HEAT PUMP REPLACEMENT
Maurice Lamontagne Institute
Project n°.: R.072777.001

FOR TENDER

Divisions 02 to 09
Technical specifications

Architectural specifications

N/D: 2014-180

December 2016

SIGNATURES

PREPARED BY: NAME / POSITION	APPROVED BY: NAME / DEPARTMENT	DATE	STAMP/SIGNATURE
Claude Létourneau, Eng.	Claude Létourneau, Eng. BUILDING SERVICES	2016-12	 2016-12-22
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Jean LeBel, Architect	Jean LeBel, Architect ARCHITECTURE	2016-12	

DRAWINGS AND SPECIFICATIONS

SPECIFICATIONS:

DIVISION	SECTION	NUMBER OF PAGES
DIVISION 01	01 11 11 – Brief description of work	3 pages
	01 14 00 – Restrictions on work	2 pages
	01 32 16.07 – Sequence of work Bar chart (GANTT)	3 pages
	01 33 00 – Documents and samples to submit	5 pages
	01 35 29.06 – Health and safety	7 pages
	01 41 00 – Regulatory requirements	1 page
	01 45 00 – Quality control	2 pages
	01 51 00 – Temporary utility services	1 pages
	01 52 00 – Construction site facilities	3 pages
	01 56 00 – Temporary access and protection structures	2 pages
	01 61 00 – General product requirements	5 pages
	01 73 00 – Execution of work	2 pages
	01 74 11 – Clean-up	2 pages
	01 74 21 – Construction/demolition waste management and disposal	6 pages
	01 77 00 – Completion of work	2 pages
	01 78 00 – Documents/elements to submit upon completion of work	7 pages
	01 79 00 – Portfolio and education	2 pages
DIVISION 02	02 41 99 – Demolition, Small-scope work	4 pages
DIVISION 06	06 08 99 – Carpentry, Small-scope work	7 pages
	06 20 00 – Joinery	6 pages
DIVISION 07	07 21 16 – Blanket insulation	2 pages
	07 84 00 – Fire protection	5 pages
	07 92 00 – Sealant products for joints	6 pages
DIVISION 09	09 21 16 – Gypsum board finish	5 pages
	09 22 14 – Furring and lathing	5 pages
	09 51 13 – Acoustic components for ceilings	3 pages
	09 53 00.01 – Suspension system for acoustic ceilings	5 pages
	09 91 23.01 – Paint, Refinishing work	15 pages

SPECIFICATIONS (cont.):

DIVISION 23

23 05 00 – HVAC – General requirements regarding the outcome of the work .....3 pages
23 05 05 – Pipe installation.....5 pages
23 05 17 – Pipe welding.....4 pages
23 05 19.01 – Pipe thermometers and manometers .....3 pages
23 05 23.01 – Valves – Bronze .....3 pages
23 05 23.03 – Valves – Cast steel.....5 pages
23 05 23.04 – Lubricated plug valves.....3 pages
23 05 29 – HVAC pipe and equipment mounting and suspensions.....7 pages
23 05 48 – HVAC pipe and equipment antivibration and aseismic systems and devices .....7 pages
23 05 49.01 – Aseismic protection systems – Type P buildings .....6 pages
23 05 53.01 – Identifying mechanical networks and devices.....7 pages
23 05 93 – HVAC networks setting and balancing test .....6 pages
23 05 94 – Aeraulic networks pressure test .....4 pages
23 21 13.02 – Hydronic networks – steel pipes, valves and related fittings.....5 pages
23 21 14 – Hydronic network attachments .....3 pages
23 31 13.01 – Metal air ducts – Low pressure, up to 500 Pa.....6 pages
23 33 00 – Air duct attachments.....5 pages
23 33 14 – Balancing dampers.....3 pages
23 33 46 – Flexible air ducts.....4 pages
23 33 53 – Air duct lining .....4 pages
23 37 13 – Diffusers, dampers and grills.....3 pages
23 44 00 – HVAC air filters .....3 pages
23 81 40 – Air-source and water-source heat pumps .....6 pages

DIVISION 25

25 05 01 EMS – General specifications .....12 pages
25 90 01 EMS – Site-specific requirements and systems operation sequence .....4 pages

SPECIFICATIONS (cont.):

