 KPa or 20 psi or less).
 - .1 Construction materials
 - .1 Body: cast iron
 - .2 Safety valve spring: aluminum
 - .3 Disc and diaphragm: nitrile
 - .4 Cap: ABS
 - .5 Membrane and lid: nylon
 - .2 Temperature range
 - .1 Nitrile: -29C to 65.5C

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

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

3.2 PIPING

- .1 Install in accordance with Section 23 05 05 - Installation of Pipework, applicable Provincial/Territorial Codes, CAN/CSA B149.1, supplemented as specified.
- .2 Use connectors according to ANSI for piping assembly.
- .3 Install drip points:
 - .1 At low points in piping system.
 - .2 At connections to equipment.
- .4 Unless shown otherwise, connect piping to materials recommended by manufacturer.
- .5 Install piping with slope towards fluid direction.
- .6 Use reducers to connect pipes of different diameters, to maintain proper fluid flow.
- .7 Provide sufficient clearance around pipes for maintenance.

3.3 VALVES

- .1 Install valves with stems upright or horizontal unless otherwise approved by Departmental Representative.
- .2 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

3.4 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
 - .1 Test system in accordance with CAN/CSA B149.1 and requirements of authorities having jurisdiction.
 - .2 Manufacturer's Field Services:
 - .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its product[s], and submit written reports, in acceptable format, to verify compliance of work with Contract.
 - .2 Provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
 - .3 Schedule site visits to review work at stages listed:
 - .1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.
 - .2 Upon completion of work, after cleaning is carried out.
 - .3 Obtain reports within 3 days of review and submit immediately to Departmental Representative.
-

3.5 PRE-START-UP INSPECTIONS:

- .1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.
- .2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.6 ADJUSTING

- .1 Purging: purge after pressure test in accordance with CAN/CSA B149.1.

3.7 CLEANING

- .1 Cleaning: in accordance CAN/CSA B149.1 supplemented as specified.
- .2 Perform cleaning operations in accordance with manufacturer's recommendations.
- .3 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Approved: 2005-03-31

Part 1 General

1.1 SUMMARY

- .1 Related Requirements
 - .1 Section 01 33 00 - Submittal Procedures
 - .2 Section 01 35 29.06 - Health and Safety Requirements
 - .3 Section 01 61 00- General requirements regarding products
 - .4 Section 01 74 21 - Construction/Demolition Waste Management and Disposal
 - .5 Section 23 05 94 - Pressure Testing of Ducted Air Systems

1.2 REFERENCES

- .1 Unless shown otherwise, latest versions of codes and standards apply.
- .2 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A635/A635M Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
 - .3 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .4 National Fire Protection Association (NFPA).
 - .1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
 - .3 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.
 - .3 IAQ Guideline for Occupied Buildings Under Construction 2007.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 QUALITY ASSURANCE

- .1 Certification of Ratings:

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Indoor Air Quality (IAQ) Management Plan.
 - .1 Develop and implement an Indoor Air Quality (IAQ) Management Plan in accordance with Section [01 47 15 - Sustainable Requirements: Construction] for construction and preoccupancy phases of building.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage according to section 01 61 00.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal].

Part 2 Products

2.1 SEAL CLASSIFICATION

- .1 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 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	A
250	A
125	B
125	B

2.2 SEALANT

- .1 Sealant: oil resistant, 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.
 - .1 ULC listed, AAMA804.3 and 807.3.

2.4 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows.
 - .1 Rectangular: standard radius
 - .2 Round: smooth radius. Centreline radius: 1.5 times diameter.
- .3 Mitred elbows, rectangular:
 - .1 To 400 mm: with single thickness turning vanes.
 - .2 Over 400 mm: with double thickness turning vanes.
- .4 Branches:
 - .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 with conical connection.
 - .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 Full radiused elbows.
- .7 Obstruction deflectors: maintain full cross-sectional area.
 - .1 Maximum included angles: as for transitions.

2.5 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to ASHRAE et SMACNA *low pressure duct construction standards and high pressure duct construction standards*.
- .3 Joints:
 - .1 Joints conforms to ASHRAE and SMACNA.
- .4 Used for 500 Pa maximum.

Part 3 Execution

3.1 GENERAL

- .1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE, SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
 - .1 Insulate strap hangers 100 mm beyond insulated duct.
- .3 Support risers in accordance with ASHRAE and SMACNA.
- .4 Install breakaway joints in ductwork on sides of fire separation.

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

3.2 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.3 WATERTIGHT DUCT

- .1 Provide watertight duct for:
 - .1 Fresh air intake.
 - .2 Fresh air plenums.
 - .3 Fresh or exhaust air ducts connected to or close to an exterior wall.
 - .4 Exhaust air plenums.
- .2 Form bottom of horizontal duct without longitudinal seams.
 - .1 Weld or solder joints of bottom and side sheets.
 - .2 Fit base of riser with 150 mm deep drain sump and 25 mm drain connected, with deep seal trap and discharging to open funnel drain.

3.4 SEALING AND TAPING

- .1 Apply sealant to outside of joint to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.
- .3 Seal all openings in air ducts.

3.5 LEAKAGE TESTS

- .1 Refer to Section 23 05 94 - Pressure Testing of Ducted Air Systems.
- .2 In accordance with SMACNA HVAC Duct Leakage Test Manual.

3.6 DUCT CLEANLINESS

- .1 All ducts shall be clean at the fabrication location and when delivered to the site. Duct ends shall be capped with a plastic film.

END OF SECTION

Approved: 2005-03-31

Part 1 General

1.1 SUMMARY

- .1 Related Requirements
 - .1 Section 01 33 00- Documents and sample submittals
 - .2 Section 01 35 29.06 - Health and Safety Requirements
 - .3 Section 01 45 00- Quality Control
 - .4 Section 01 74 21 - Construction/Demolition Waste Management and Disposal
 - .5 Section 01 78 00 - Closeout Submittals

1.2 REFERENCES

- .1 Except where indicated, use latest standards and codes.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible 95.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .3 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
 - .4 Separate for reuse or recycling and place in designated containers [waste in accordance with Waste Management Plan (WMP).
 - .5 Divert unused materials from landfill to recycling facility as approved.

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 1.3 mm thick 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.

2.3 ACCESS DOORS IN DUCTS

- .1 General
 - .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. Wrap insulation with sheet metal sheathing of same gauge as door.
 - .3 Gaskets: neoprene.
 - .4 Prefabricated doors.
 - .5 Seamless one-piece frame, mechanical fastened or welded.
 - .6 Low-leakage door. Maximum leak rate of 1.02 L/min for a typical door of 203 x 127 mm à 8 in. wg.
- .2 Hardware:
 - .1 Provide protection chains with doors
 - .2 Doors up to 457 x 254 mm: provide 2 locking devices per frame.
 - .3 Doors up to 635 x 432 mm: provide 4 locking devices per frame.
 - .4 Provide a hold open chain for each door.

2.4 TURNING VANES

- .1 Factory or shop fabricated double 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.
-

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

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

3.2 INSTALLATION

- .1 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 to a maximum of 150 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.

3.3 CLEANING

- .1 Perform cleaning operations as specified and in accordance with manufacturer's recommendations.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Approved: 2005-12-31

Part 1 General

1.1 REFERENCES

- .1 Unless shown otherwise, execute works according to latest codes and standards.
- .2 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include product characteristics, performance criteria, and limitations.

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 Control rod with locking device and position indicator.
- .3 Rod configuration to prevent end from entering duct.
- .4 Pivot: piano hinge.
- .5 Folded leading edge.

2.3 SINGLE BLADE DAMPERS

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 225 mm.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside nylon end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 MULTI-BLADED DAMPERS

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

- .3 Maximum blade height: 225 mm.
- .4 Bearings: self-lubricating nylon.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 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 where indicated and in each branch.
- .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.

3.3 FIELD QUALITY CONTROL

- .1 Tests:
 - .1 Tests to cover period of not less than 30 days and demonstrate that system is functioning as specified.

3.4 CLEANING

- .1 Proceed in accordance with methods prescribed.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Approved: 2005-12-31

Part 1 General

1.1 SUMMARY

- .1 Related Requirements
 - .1 Section 23 33 00 – Air duct accessories.

1.2 REFERENCES

- .1 ASHRAE Standard 70-2006 “Method of Testing for Rating the performance of Air Outlets and Inlets”

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, and limitations.
Indicate following:.
 - .1 Air Flow
 - .2 Throw in x and y for terminal velocity.
 - .3 Critical x distance.
 - .4 Temperature and throw ratio.
 - .5 Noise criteria.
 - .6 Pressure drop.
 - .7 Neck velocity.
 - .8 Dimensions.
 - .9 Brand names and models.
- .2 Quality assurance submittals:
 - .1 Technical data taken from catalogues and other manufacturers' data must be from reliable sources and based on tests done by manufacturers, or by independent laboratories acting in their name, to certify conformity to codes and other relevant standards.

Part 2 Products

2.1 SUPPLY GRILLES

- .1 General: supply grilles.
- .2 Aluminum, 32 mm border, Egg Crate.
- .3 Shall have 2 sets of perpendicular blades air foil with a maximum distance between them of $\frac{3}{4}$ ". Each set shall be able to pivot individually for adjustment purposes.
- .4 Opposed blades options.

2.2 RETURN AND EXHAUST GRILLES AND REGISTERS

- .1 General: Return Grilles
- .2 Aluminum, 32 mm border, Egg Crate.
- .3 Shall have 2 sets of perpendicular blades air foil with a maximum distance between them of $\frac{1}{2}$ ".

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 manufacturers' instructions.
- .2 Install with flat head stainless steel screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.
- .4 Provide concealed safety chain on each grille, register and diffuser in gymnasium and similar game rooms and elsewhere as indicated.

3.3 CLEANING

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

END OF SECTION

Approved: 2008-12-31

Part 1 General

1.1 Summary

.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittals Procedures
- .2 Section 01 61 00 – Common Products Requirements
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .4 Section 01 78 00 – Closeout Submittals
- .5 Section 23 05 05 – Installation of Pipework

1.2 REFERENCES

- .1 American National Standards Institute (ANSI) / American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE 52.1-1992, Gravimetric and Dust Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
- .2 American National Standards Institute (ANSI) / Canadian Standards Association (CSA International)
 - .1 ANSI Z21.47-2007A/ CSA 2.3A-2007, Gas-Fired Central Furnaces.
 - .2 ANSI Z83.8 -2006/CSA 2.6-2006, CSA Standard for Gas Unit Heaters and Gas-Fired Duct Furnaces.
- .3 Canadian Standards Association (CSA International) / Canadian Gas Association (CGA)
 - .1 CGA 3.2-1976(R2003), Industrial and Commercial Gas-Fired Package Furnaces.
- .4 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B149.1-F05, Natural Gas and Propane Installation Code.
 - .2 CSA C22.2 No. 24-93(R2008), Temperature-Indicating and Regulating Equipment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for furnace units and furnace parts, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Québec.
 - .2 Submit manufacturer's written recommendations.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Include following: air flow and capacity.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products**2.1 GENERAL**

- .1 Provide CSA approved, packaged factory assembled unit consisting of cabinet, fan, [induced fan], fan motor, intake/exhaust assembly, heat exchanger, combustion chamber, burner, controls, air filter, condensate drain.
- .2 Minimum efficiency: 82%.
- .3 Certification of components and construction of factory assembled gas-fired unit: to ANSI Z83.8/CSA 2.6 for gas fired duct furnace for package furnace.
- .4 Certification of components and construction of factory assembled oil-fired unit: to CAN/CSA B140.4.

2.2 CAPACITY

- .1 Output: 18.2W sea level rating.
- .2 Air flow rate: 450 L/s standard air.

2.3 TYPE

- .1 Horizontal type with gas burner.

2.4 CABINET

- .1 1.0 mm thick minimum steel with baked enamel finish.
- .2 Welded steel base for floor type.
- .3 Easily removed and secured access doors for components requiring service.

2.5 COMBUSTION CHAMBER

- .1 Atmospheric : to manufacturers standard.

2.6 CIRCULATION BLOWER MOTOR ASSEMBLY

- .1 Blower: centrifugal type:
 - .1 Statically and dynamically balanced.

.2 Rubber mounted.

.2 Motor: 1/20 hp, 1550 r/min. single speed, overload protection, adjustable mounts.

2.7 HEATER BURNER

.1 General: to bear CSA and ULC labels.

.2 Gas burner:

.1 Continuous port steel or multislotting, non-clogging cast iron with adjustable combustion air supply.

2.8 INTAKE AND VENT ASSEMBLY

.1 Provide manufacturer's standard wall vent and intake complete with termination assembly for high efficiency gas (condensing) furnace.

2.9 PRODUCTS

.1 Unit heater, natural gas with separate combustion approved for commercial and industrial use and having a capacity of 75000 BTU with an efficiency of 82-83%. Approved by CSA. Unit shall come with a 12" fan, 961 CFM with a 120V motor and 24V controls. Unit shall be equipped with 4" inlet and outlet with a single exterior wall opening.

2.10 CONTROLS

.1 General: conform to CSA C22.2 No.24.

.2 Gas firing:

.1 Operating controls:

.1 Set-back thermostat.

.2 Electronic pilot ignition.

.3 Manual main shut-off valve, automatic safety pilot, automatic electric valve and gas pressure regulator.

.4 Fan operating control switch with adjustable set points and continuous operating switch.

.2 Safety controls:

.1 Electronic combustion control relay with flame rectification sensor to detect and supervise flame by shutting off fuel upon flame failure or safety interlock signal within seconds, in sequence prepurge-pilot ignition, supervision-main valve opening-pilot cut-off-burner operation and roll out switch.

.2 Blocked vent shut-off switch or control system.

.3 Limit control to shut down furnace if heat exchanger temperature exceeds limit setting. Combination fan and limit control to be spiral wound.

.4 Door interlock switch on fan compartment access panel to shut down furnace when panel is removed.

.5 Internal float switch to shut off furnace if condensate do not drain properly.

.6 Electronic board built-in diagnostics.

Part 3 Execution**3.1 APPLICATION**

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

3.2 INSTALLATION

- .1 Install in accordance with manufacturer's instructions, regulations of authorities having jurisdiction and to CAN/CSA-B149.1.
- .2 Provide Departmental Representative written report of test results.
- .3 Bacharach smoke density number not to exceed #1.

3.3 CLEANING

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

END OF SECTION

Approved: 2006-09-30

PART 1 GENERAL

1.1 GENERAL

- .1 This Section describes the Common Work Results applicable to electrical disciplines (section 26), and electronic safety and security work (section 28) and is in addition to the general requirements
- .2 The term « provide » include installation and wiring/connection unless otherwise specified.
- .3 Provide new materials, equipment and sets of recognized quality and design. Characteristics of those equipment must be cataloged and spare parts must be available on request.
- .4 Meet the most demanding requirements of this section and other sections.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-06, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2
 - .3 CAN/CSA-C22.3 No. 1m, Overhead Systems.
 - .4 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 DEFINITIONS

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

1.4 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English and French.
- .4 Use one nameplate or label for both languages.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 81 01 - Hazardous Materials.
- .3 Submit for review single line electrical diagrams under plexiglass and locate as indicated or as indicated by ministry Representative.
 - .1 Electrical distribution system in main electrical room.
 - .2 Electrical power generation and distribution systems in power plant rooms.
- .4 Submit for review fire alarm riser diagram, plan and zoning of building under plexiglass at fire alarm control panel and annunciator.
- .5 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .5 If changes are required, notify ministry Representative of these changes before they are made.
- .6 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment/material is not available, submit such equipment/material to authority having jurisdiction for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to ministry Representative.
- .7 Manufacturer's Field Reports: submit to ministry Representative, manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.6 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
Qualifications: electrical Work to be carried out by qualified, licensed electricians who

hold valid Master Electrical Contractor license or apprentices as per the conditions of Territorial Act respecting manpower vocational training and qualification.

- .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
- .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide ministry Representative with schedule within 2 weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.8 SYSTEM STARTUP

- .1 Instruct ministry Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.9 OPERATING INSTRUCTIONS

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- .1 Provide material/equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material/equipment to be CSA certified. Where CSA certified material/equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of ministry Representative.
- .2 Minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

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

2.5 EQUIPMENT IDENTIFICATION

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

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.
- .3 Wording on nameplates/labels to be approved by ministry Representative prior to manufacture. Allow for minimum of twenty-five (25) letters per nameplate/label.
- .4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .5 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. []" as directed by ministry Representative.
- .6 Disconnects, starters and contactors: indicate equipment being controlled, voltage, feeder panelboard and circuits.
- .7 Terminal cabinets and pull boxes: indicate system, voltage, circuits inside.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Prime	Auxiliary	
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment light grey to EEMAC 1Y-1.
 - .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

PART 3 EXECUTION**3.1 INSTALLATION**

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

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.
- .4 Where firestop is required, use solution that are approved for the specific use. The solution must satisfy the requirement of CAN/ULC-S115 for the right wall/ceiling/floor composition.