DIVISION 26

26 05 00 – Electricity – General specifications.....8 pages
26 05 20 – Cable and box connecters (0-1000V).....2 pages
26 05 21 – Wires and cables (0-1000V).....2 pages
26 05 29 – Mounts and suspensions for electrical installations.....2 pages
26 05 32 – Bypass and outlet boxes, and attachments.....2 pages
26 05 34 – Ducts, attachments, and duct fittings.....4 pages
26 28 16.02 – Moulded case breakers.....2 pages
26 28 23 – Fuse and non-fuse switches.....2 pages

Appendix 1 Disposal of a system containing halocarbon
Appendix 2 Waste diversion report

DRAWINGS:

A0 de 8/50 List of plans

A1 de 8/50 Construction site layout plan
General and specific notes

A2 de 8/50 Partial plan of ceilings, A-500
Demolition and renovation

A3 de 8/50 Partial plan of ceilings, B-500
Demolition and renovation

A4 de 8/50 Partial plan of ceilings, B-400
Demolition and renovation

A5 de 8/50 Partial plan of ceilings, B-300
Demolition and renovation

A6 de 8/50 Partial plan of ceilings, B-200
Demolition and renovation

A7 de 8/50 Partial plan of ceilings, B-100
Demolition and renovation

A8 de 8/50 Partial plan of ceilings, C-100 and C-200
Demolition and renovation

M01 de 27/50 Demolition, plan view, key
Block A, Level 5

M02 de 27/50 Construction, plan view, Block A
Level 5

DRAWINGS (cont.):

M03 de 27/50 Demolition, plan view, Block B Level 1

M04 de 27/50 Construction, plan view, Block B Level 1

M05 de 27/50 Construction, plan view, Block B Level 1

M06 de 27/50 Demolition, plan view, Block B Level 2

M07 de 27/50 Demolition, plan view, Block B Level 2

M08 de 27/50 Demolition, plan view, Block B Level 3

M09 de 27/50 Demolition, plan view, Block B Level 3

M10 de 27/50 Demolition, plan view, Block B Level 4

M11 de 27/50 Construction, plan view, Block B Level 4

M12 de 27/50 Demolition, plan view, Block B Level 5

M13 de 27/50 Construction, plan view, Block B Level 5

M14 de 27/50 Demolition-construction, plan view Block C, Level 1

M15 de 27/50 Demolition-construction, plan view Block C, Level 2

M16 de 27/50 Construction details

M17 de 27/50 Construction tables and details

M18 de 27/50 Construction tables

M19 de 27/50 Construction tables

DRAWINGS (cont.):

M20 de 27/50 Construction, plan view, Block A Level 2

M21 de 27/50 Construction, plan view, Block A Level 5

M22 de 27/50 Construction, plan view, Block B Level 1

M23 de 27/50 Construction, plan view, Block B Level 2

M24 de 27/50 Construction, plan view, Block B Level 3

M25 de 27/50 Construction, plan view, Block B Level 4

M26 de 27/50 Construction, plan view, Block B Level 5

M27 de 27/50 Demolition-construction, plan view Block C, Levels 1 and 2

E01 de 15/50 Demolition, plan view, Key Block A, Level 5

E02 de 15/50 Construction, plan view, Block A Level 5

E03 de 15/50 Demolition, plan view, Block B Level 1

E04 de 15/50 Construction, plan view, Block B Level 1

E05 de 15/50 Construction, plan view, Block B Level 1

E06 de 15/50 Demolition, plan view, Block B Level 2

E07 de 15/50 Construction, plan view, Block B Level 2

E08 de 15/50 Demolition, plan view, Block B Level 3

DRAWINGS (cont.):

E09 de 15/50 Construction, plan view, Block B Level 3

E10 de 15/50 Demolition, plan view, Block B Level 4

E11 de 15/50 Construction, plan view, Block B Level 4

E12 de 15/50 Demolition, plan view, Block B Level 5

E13 de 15/50 Construction, plan view, Block B Level 1

E14 de 15/50 Demolition-construction, plan view Block C, Level 1

E15 de 15/50 Demolition-construction, plan view Block C, Level 2

1. General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract include the replacement of heat pumps, as well as the mechanics (ventilation/plumbing/control) attached to it. Works also include the replacement of the controls of existing heat pumps at Maurice Lamontagne Institute located at 850, route de la mer, Mont-Joli, Qc.