3.4 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 5000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.
- .5 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .6 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .7 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1200 mm.
 - .2 Wall receptacles:
 - .1 In mechanical rooms: 1400 mm.
 - .3 Wall mounted telephone and interphone outlets: 1500 mm.
 - .4 Fire alarm stations: 1200 mm.
 - .5 Fire alarm bells: 2100 mm.(minimum)

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.6 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well

as hour and date on which each load was measured, and voltage at time of test.

- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm system and communications.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of ministry Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.7 CLEANING

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

END OF SECTION

Approved: 2011-12-31

PART 1 GENERAL

1.1 REFERENCES

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
- .2 CSA International
 - .1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .3 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .4 National Electrical Manufacturers Association (NEMA)

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 wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS**2.1 MATERIALS**

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper or aluminum sized to fit copper or aluminum conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 and NEMA to consist of:
 - .1 Connector body and stud clamp for stranded conductors.
 - .2 Clamp for stranded copper conductors.
 - .3 Clamp for stranded aluminum conductors.
 - .4 Stud clamp bolts.
 - .5 Bolts for copper conductors or bar.
 - .6 Bolts for aluminum conductors or bar.
 - .7 Sized for conductors, tubes and bars as indicated.
- .4 Clamps or connectors for armoured cable, [TECK cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

PART 3 EXECUTION**3.1 EXAMINATION**

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

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and cables and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
 - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2 and NEMA.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
-

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

END OF SECTION

Approved: 2008-12-31

PART 1 GENERAL

1.1 REFERENCES

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.
- .2 CSA International
 - .1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .3 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .4 National Electrical Manufacturers Association (NEMA)

1.2 PRODUCT DATA

- .1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 and 1000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE.
- .3 Conductors carrying a voltage of 400 volts and greater must be 1000 V of dielectric insulation.

- .4 Unless otherwise indicated, conductors wearing a voltage lower than 400 volts can be insulated for 600 volts.

2.2 ARMoured Cables

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

2.3 CONTROL Cables

- .1 Type: LVT: soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket
- .2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT: soft annealed copper conductors, sized as indicated:
 - .1 Insulation: PVC TW or TW 40 degrees C

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

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

3.2 SPECIFIC DATA

- .1 All the project wiring must be realised using conductors with 90°C insulation. Despite this, the ampacity of the conductors must be determined by using the data for 75°C insulation from the Canadian Electrical Code.
- .2 Copper wiring is usually indicated on the drawings. The use of NUAL type conductors will however be accepted if all the following conditions are met:
 - .1 Higher gage than #6AWG;
 - .2 At no point in the path of the cable, there is buried section or a section installed outdoors;
 - .3 Connection lugs at both ends allow the use of this type of conductors;
 - .4 The cable is used as a distribution panelboard feeder;

Despite what is mentioned in the previous points, the physical aspect was validated with cables and conduits indicated in the line diagrams. It is therefore the responsibility of the contractor, if he uses the NUAL, to ensure the feasibility and to coordinate with other disciplines. No charge due to a change in cascade will be accepted.

3.3 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .3 Install in conduit
- .4 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.4 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

3.5 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible on channels.

3.6 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

END OF SECTION

Approved: 2003-12-31

PART 1 GENERAL

1.1 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved
- .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended, set in poured concrete walls and ceilings.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Although not explicitly indicated on the plans, support will have to be built to secure all equipment that are not installed against a wall or freestanding.
- .5 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .6 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .7 Fasten exposed conduit or cables to building construction or support system using clamps.
 - .1 One-hole steel clamp to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel clamp for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .8 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .9 For surface mounting of two or more conduits use channels at 1,5 m on centre spacing.
- .10 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .11 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .12 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .13 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .14 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Approved: 2008-06-30

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-06, Canadian Electrical Code, Part 1, 20th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 DELIVERY, STORAGE AND HANDLING

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

PART 2 PRODUCTS

2.1 JUNCTION AND PULL BOXES

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat turned edge covers.

PART 3 EXECUTION

3.1 JUNCTION, PULL BOXES INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating , system name, voltage and phase or as indicated.

END OF SECTION

Approved: 2008-06-30

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

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

2.2 GALVANIZED STEEL OUTLET BOXES

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

2.3 MASONRY BOXES

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

2.4 CONCRETE BOXES

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

2.5 CONDUIT BOXES

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

2.6 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 EXECUTION**3.1 INSTALLATION**

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

END OF SECTION

Approved: 2006-12-31

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 PRODUCTS

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils. Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83.
- .4 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56.
- .6 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits of 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits. Spacing according to conduits weight and by Canadian Electrical Code, section 12-1010.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

- .1 Polypropylene.

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

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Use electrical metallic tubing (EMT) except in cast concrete when not subject to mechanical injury.
- .3 Use rigid pvc conduit underground.
- .4 Use flexible metal conduit for connection to motors in dry areas, connection to recessed fixtures without prewired outlet box, connection to surface or recessed fixtures, work in movable metal partitions.
- .5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations and inside air handling unit.
- .6 Use explosion proof flexible connection for connection to explosion proof motors.
- .7 Minimum conduit size for lighting and power circuits: NPS 3/4 (19 mm).
- .8 Install EMT conduit from branch circuit panel to outlet boxes located in sub floor.
- .9 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 19 mm diameter.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Install fish cord in empty conduits.
- .13 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .14 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS (existing building only)

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

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
-

- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL**1.1 REFERENCES**

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
- .2 CSA International
 - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55-M1986(R2008), Special Use Switches.
 - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

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 wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Canada.
- .4 Sustainable Design Submittals:

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wiring devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS**2.1 SWITCHES**

- .1 15 and 20 A at 120 V or 347 V, single pole, double pole, three-way, four-way switches to: CSA C22.2 No.55 and CSA C22.2 No.111.
- .2 Manually-operated heavy duty AC switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 White toggle.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads or heating loads.
- .4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

- .1 **No 5-15R (15A@120V) receptacle will be installed in the building, minimal receptacle configuration will be 5-20R (20A@120V).**
- .2 Duplex receptacles, CSA type 5-20 R, 125 V, 20 A, U ground, to: CSA C22.2 No.42 with following features:
 - .1 Urea moulded housing, color:
 - .1 **White** for normal receptacles
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .3 Other receptacles with ampacity and voltage as indicated. Color as for 5-20R receptacles.
- .4 Receptacles of one manufacturer throughout project.
- .5 Heavy duty.

2.3 SPECIAL WIRING DEVICES

- .1 As indicated on plans.
- .2 Heavy duty.

2.4 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
 - .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
 - .3 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
-

- .4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.5 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height as indicated or in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height as indicated in accordance with Section 26 05 00 - Common Work Results for Electrical.
 - .3 Install GFI type receptacles as indicated.
- .3 Cover plates:
 - .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

Approved: 2008-06-30

PART 1 GENERAL

1.1 REFERENCES

- .1 Association canadienne de normalisation (CSA)
 - .1 CSA C22.2 n° 248.12-94, Fusibles basse tension – Partie 12 : Fusibles de classe R (norme binationale - UL 248-12, 1^{re} édition).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide fuse performance data characteristics for each fuse type and size above 100A. Performance data to include: average melting time-current characteristics.
- .3 Shop Drawings:
 - .1 Provide shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in switchboard.
- .3 Store fuses in original containers in moisture free location.
- .4 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.

1.4 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide three (3) spare fuse for each type of 100A and more fuse.

PART 2 PRODUCTS

2.1 FUSES - GENERAL

- .1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.
- .2 Fuses: product of one manufacturer.

2.2 FUSE TYPES

- .1 Class L fuses.

- .1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
- .2 Type L2, fast acting.
- .2 Class J fuses.
 - .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
 - .2 Type J2, fast acting.
- .3 Class C fuses.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.
- .3 Ensure correct fuses fitted to assigned electrical circuit.
- .4 Install spare fuses in fuse storage cabinet.

END OF SECTION

Approved: 2012-06-30

PART 1 GENERAL

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 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 circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
 - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
 - .1 Production certificate of origin must be submitted to Departmental Representative for approval.
 - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
 - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative. Unless complying with this requirement, ministry Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
 - .4 Production certificate of origin must contain:
 - .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
 - .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.
 - .3 Contractor's name and address and person responsible for project.
 - .4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.
 - .5 Name and address of building where circuit breakers will be installed:
 - .1 Project title.
 - .2 End user's reference number.
 - .3 List of circuit breakers.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store circuit breakers off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

- .1 In accordance with CSA C22.2 No. 5
- .2 **In the current project, supply necessary breakers in existing pannels as indicated on drawings. Breakers must be of the same brand, model and switching power as existing ones.**
- .3 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .4 Common-trip breakers: with single handle for multi-pole applications.
- .5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .6 Circuit breakers with interchangeable trips as indicated.
- .7 Interrupting capacity rating is indicated in each panelboard detail. Breakers must have the same rating as the panelbord unless otherwise indicated on plans or specification. Only "fully rated" protections will be accepted (no series rated protection) unless otherwise indicated.

2.2 THERMAL MAGNETIC BREAKERS

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 CURRENT LIMITING AND SERIES RATED THERMAL MAGNETIC BREAKERS

- .1 This breaker type is prohibited unless otherwise 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 installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative. Inform ministry Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install circuit breakers as indicated.

3.3 CLEANING

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

END OF SECTION

Approved: 2005-03-31

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 28 13.01 - Fuses – low voltage.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.
 - .2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 HEALTH AND SAFETY

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Separate for reuse or recycling and place in designated containers Steel, Metal and Plastic waste in accordance with Waste Management Plan.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

- .1 Fusible and non-fusible disconnect switch in CSA Enclosure, to CAN/CSA C22.2 No.4 size as indicated.
 - .2 Provision for padlocking in off switch position by three locks.
 - .3 Mechanically interlocked door to prevent opening when handle in ON position.
 - .4 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.
 - .5 Fuseholders: to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.
-

- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

Approved: 2008-12-31

PART 1 GENERAL

1.1 REFERENCES

- .1 International Electrotechnical Commission (IEC)
 - .1 IEC 947-4-1-2002, Part 4: Electromechanical contactors and motor-starters.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Provide shop drawings for each type of starter to indicate:
 - .1 Mounting method and dimensions.
 - .2 Starter size and type.
 - .3 Layout and components.
 - .4 Enclosure types.
 - .5 Wiring diagram.
 - .6 Interconnection diagrams.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit operation and maintenance data for each type and style of motorstarter for incorporation into maintenance manual.
- .3 Extra Materials:
 - .1 Provide listed spare parts for each different size and type of starter.
 - .1 3 contacts, stationary.
 - .2 3 contacts, movable.
 - .3 2 contacts, auxiliary.
 - .4 1 control transformer.
 - .5 1 operating coil.
 - .6 3 fuses.
 - .7 10% indicating lamp bulbs used.

1.4 DELIVERY, STORAGE AND HANDLING

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

- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Starters: to IEC 947-4 with AC4 utilization category.

2.2 MANUAL MOTOR STARTERS

- .1 Manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
 - .1 Switching mechanism, quick make and break.
 - .2 Overload heaters, manual reset, trip indicating handle.
- .2 Accessories:
 - .1 switch: heavy duty labelled as indicated.
 - .2 Heavy duty LED indicating light.
 - .3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

- .1 Combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
 - .1 Contactor solenoid operated, rapid action type.
 - .2 Motor overload protective device in each phase, manually reset from outside enclosure.
 - .3 Wiring and schematic diagram inside starter enclosure in visible location.
 - .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
 - .5 Terminals for command and power supply circuits.
- .2 Combination type starters to include circuit breaker with operating lever on outside of enclosure and provision for:
 - .1 Locking in "OFF" position with up to 3 padlocks.
 - .2 Independent locking of enclosure door.
 - .3 Provision for preventing switching to "ON" position while enclosure door open.
- .3 Accessories:
 - .1 Selector switches : « MAN » - « ARRÊT » - « AUTO » mounted on the door, heavy duty labelled as indicated.
 - .2 Indicating lights LED: heavy duty type and color as indicated, red (stop) and green (running)
 - .3 Unless otherwise indicated, 2-N/O and 2-N/C auxiliary contacts in addition to those indicated on the drawings..

- .4 Terminal for connexion and command devices. See BACS diagrams, and coordinate with this contractor to provide the appropriate terminals for their needs.

2.4 CONTROL TRANSFORMER

- .1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.
- .2 Size control transformer for control circuit load plus 20% spare capacity.

2.5 ACCESSORIES

- .1 Pushbutton: heavy duty, oil tight as required.
- .2 Selector switches: heavy duty, oil tight as required.
- .3 Indicating lights LED: heavy duty, oil tight, type and colour as indicated.

2.6 FINISHES

- .1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.7 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.
- .3 Magnetic starter designation label, white plate, black letters, size 3 engraved as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install starters and control devices in accordance with manufacturer's instructions.
- .2 Install and wire starters and controls as indicated.
- .3 Ensure correct fuses installed and right overload adjustment.
- .4 Confirm motor nameplate and adjust overload device to suit.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and manufacturer's instructions.
- .2 Operate switches and contactors to verify correct functioning.
- .3 Perform starting and stopping sequences of contactors and relays.
- .4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

3.3 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

PART 1 GENERAL**1.1 RELATED REQUIREMENTS**

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

1.2 REFERENCES

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
- .2 Treasury Board of Canada Secretariat (TBS), Occupational Safety and Health (OSH)
 - .1 Fire Protection Standard-[10].
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-[06], Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S526-[07], Visible Signal Devices for Fire Alarm Systems, Including Accessories.
 - .3 CAN/ULC-S527-[99], Standard for Control Units for Fire Alarm Systems.
 - .4 CAN/ULC-S528-[05], Manual Stations for Fire Alarm Systems, Including Accessories.
 - .5 CAN/ULC-S529-[09], Smoke Detectors for Fire Alarm Systems.
 - .6 CAN/ULC-S530-[91(R1999)], Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S531-[02], Standard for Smoke Alarms.
 - .8 CAN/ULC-S537-[04], Standard for the Verification of Fire Alarm Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [multiplex fire alarm system] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Canada.
 - .2 Indicate on shop drawings:
 - .1 Detail assembly and internal wiring diagrams for control units.
 - .2 Overall system riser wiring diagram identifying control equipment, initiating zones, signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
 - .3 Details for devices.

- .4 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.
- .5 Step-by-step operating sequence, cross referenced to logic flow diagram.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for fire alarm system for incorporation into manual.
- .3 Include:
 - .1 Instructions for complete fire alarm system to permit effective operation and maintenance.
 - .2 Technical data - illustrated parts lists with parts catalogue numbers.
 - .3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.
 - .4 List of recommended spare parts for system.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 DESCRIPTION

- .1 Existing fire alarm system brand is Siemen model CP3-16. Current project consist in supplying new equipment (horn, stroboscopes, detectors, etc.) of the same or compatible brand, and perform the adequate connection to the existing network.
- .2 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .3 Power supply: to CAN/ULC-S524.
- .4 Audible signal devices: to CAN/ULC-S524.

- .5 Visual signal devices: to CAN/ULC-S526.
- .6 Control module: to CAN/ULC S527.
- .7 Manual pull stations: to CAN/ULC-S528.
- .8 Thermal detectors: to CAN/ULC-S530
- .9 Smoke detectors: to CAN/ULC-S529.
- .10 Regulatory Requirements:
 - .1 To TBS Fire Protection Standard.
 - .2 Subject to Fire Commissioner of Canada (FC) approval.
 - .3 Subject to FC inspection for final acceptance.
 - .4 To Canadian Forces Fire Marshal approval.
 - .5 System components: listed by ULC and comply with applicable provisions of NBC 2010, and meet requirements of local authority having jurisdiction.

2.2 INITIATING/INPUT CIRCUITS

- .1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors and water flow switches, wired in DCLB configuration to central control unit.
- .2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.
- .3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".
- .4 Receiving circuits for supervisory, N/O devices. Devices: wired in DCLB configuration to central control unit.
- .5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.3 ALARM OUTPUT CIRCUITS

- .1 Alarm output circuit: connected to signals, wired in class B configuration to central control unit.
 - .1 Signal circuits' operation to follow system programming; capable of sounding horns continuously at 20 spm 2 A, 24 VDC; fuse-protected from overloading/overcurrent.
 - .2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.