.2 Works include (without being limited to), the following works:

- .1 Replacement of vertical and horizontal heat pumps .
  - .1 The interventions on the floors will be done in the evening in order to minimize the interruption of the heat pump system.
  - .2 Demolition of the heat pumps' mitigated water supply pipes and reinstatement of these with the new flexible and balancing valves.
  - .3 Replacement of the flexibles on the feed and the return of the horizontal heat pumps.
  - .4 Identification of the feed and return mitigated water pipes and of the emplacement of the heat pumps.
  - .5 Disconnect and reconnect the electricity of the replaced heat pumps.
- .2 Replacement of the room controls.
  - .1 In each room served by a heat pump identified on the plans, removal of the existing pneumatic controls.
  - .2 The heat pumps will be controlled by Siemens centralization.
  - .3 Installation of a new thermostat on the wall of the room as well as a new Siemens controller in the ceiling in order to monitor the new heat pumps and, if needed, the casing humidifier and the heating coil.
- .3 Installation of a new heat pump in the room B131.
  - .1 Installation of a heat pump.
  - .2 Installation of the new ventilation ducts.
  - .3 Installation of the new mitigated water lines.
  - .4 Installation of the new Siemens controls (control and thermostat).
  - .5 Supply and install the heat pump electric supply cord.
- .4 Modification of a humidifier in the room A522
  - .1 Conversion of the humidifier controls from pneumatic to electric.
  - .2 Installation of a triac relay on the heating coil.
  - .3 Installation of a new Siemens controller in order to monitor the new heat pump, the humidifier and the electric coil.
- .5 General Work
  - .1 Removing and re-installing the suspended ceiling .
  - .2 Protection of the furniture.
  - .3 Fire proof sealant.
  - .4 Removing and re-installation of the lighting, sprinkers and other equipment in the ceiling for the completion of the work.
  - .5 Removing and re-installation of the acoustic and« paraline » ceiling.
  - .6 Drilling, patching and painting the ceilings and gypsum walls.
  - .7 Cleaning.

1.2 WORK SEQUENCE

.1 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.

.2 Maintain fire access/control.

.3 Refer to Section 01 32 16.07 Construction Progress Schedule –Bar (Gantt) Chart for works schedule.

1.3 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for Work, to allow:

.1 Owner occupancy.

.2 Co-ordinate use of premises under direction of Departmental Representative.

.3 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.4 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

.5 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.4 OWNER OCCUPANCY

.1 Owner will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.5 WORKS BY A THIRD PARTY

.1 There will probably be other works going on simultaneously elsewhere in premises, sot that Contractor will have to make sure to define his site so that he can separate his works from other contractors.

.2 There are rooms in this project in which works will be conducted by an other contractor. This Contractor will have to adapt his schedule to coordinate his works with those of the other contractor and make sure he is responsible for his works concerning health-security and responsibility for existing premises and his own works.

1.6 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.7 DOCUMENTS REQUIRED

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

.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Reviewed Shop Drawings.
.5 List of Outstanding Shop Drawings.
.6 Change Orders.
.7 Other Modifications to Contract.
.8 Field Test Reports.
.9 Copy of Approved Work Schedule.
.10 Health and Safety Plan and Other Safety Related Documents.
.11 Other documents as specified.

2. Products

2.1 NOT USED

.1 Not used.

3. Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

1. General

1.1 ACCESS AND EGRESS

.1 Access to the construction site will be permitted by the AM1 loading dock .

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.4 EXISTING SERVICES

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

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for personnel and vehicular traffic.

.4 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

1.5 SPECIAL REQUIREMENTS

.1 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

.2 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.3 Keep within limits of work and avenues of ingress and egress.

.4 Take care that materials/equipments must be delivered in the day time in the B bloc mechanical shafts, between 4:30 PM and 6:00 PM.

1.6 SECURITY CLEARANCES

.1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.

.2 Personnel will be checked daily at start of work shift. They have to sign the attendance sheet.

1.7 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not allowed.

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1. General

1.1 DEFINITIONS

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

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

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

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

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

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

1.2 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately five (5) working days, to allow for progress reporting.

.4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

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

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

.3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.4 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.

.1 The maximum duration of work must not be more than 16 weeks after signing the contract.

1.5 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Departmental Representative will review and return revised schedules within 5 working days.

.3 Revise impractical schedule and resubmit within 5 working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.6 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:

.1 Remplacement of each heat pump.
.2 Installation of the new heat pump in the local B131.
.3 Modification of the controls in the local A522.
.4 Testing, balancing and commissioning of the heat pumps.

1.7 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress. Submit to Departmental Representative so that he can plan for actions to be taken for works to come.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.8 PROJECT MEETINGS

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

.2 Weather related delays with their remedial measures will be discussed and negotiated.