2.4 WIRING

- .1 Twisted copper conductors: rated 300 V.
- .2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.
- .3 To signal circuits: 16 AWG minimum, and in accordance with manufacturer's requirements.
- .4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

2.5 MANUAL ALARM STATIONS

- .1 Conventional manual pull station.
 - .1 Pull lever, break glass rod, surface or semi-flush wall mounted type, single action, single stage, electronics to communicate station's status to module/transponder over 2 wires and to supply power to station.
 - .2 Siemens model [MS-51C](#)

2.6 VISUAL AND AUDIBLE ALARM SIGNAL DEVICES

- .1 24V temporal horns/stroboscopes: Supply horns/stroboscopes to the indicated locations on drawing. The horn/stroboscope must produce a 95 dBA tonality from 10 feet (peak value) and a smaller value of 75 dBA (adjustable on site) in smaller rooms (as indicated on drawing), measured in a reverberant room in compliance to UL-464.
- .2 Stroboscopes must produce synchronised shards. Stroboscope must adjustable on site, as indicated on drawings, and chose one of the following light intensity: 30cd, 75cd or 110cd. The fire alarm manufacturer can use a light intensity below 75 candelas, where permitted without exceeding 30 cd.
- .3 Audible signal of the horn must be adjustable on a continuous intensity or a synchronised temporal intensity. Horns/Stroboscopes must permit the fixation on single North-American electrical boxes or on a surface mounting box supplied by the manufacturer, according to the indicated needs on site.
- .4 Siemens model [MTH-R](#)

2.7 END-OF-LINE DEVICES

- .1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open ,short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.8 AS-BUILT RISER DIAGRAM

- .1 Fire alarm system riser diagram: in glazed frame minimum size 600 x 600 mm.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Install systems in accordance with CAN/ULC-S524 and to Treasury Board of Canada Secretariat (TBS), Occupational Safety and Health (OSH)
- .2 Install manual alarm stations and connect to alarm circuit wiring.
- .3 Install detector to the indicated locations and connect to alarm circuit wiring. Detector must be installed at least 1m above air exhaust. In the case of ceiling detector, let a radius of at least 600 m around and over the detector. Duct type detector must be installed in a linear duct section.
- .4 Connect alarm circuit wiring to main control panel.
- .5 Install horns and visual signal devices to the indicated locations and connect to signalling circuits.
- .6 Connect signalling circuits to main control panel.
- .7 Install end-of-line devices at end of alarm and signalling circuits.
- .8 Install door closer devices.
- .9 Install the relays for the stopping of ventilators.
- .10 Splices are not permitted.
- .11 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.
- .12 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .13 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and CAN/ULC-S537.
- .2 Fire alarm system:
 - .1 Test such device and alarm circuit to ensure manual stations, sprinkler system transmit alarm to control panel and actuate first stage alarm, general alarm and ancillary devices.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.
- .3 Provide final PROM program re-burn for system Departmental Representative incorporating program changes made during construction.

3.4 CLEANING

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

3.5 PROTECTION

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

3.6 CLOSEOUT ACTIVITIES

- .1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

END OF SECTION

Approved: 2010-12-31

Part 1 General

1.1 REFERENCES

- .1 Ministère des Transports du Québec Cahier des charges et devis généraux (CCDG) : infrastructures routières, Édition 2015.
- .2 Collection Normes – Ouvrages Routiers, most recent version, prepared for Transport du Québec published by Les publications du Québec.
- .3 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft)

1.2 SCOPE OF WORK

- .1 Contractor shall provide all labour, materials, equipment, tools and services required for the complete execution of the sitework as defined by article 11.1 of CCDG (2015) of Ministère des Transports du Québec.
- .2 Sitework includes, at least, the following:
 - .1 Wood clearing, cutting, stump removal, removal of debris and protection of trees and shrubs;
 - .2 Protection of existing elements;
 - .3 Clearing;
 - .4 Removal of paved surfaces;
 - .5 Preparation of infrastructure;
 - .6 Backfill;
 - .7 Grading;
 - .8 Compaction;
 - .9 Preparation and stabilisation of infrastructure.

Part 2 Products

2.1 MATERIALS

- .1 Granular MG20, MG112 must be in compliance with CCDG: infrastructures routières, edition 2015.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions:
 - .1 Before commencing work establish locations of buried services on and adjacent to site.
- .2 Evaluation and Assessment:
 - .1 Testing of materials and compaction of backfill will be carried out by testing laboratory designated by Departmental Representative.

- .2 Not later than 48 hours before backfilling or filling with approved material, notify Departmental Representative so that compaction tests can be carried out by designated testing agency.
- .3 Before commencing work, conduct, with Departmental Representative, condition survey of existing structures, trees and plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Use temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- .2 Protection of in-place conditions:
 - .1 Protect excavations from freezing.
 - .2 Keep excavations clean, free of standing water, and loose soil.
 - .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
 - .4 Protect buried services that are to remain undisturbed.
- .3 Removal:
 - .1 Remove obsolete buried services within 2 m of foundations. Cap cut-offs.
 - .2 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
 - .3 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 EXCAVATION

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations.
- .2 Topsoil stripping:
 - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
 - .2 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
 - .3 Stockpile in locations as directed by Departmental Representative.
 - .4 Dispose of topsoil off site as directed by Departmental Representative.
- .3 Excavate as required to carry out work, in all materials met.
 - .1 Do not disturb soil or rock below bearing surfaces. Notify Departmental Representative when excavations are complete.
 - .2 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
- .4 Compaction : Article 11.9 of CCDG (2015) of ministère des Transports du Québec.

- .5 2nd class fill : Articles 11.4 and 11.4.5 du CCDG (2015) of ministère des Transports du Québec. Contractor shall prioritise the reuse of materials for paving surface interface.
- .6 Backfill : Articles 11.8.1 and 11.8.2 of CCDG (2015) of ministère des Transports du Québec.
- .7 Bearing tests : Article 11.10.4 of CCDG (2015) of ministère des Transports du Québec.
- .8 Preparation of infrastructure : Article 11.10.1 of CCDG (2015) of ministère des Transports du Québec.
- .9 Waste : Article 11.4.7 of CCDG (2015) of ministère des Transports du Québec.
- .10 Fill : Article 11.6 of CCDG (2015) of ministère des Transports du Québec.
- .11 Cutting : Article 11.4.9 of CCDG (2015) of ministère des Transports du Québec

3.4 SITE QUALITY CONTROL

- .1 Fill material and spaces to be filled to be inspected and approved by Departmental Representative.

3.5 BACKFILLING

- .1 Start backfilling only after inspection and receipt of written approval of fill material and spaces to be filled from Departmental Representative.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill. Fill excavated areas with [selected subgrade material] [gravel and sand] compacted as specified for fill.
- .5 Placing:
 - .1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.
- .6 Compaction: compact each layer of material to following densities for material to ASTM D698
- .7 In trenches:
 - .1 Up to 300 mm above pipe or conduit: sand placed by hand.
 - .2 Over 300 mm above pipe or conduit: [native material approved by Departmental Representative.
- .8 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.

3.6 GRADING

- .1 Grade to ensure that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative. Grade to be gradual between finished spot elevations as indicated.
- .2 Consider all existing elements when performing work. Contractor is responsible to level all new surfaces to existing surfaces' levels.

3.7 CLEANING

- .1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 Devis normalisés techniques, BNQ 1809-300/2004 (R2007), Travaux de construction – Clauses techniques générales – Conduites d’eau potable et d’égouts, published by le Bureau de normalisation du Québec including relevant erratas as of the date of proposal submittal.
- .2 Cahier des charges et devis généraux (CCDG), édition 2015 : Infrastructures routières – Construction et réparation, prepared by le ministère des Transports du Québec and published by « Les publications du Québec ».
- .3 Collection Normes – Ouvrages Routiers, most recent version, prepared by le ministère des Transports du Québec published by « Les publications du Québec ».
- .4 Norme 1101 du Ministère des Transports du Québec.
- .5 Norme NQ 2560-114 «Travaux de génie civil-Granulats».

1.2 SCOPE OF WORK

- .1 Contractor to provide all labour, materials, equipment, tools and other services required for the complete execution of the excavation and backfilling works, including but not limited to:
 - .1 Excavation works;
 - .2 Maintain sides and slopes of excavations in safe condition;
 - .3 Setting up the bedding;
 - .4 Backfilling;
 - .5 Delivering;
 - .6 Setting up the borrow materials;
 - .7 Compacting
 - .8 Pumping;
 - .9 Maintain and protect from damage existing works.

Part 2 Products**2.1 MATERIALS**

- .1 Borrow materials: All solid blocks with a diameter of 200 mm or larger and all plant matter must be removed from the backfilling materials.
 - .1 Materials with 20% or more water content will be automatically class as non-compactible and would not be allowed in areas needing a 90% compacting of the modified Proctor.
 - .2 If excavation materials are judged as non-usable by the client, and thus, are in insufficient quantity to backfilling the trench, the Contractor must use a complementary backfilling material which is in compliance with Norm 1101 of MTQ, compactible to 90% of the modified Proctor.

.2 Granular materials:

- .1 For structure's bedding and pipe's bedding and surround: CG-14 in compliance to Norm NQ 2560-114-III/202, compacted to 90% of modified Proctor.
- .2 For structure's surround: CG-14 in compliance to Norm NQ 2560-114-III/202, compacted to 90% of modified Proctor.

Part 3 Execution

3.1 IMPLEMENTATION

- .1 Contractor must perform the works in compliance with the specifications of BNQ 1809-300/2004 (R 2007) including but not limited to:
 - .1 Bedding: Section 9.2.2 of BNQ 1809-300/2004 (R 2007)
 - .2 Default to the bottom of trench: Section 9.1.12 of BNQ 1809-300/2004 (R 2007)
 - .3 Trench's excavation: Section 9.1 of BNQ 1809-300/2004 (R 2007).
 - .4 Trench's extent: Section 9.1.8 of BNQ 1809-300/2004 (R 2007).
 - .5 Trench's shoring: Section 9.1.11 of BNQ 1809-300/2004 (R 2007).
 - .6 Water depletion of trench: Section 9.1.15 of BNQ 1809-300/2004 (R 2007) and amended by the following:

« L'Entrepreneur doit, à ses frais et dépens, garder les excavations à sec. En aucun temps, l'Entrepreneur ne doit pomper les eaux usées dans la rue ou dans les conduites projetées ».
 - .7 Exploration well: Section 9.1.17 of BNQ 1809-300/2004 (R 2007).
 - .8 Backfilling and compacting: Section 9.2 of BNQ 1809-300/2004 (R 2007).
 - .9 Pipe's embedding: Section 9.2.3, 9.2.4 and 9.2.5 of 1809-300/2004 (R 2007).
 - .10 Structure's embedding: Section 9.2.6 of BNQ 1809-300/2004 (R 2007).
 - .11 Recoverable materials: Section 9.1.9 of BNQ 1809-300/2004 (R 2007).
 - .1 Exceeding excavated soils are the contractor's property and must be evacuated from the site at its own cost.
 - .12 Non-recoverable materials: Section 9.1.10 of BNQ 1809-300/2004 (R 2007).
 - .1 Exceeding excavated soils are the contractor's property and must be evacuated from the site at its own cost.
 - .13 Typical cross-section of trench: Section 9.1.3 of BNQ 1809-300/2004 (R 2007).
 - .14 Trench for connection: Section 9.1.5 of BNQ 1809-300/2004 (R 2007).
 - .15 Existing public underground services: Section 9.1.16 of BNQ 1809-300/2004 (R 2007).

END OF SECTION

Approved: 2002-12-04

Part 1 General

1.1 REFERENCES

- .1 Cahier des charges et devis généraux (CCDG), section 12, édition 2015 : Infrastructures routières – Construction et réparation, prepared by le ministère des Transports du Québec and published by « Les publications du Québec ».
- .2 Collection Normes – Ouvrages Routiers, most recent version, prepared by le ministère des Transports du Québec published by « Les publications du Québec ».
- .3 Norme NQ 2560-114 «Travaux de génie civil-Granulats».

1.2 SCOPE OF WORK

- .1 Contractor to provide all labour, materials, equipment, tools and other services required for the complete execution of the foundation works, including but not limited to:
 - .1 Forming and compacting.

Part 2 Products

2.1 MATERIALS

- .1 Foundation materials shall be in compliance with standard NQ 2560-114 «Travaux de génie civil-Granulats».
 - .1 Top foundation : MG 20, 300 mm thick, compacted to 98% of modified Proctor;
 - .2 Sub-foundation : MG 112, 150 mm thick, compacted to 95% of modified Proctor;
 - .3 Sub-foundation : MG 112 , 450 mm thick, compacted to 90% of modified Proctor.

Part 3 Execution

3.1 PLACING

- .1 Unless told otherwise, contractor shall execute all works using specifications of 12.3.3 of CCDG (2015) for the sub-foundation and foundation.
 - .1 Place granular material in compliance to the specified thickness.
 - .2 Construct foundation to depth and grade in areas indicated.
 - .3 Ensure no frozen material is placed.
 - .4 Place material only on clean unfrozen surface, free from snow or ice.
 - .5 Place granular foundation materials using methods which do not lead to segregation or degradation.
 - .6 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 SITE TOLERANCES

- .1 Finished foundation surface to be within 10 mm of elevation, as indicated, but not uniformly high or low.
- .2 Contractor shall correct all irregularities of the surface by loosening soil and by adding or removing materials, until the foundation's surface level is within tolerances.

3.3 PROTECTION

- .1 Maintain finished foundation layer in condition conforming to this section until succeeding layer is constructed, or until foundation work is accepted by Departmental representative.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .3 Contractor must clean all gravel and other materials accumulation caused by the work so that the manhole is in working condition. The cleaning of the frame and lid must be included in the quote.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 Cahier des charges et devis généraux (CCDG), Section 13, édition 2015 : Infrastructures routières – Construction et réparation, prepared by le ministère des Transports du Québec and published by « Les publications du Québec ».
- .2 Collection Normes – Ouvrages Routiers, most current version, prepared by le ministère des Transports du Québec published by « Les publications du Québec ».

1.2 SCOPE OF WORK

- .1 Contractor to provide all labour, materials, equipment, tools and other services required for the complete execution of the asphalt paving works, including but not limited to:
 - .1 Binder application;
 - .2 Asphalt paving according to the indicated area on drawings;
 - .3 Connection to the existing pavement.

Part 2 Products**2.1 BITUMEN**

- .1 Contractor must provide to the Departmental Representative a conformity certificate of the bitumen before the work and for every change of batch during the pavement work.
- .2 The bitumen used for the work must be in accordance to the specifications of the designer.

2.2 ASPHALT TYPE

- .1 Asphalt type required for the present project:
 - .1 Wear layer: ESG-10S, 40 mm thick, compacted to 93% of the maximal density, obtain in the test LC-26-045 for the asphalt mixture;
 - .2 Base layer: EB-20, 60 mm thick, compacted to 93% of the maximal density, obtain in the test LC-26-045 for the asphalt mixture;

Part 3 Execution**3.1 IMPLEMENTATION**

- .1 Unless told otherwise, contractor shall execute all works using specifications of 13.3 of CCDG (2015) including but not limited to the following activities:
 - .1 Joints: to 13.3 of CCDG (2015) and as amended by the following:
 - .1 “The contractor must brush a uniform layer of emulsion or liquid bitumen on every transverse or longitudinal joint, regardless of its temperature.

- .2 Under no circumstance, it is allowed to heat a joint.
- .2 Impregnation binder or binding agent: to 13.2 of CCDG (2015).

3.2 ACCESSORIES

- .1 The contractor must pay a special attention to the finish of all the paved surfaces, particularly around the accessories.
- .2 In the case of an accidental movement of an accessory, the contractor must redo the compacting of the top foundation, before the asphalt paving.
- .3 The contractor must take all required measures to protect the accessories in a way to keep them clean and in good shape after the works and to the satisfaction of the client.
- .4 Before the work, the contractor must protect the manhole's lid to prevent gravel or asphalt paving to enter the manholes.

3.3 CLEANING

- .1 After the finish coating, the contractor must clean all gravel, bitumen and other materials accumulation caused by the work so that the manhole is in working condition. The cleaning of the frame and lid must be included in the quote for the asphalt paving.

END OF SECTION

Approved: 2006-09-30

Part 1 General

1.1 REFERENCES

- .1 Cahier des charges et devis généraux CCDG (2015) du ministère des Transports du Québec.
- .2 Collection Normes – Ouvrages Routiers du ministère des Transports du Québec, most recent version, Norme 9101 dated 15 December 2009.

1.2 SCOPE OF WORK

- .1 Contractor to provide all labour, materials, equipment, tools and other services required for the complete execution of the topsoil placement works and include all related costs to the accomplishment of the works
- .2 Work includes but is not limited to:
 - .1 Surface preparation and finish grading.