2. Products

2.1 NOT USED

.1 Not used.

3. Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

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 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 Allow 5 days for Departmental Representative's review of each submission.

.4 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.

.5 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.

.6 Accompany submissions with transmittal letter containing:

.1 Date.
.2 Project title and number.
.3 Contractor's name and address.
.4 Identification and quantity of each shop drawing, product data and sample.
.5 Other pertinent data.

.7 Submissions include:

.1 Date and revision dates.
.2 Project title and number.
.3 Name and address of:
.1 Subcontractor.
.2 Supplier.
.3 Manufacturer.
.4 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.

.8 After Departmental Representative's review, distribute copies.

.9 Submit one print or electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.10 Submit one print or electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.11 Submit one print or electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
.2 Testing must have been within 3 years of date of contract award for project.

.12 Submit one print or electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

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

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

.13 Submit one print or electronic copy 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.

.14 Submit one print or electronic copy 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.

.15 Submit one print or electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Delete information not applicable to project.

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

.18 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, electronic copy or print 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.

.19 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

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

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 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status .

.2 Submit transcription of insurance immediately after award of Contract.

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

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)

.4 Act Respecting Occupational Health and Safety, R.S.Q. Chapter S-2.12002.

.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 Association paritaire en santé et sécurité du secteur de la construction (ASP Construction) 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;

.9 positioning platform;

.10 Any other requirement of Regulations or 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.

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 contactor must take account of the following specific conditions:

.1 Concerning premises :

.1 Building occupied during works.

.2 Keeping of building services during works.

.3 Keeping of fire security.

.2 Concerning Works :

.1 Works in height.

.2 Hoisting equipment.

.3 Electrical works, shutdowns.

.4 Welding works.

.5 Demolition works.

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.

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.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.

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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

1.15 LOCKOUT

.1 For every work on energized equipment or equipment that may be started accidentally, the Contractor shall draw up and implement a lockout procedure and complete the Request for Electrical Isolation Form provided by the Manager in Charge of Worksite. Although the hereunder list is not exhaustive, here are some examples for which the use of the form is obligatory:

.1 main building power feeders

.2 feeder supply panels and sub-panels

.3 bus ducts

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.4 motor control centres

.5 emergency power circuits

.6 fire alarm and fire protection equipment

.7 mechanical protective equipment

.8 alarm circuit for building services, including all heating, ventilating and air conditioning equipment

.9 circuits supplying more than one (1) piece of equipment

.10 circuits affecting one (1) single piece of equipment used in a cooling or heating system.

.2 After having completed the form, the Contractor, shall have it countersigned by the Manager in Charge of Worksite before starting work.

.3 Notwithstanding the previous paragraphs, the Contractor shall, in emergency situation, receive an oral guarantee of isolation of the Manager in Charge of Worksite and immediately countersign the request of electrical isolation.

.4 The procedure requested at paragraph 1 must comply with the principles listed in the "*Le cadenassage*" pamphlet published by the *Association paritaire pour la santé et la sécurité du travail secteur construction (ASP Construction).*

.5 Supervisors and all workers concerned must have followed ASP Construction's "*Les techniques de cadenassage"* course (514 355-6190 or 1 800 361-2061) or an equivalent course given by another firm.

.6 Identify every work that must absolutely be done on live equipment and establish the safety measures that will be applied, including the personal protective equipment.

1.16 LIFTING MATERIAL

.1 Lifting devices shall be positioned in such a way that loads are not carried over workers, occupants or the public.

.2 The Contractor must transmit to Engineer a work procedure, signed and sealed by an engineer, including inter alia the position of the crane, a sketch of the trajectory of the transported loads, the length of the mast and a plan of lifting for the handling of loads above occupied buildings. Engineer can, if judge necessary, impose work of evening and weekend.

.3 All mobile cranes manufactured after January 1st 1980 must be equipped with a safety device against overload.

.4 All mobile cranes with cables manufactured after January 1st 1970, except if they are used for other end than lifting loads, must be provided with a safety device against two-blocking. Regarding mobile cranes with cables manufactured before January 1st 1970, they will have to be equipped with the device at the latest on December 31st 2006.

.5 The Contractor shall provide the Engineer with a mechanical service inspection certificate for each lifting device. Inspections must be carried out just prior to the delivery of the equipment to the work site.

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

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

.8 The entire lifting area shall be closed off to prevent non-authorized people from entering it.