Part 2 Products

2.1 TOPSOIL

- .1 Topsoil for seeded areas: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
- .2 Contain no toxic elements or growth inhibiting materials.
- .3 Must contain 3 to 20 % organic matter by weight
- .4 Apparent density of soil should not exceed 1800 kg/m³.
- .5 Finished surface free from:
 - .1 Debris and stones over 50 mm diameter.
 - .2 At least 90 % of the minerals (by mass) shall pass through 5 mm sieve.
- .6 Consistence: friable when moist.

Part 3 Execution

3.1 PREPARATION OF EXISTING GRADE

- .1 Verify that grades are correct.
 - .1 If discrepancies occur, notify Departmental and do not commence work until instructed by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
 - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

- .2 Remove debris which protrudes more than 75 mm above surface.
- .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
- .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.2 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers.
- .3 Spread topsoil to following minimum depths after settlement.
 - .1 100 mm for areas to be sodded.
- .4 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.3 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
 - .2 Leave surfaces smooth, uniform and firm against deep foot printing.

3.4 CLEANING

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

END OF SECTION

Approved: 2011-06-30

Part 1 General

1.1 REFERENCES

- .1 Cahier des charges et devis généraux (CCDG), Section 13, édition 2015 : Infrastructures routières – Construction et réparation, prepared for le ministère des Transports du Québec and published by « Les publications du Québec ».
- .2 Collection Normes – Ouvrages Routiers, most recent version, prepared by le ministère des Transports du Québec published by « Les publications du Québec ».

1.2 SCOPE OF WORK

- .1 Contractor to provide all labour, materials, equipment and tools required for the complete execution of the sodding works and include all related costs to the accomplishment of the works as indicate on the drawings and the present specifications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit the following documents :
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for sod and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 MATERIALS

- .1 All materials required for the sodding work covered by the present section must be in accordance to "Norme 9101 du ministère des Transports du Québec" and the contractor must refer to it.
- .2 Turf Grass Nursery Sod types:
 - .1 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Cheving

Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.

- .3 Water:
 - .1 Supplied by Departmental Representative at designated source.
- .4 Fertilizer:
 - .1 To Canada "Fertilizers Act" and Fertilizers Regulations.

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 sod installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.

3.3 IMPLEMENTATION

- .1 Contractor must accomplish the works in compliance to the technical specifications of Section 19 of CCDG (2015) including but not limited to:
 - .1 Plates retained by their own weight (P1): Section 19.3.7.2.1 of CCDG (2015).

3.4 GRASSING PERIOD

- .1 Grassing with sod: refer to Section 19.3.7.1 of CCDG (2015)

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
 - .1 Clean and reinstate areas affected by Work.

3.6 ACCEPTANCE

- .1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
 - .1 Sodded areas are properly established.
 - .2 Sod is free of bare and dead spots.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 Devis normalisés techniques, BNQ 1809-300/2004 (R2007), Travaux de construction – Clauses techniques générales – Conduites d’eau potable et d’égouts, published by le Bureau de normalisation du Québec including relevant erratas as of the date of proposal submittal.
- .2 Devis normalisés administratifs, BNQ 1809-900/2002, Travaux de construction-Documents administratifs généraux-Ouvrages de génie civil published by le Bureau de normalisation du Québec including relevant erratas as of the date of proposal submittal.
- .3 NQ-3623-085 - «Travaux en fonte ductile pour canalisations d’eau sous pression-Caractéristiques et méthodes d’essais»
- .4 ANSI/AWWA C104/A 21.4 - Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
- .5 ANSI/AWWA C110/A21.10- American National Standard for Ductile-Iron and Gray Iron Fittings for Water.
- .6 ANSI/AWWA C150/A21.50 - Standard for Thickness Design of Ductile-Iron Pipe.
- .7 ANSI/AWWA C153/21.53 - Standard for Ductile-Iron Compact Fittings.
- .8 AWWA C111/A21.11 - American National Standard for Rubber-Gasket Joints for Ductile-Iron and Fittings.
- .9 AWWA C509 - 09 Resilient-Seated Gate Valves for Water Supply Service.
- .10 CAN/ULC – S520-M - Fire Hydrants

1.2 SCOPE OF WORK

- .1 Contractor to provide all labour, materials, equipment and tools required for the complete execution of the incoming site water utility distribution piping works including but not limited to:
 - .1 Bedding;
 - .2 Surround;
 - .3 Trench's backfilling;
 - .4 Temporary supply network with fire hydrant;
 - .5 Supply and installation of water connections;
 - .6 Connection to the existing pipes;
 - .7 Removal of existing valves, supply and installation of new valves as proposed on drawings;

- .8 Removal, supply and installation of an upright post indicator as proposed on drawings;
- .9 Removal, supply and installation of a fire hydrant;
- .10 Supply and installation of all elbows, tees, etc. as well as all other fittings shown or not on drawings and required for a complete installation;
- .11 Supply and installation of restraint devices such as rebate and retainer seals;
- .12 Cleaning and testing of the piping watertightness;
- .13 Disinfection and start-up of piping.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for valves, couplings and mechanical joints in accordance to Section 01 33 00 - Submittal Procedures.

1.4 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for materials for incorporation into manual.

Part 2 Products

2.1 PIPE

- .1 Service water pipe: ductile iron, 150mm diameter, class 350, to Section 6.2.2.1 of BNQ 1809-300/2004 (R2007), NQ 3623-085 of "Bureau de normalisation du Québec" and ANSI/AWWA/C104/A21.4. Joint must be mechanical or sleeve type. A warning tape must be placed 300 mm over the pipe.

2.2 FITTINGS

- .1 Fittings: ductile iron, mechanical or sleeve type joint, to BNQ 1809-300/2004 (R2007), AWWA C110/A21.10 and AWWA C153/A21.53. Fittings must be the same diameter than the pipe and must be conceived to bear the same external and internal pressure. Interior must be coated with cement mortar in compliance to AWWA C104/A21.4.

2.3 T-HEAD BOLTS, NUTS AND WASHERS FOR MECHANICAL AND FLANGED JOINTs

- .1 In compliance to Section 6.2.2.3 of BNQ 1809-300/2004 (R2007). T-head bolts, nuts and washers for mechanical and flanged joints must be built from high strength, low alloy steel (HSLA) in compliance to AWWA C111/A21.11. Threads must be in compliance with the norm.

2.4 BITUMEN COATING IN PIPES AND FITTINGS

- .1 In compliance to Section 6.2.2.4 of BNQ 1809-300/2004 (R2007).

2.5 GASKETS

- .1 In compliance to Section 6.2.2.4 of BNQ 1809-300/2004 (R2007).

2.6 BRACING SYSTEM

- .1 In compliance to Section 6.2.2.6 of BNQ 1809-300/2004 (R2007). Pipes must be anchored when there is a direction change with a system. Bracing system for ductile iron pipe's accessories must comply to manufacturer's recommendations and to the requirements of those systems.

2.7 FUTUR CONNECTION ON EXISTING PIPE

- .1 In compliance with Section 6.2.2.7 of BNQ 1809-300/2004 (R2007).

2.8 VALVES

- .1 150 mm nominal diameter, gray iron straight valves must comply to AWWA C509 and Section 6.2.9.2 of BNQ 1809-300/2004 (R2007).

2.9 SURFACE BOX

- .1 Surface box : In compliance to Section 6.2.10 of BNQ 1809-300/2004 (R2007) and amended by the following::
« Type 1 surface box ».

2.10 FIRE HYDRANT

- .1 In compliance with Section 6.2.12 of BNQ 1809-300/2004 (R2007). Fire Hydrant must comply to CAN/ULC-S520-M and amended by the following :
«Le poteau d'incendie doit être muni de 50 mm à 150 mm au-dessus du niveau du sol, d'une bride de rupture à la colonne et d'un manchon à la tige dans tous les cas»
- .2 Furthermore, as specified in Section 10.4.8.1 of BNQ 1809-300/2004 (R2007), the fire hydrant length must allow a minimum cover over the connection pipe in order to prevent freezing.
- .3 Fire hydrant must be fire red and the outlet must be black.
- .4 Fire hydrant must have a sleeve and must have only one breaking flange localised above the finished ground. The breakable coupling inside of the fire hydrant must be located on the top part of the fire hydrant.

In the case a fire hydrant is in or behind a sidewalk, it must have an elongated sleeve with only one breaking flange located on its top part. It is important that the breakable sleeve inside the fire hydrant is located on the top part of the extension rod. The length of the elongated sleeve should not exceed 450 mm. When the fire hydrant is not located behind a sidewalk, but an elongated sleeve is necessary, the same restrictions must apply.
- .5 The fire hydrant connection and the anchoring tee must be in ductile cast iron, whatever the material chosen for the main piping and its accessories.

2.11 UPRIGHT POST INDICATOR VALVE

- .1 Indicator post valves resilient wedge, 150 mm diameter, in compliance with Norm AWWA C509.
- .2 250 psi maximum working pressure.
- .3 The indicator post must be approved for depths of bury from 3 through 20 feet and more.
- .4 Indicator posts must be extendable after installation
- .5 Indicator posts are tapped (plugged) for control valve supervisory switch installation.

2.12 TEMPORARY FIRE PROTECTION WATER SUPPLY NETWORK

- .1 Main piping – In compliance with Section 5.9.10.3 of BNQ 1809-300/2004 (R2007).
- .2 Temporary fire hydrant – In compliance with Section 5.9.10.4 of BNQ 1809-300/2004 (R2007).

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 distribution piping installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 TRENCH DIGGING

- .1 Dig trench in compliance with section 31 23 33.01 - Excavating, trenching and backfilling
- .2 Before put in place bedding materials and piping, the Department Representative must approve the alignment and depth of the trenches.

3.3 GRANULAR MATERIAL BEDDING

- .1 Perform the granular bedding as shown on typical cross-section on drawing, by uniform layer.
- .2 Do not use frozen material for bedding.
- .3 Perform the bedding to the prescribed depth, such that the bearing surface of the pipes is uniform and continuous.
- .4 Perform transversal low, as needed, in order to bed in to the seal's shape.

3.4 FRESH WATER PIPING

The contractor must perform the works in compliance with technical specifications of Section 10 of BNQ 1809-300/2004 (R2007) including but not limited to:

- .1 Installation of a fresh water supply pipe: in compliance with Section 10.4.2 of BNQ 1809-300/2004 (R2007) and amended by the following
 - « Contractor must:
 - .1 Except if stated otherwise, the excavation and backfilling necessary are the responsibility of each sub-section;
 - .2 Perform the bedding and surround of aqueduct pipes as shown on drawings;
 - .3 Perform the connection to the existing systems as shown on drawings, if applicable».
- .2 Accessories anchoring and restraint system: in compliance with Section 10.4.7 of BNQ 1809-300/2004 (R2007).
- .3 Restraint system: in compliance with Section 10.4.7.2 of BNQ 1809-300/2004 (R2007).

3.5 FIRE HYDRANT

- .1 Fire hydrant installation: in compliance to Section 10.4.8 of BNQ 1809-300/2004 (R2007).
- .2 Install fire hydrant to the locations shown on drawing.
- .3 During the execution of works, install a signalisation device to indicate if the installed fire hydrants are functional or not.

3.6 PLUMBING FIXTURES INSTALLATION

- .1 Install the plumbing fixtures in compliance with manufacturer's recommendations, to the indicated locations.

3.7 TEMPORARY FIRE PROTECTION WATER SUPPLY NETWORK

- .1 Contractor must install a fresh water supply network in compliance with 5.9.10 of BNQ 1809-300/2004 (R2007).

3.8 PRESSURE AND WATERTIGHTNESS TESTING

- .1 Perform the test in compliance with Section 11 of BNQ 1809-300/2004 (R2007).
- .2 Provide the labor, equipment and materials necessary to perform the pressure and watertightness testing.
- .3 Inform the Departmental Representative at least 24 hours before the testing.

3.9 PIPE COVERING

- .1 Once the piping installation is finished and the work has been inspected by the Departmental Representative, cover the piping with granular materials as indicated.

- .2 Place backfilling materials over the surround layer, in uniform layer, to the indicated level.
- .3 Do not use frozen materials for the backfilling.

3.10 CLEANING

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

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 Refer to the specifications of the general technical clauses of BNQ 1809-300/2004 (R 2007) and all sections of the present specification.
- .2 Norm NQ 2622-420/2009 - Regards d'égout, puisards, chambres de vannes et postes de pompage préfabriqués en béton armé.
- .3 Norm NQ 3221-500 – Cadres, grilles, tampons, trappes de puisard et bouches à clé- Moulages en fonte grise ou en fonte ductile pour travaux de génie civil- Caractéristiques et méthodes d'essais.
- .4 Norm NQ 3624-135/2000 – Tuyaux et raccords en polychlorure de vinyle non plastifié (PVC-U)- Tuyaux de 200 mm à 600 mm de diamètre pour égouts souterrains et drainage des sols- Caractéristiques et méthodes d'essais.

1.2 SCOPE OF WORK

- .1 Contractor to provide all labour, materials, equipment, tools and other services required for the complete execution of the storm utility drainage piping works, including but not limited to:
 - .1 Digging of trench;
 - .2 Bedding;
 - .3 Surround;
 - .4 Backfilling of trench;
 - .5 Supply and installation of storm drainage piping network;
 - .6 Supply and installation of a sump for the storm drainage piping network;
 - .7 Installation of an adjustable frame and cover for existing manhole;
 - .8 Testing and acceptance criteria.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit the following documents:
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and sump to be installed and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .4 Ensure that pipes and pump have certification stamp.
- .5 Manufacturer's Instructions: submit to Departmental Representative copy of manufacturer's installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect pipes from damage.
 - .3 Replace defective or damaged materials with new.

Part 2 Products**2.1 PLASTIC PIPE**

- .1 Poly Vinyl Chloride (PVC) pipe, 250 mm diameter, to Norm 3624-135 and must have smooth outside wall.
 - .1 Standard Dimensional Ratio (SDR): 28.
 - .2 Seals: in compliance with Norm NQ 3624-125

2.2 PREFABRICATED DRAIN SUMP

- .1 In compliance with NQ 2622-420 and have rubber seals, such as described in Section 6.3.15.1 of BNQ 1809-310/2004 (2007). Butyl strings are prohibited.
- .2 Frame must be cast in grey cast iron and grills must be in ductile cast iron. All those pieces must comply to Norm NQ 3221-500 and must come from the same manufacturer.

2.3 PIPE BEDDING AND SURROUND MATERIAL

- .1 Contractor must refer to Section 31 23 33.01 - Excavating, trenching and backfilling.

2.4 FREEZING PROTECTION BARRIER

- .1 Polypropylene geocomposite and extruded PVC, 825 g/m² and 3.00 mm thick.
- .2 Contractor must install a geomembrane around the sump with a 1.7 m minimum height, to protect the structure against lifting caused by freezing. Fixation around the sump must be done with two pins.

2.5 ADJUSTABLE FRAME AND COVER

- .1 In compliance with NQ 3221-500. Frame and cover must come from the same manufacturer.

Part 3 Execution**3.1 PREPARATION**

- .1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

3.2 TRENCHING

- .1 Do trenching Work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Protect trench from contents of sewer.
- .3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding material in uniform layers not exceeding 200 mm compacted thickness to depth as indicated. Bedding thickness for pipes must be at least 150 mm. Bedding under the sump must be at least 300 mm.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
 - .1 Do not use blocks when bedding pipes.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 90 % corrected maximum dry density.

3.4 INSTALLATION

- .1 Lay and join pipes to: Section 10.5.3.2 of BNQ 1809-300/2004 (R 2007).
 - .2 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.
 - .3 Handle pipe using methods approved by Departmental Representative.
 - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
 - .4 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.
 - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
 - .5 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
 - .6 Joint deflection permitted within limits recommended by pipe manufacturer.
 - .7 Water to flow through pipes during construction only as permitted by Departmental Representative.
 - .8 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
 - .9 Storm drain pipe must be connected to the existing manhole, as shown on drawing. The connection must be done with the use of drilling. Contractor must make sure of watertightness of pipes and sump and must provide a connection bloc, if necessary. The manhole must not be damaged by this operation.
 - .10 Sump must be install in compliance with Section 10.5.9 of BNQ 1809-300/2004 (R 2007).
-

- .11 All sump joints must be provided with rubber gaskets, in compliance to Section 10.5.9.4 of BNQ 1809-300/2004 (R 2007).
- .12 Since the existing manhole is to be retained, contractor must adjust its level to the asphalt and must replace all cast iron accessories by an adjustable frame and cover.

3.5 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
 - .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 300 mm compacted thickness as indicated.
- .4 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.6 FIELD TESTS AND INSPECTIONS

- .1 Refer to Section 11.2 of BNQ 1809-300/2004 (R 2007).
- .2 Repair or replace pipe, pipe joint or bedding found defective.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.

3.7 CLEANING

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

END OF SECTION