.9 The Contractor shall obtain all of the permits at his own expense, in the event the thoroughfare must be temporarily closed off to meet the requirement stipulated in the preceding paragraph or for any other reason pertaining to the safety of workers, occupants or the public.

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

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

1.17 GENERAL PROTECTION AND WORK SITE ORGANIZATION

.1 Regardless of the circumstances and the nature of the work, individuals with access to the work site must wear protective footwear and hard hats. The Contractor shall provide chin cups or ratchet suspension helmets to workers who must bend over or crouch down.

.2 La zone des travaux doit être clairement identifié, de sorte que les occupants et le public ne puissent y avoir accès.

.3 The Contractor shall make sure that the work site is kept clean and tidy for the duration of the work.

.4 Copies of material safety data sheets of all controlled products shall be forwarded to the Engineer and to the person responsible of the work site before work begins.

END OF SECTION

□

1. General

1.1 REFERENCES AND CODES

.1 Perform Work in accordance with National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.

.2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.

.3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

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 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.

1.3 REPORTS

.1 Submit 4 copies of inspection and test reports to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested .

1.4 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.

1.5 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.

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

1.6 EQUIPMENT AND SYSTEMS

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

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

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 water for construction use.

.2 Refer to Section 01 52 00 – Construction Facilities for drinkable water supply to workers.

1.4 TEMPORARY POWER AND LIGHT

.1 Departmental Representative will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.

.2 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Departmental Representative.

.3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

1.5 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 bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 NOT USED

.1 Not Used

END OF SECTION

1. General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-0121-M1978(R2003), Douglas Fir Plywood.

.2 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.

.3 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

1.2 SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.4 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA-S269.2.

.2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs.

1.5 HOISTING

.1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.

.2 Hoists cranes to be operated by qualified operator.

1.6 ELEVATORS

.1 B bloc service-lift may be used by construction personnel and for transporting materials/equipments.

.2 Provide protective coverings for finish surfaces of cars and entrances.

1.7 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.

1.8 CONSTRUCTION PARKING

.1 Parking will be permitted in the general parking area for the unmarked cars.

1.9 SECURITY

.1 Refer to the section 01 14 00 - Work Restrictions

1.10 OFFICES

.1 Fit out a site office in the area designated by the Departmental Representative , with a lay down drawing table. Keep a minimum clearance of 1m in front of all mechanical room equipments for maintenance access.

.2 Provide marked and fully stocked first-aid case in a readily available location.

.3 Maintain in clean condition.

.4 Site Foreman to be provided with a fax or a personal computer connected to Internet wireless network (with USB modem key) at any time, to facilitate sending and receiving e-mail information.

1.11 PHONE

.1 Site Foreman to be provided with cellular phone, which activation and user fees to be paid by Contractor, in order for Foreman to be reached on site at any time.

1.12 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Storage on site must take place only in the B bloc mechanic shafts. There is no other place for storage of equipment. Keep a minimum clearance or 1m in front of all mechanical room equipment for maintenance access.

1.13 SANITARY FACILITIES

.1 Existing sanitary installations designed by the Departmental Representative may be used during works on floors but have to be cleaned at the end of each work session by Contractor.

1.14 CONSTRUCTION SIGNAGE

.1 No other signs or advertisements, other than warning signs, are permitted on site.

.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.

1.15 NOURISHMENT FOR WORKERS

.1 The Contractor and his subcontractors are not allowed to take their breaks outside site area or the construction office, so that it does not interfere with circulation in premises.

.2 There is a cafeteria in premises. Food purchasing is allowed for workers but it is forbidden to eat inside cafeteria. Workers will have to eat their lunch at the site office inside mechanical room AM-1.

.3 It is forbidden to use microwave ovens located in premises.

1.16 DRINKABLE WATER

.1 Inside construction office, supply a refrigerated household filter for drinkable water for workers.

1.17 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.

.2 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

.3 Provide for snow and ice removal where required to conduct works (ex. : roofs, walls, etc…).

1.18 SPILL

.1 Predicting the presence of equipment on site, as, absorbed, airtight containers, etc., to cope with a minor spill of gasoline, oil and liquid equipment.

1.19 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Store materials resulting from demolition activities that are salvageable.

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 Not used.

.1 Not used.

END OF SECTION

1. General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-O121-M1978 (R2003), Douglas Fir Plywood.

1.2 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.3 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.

1.4 FIRE ROUTES

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

1.5 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.6 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 Be responsible for damage incurred due to lack of or improper protection.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

1.8 FURNITURE PROTECTION

.1 The general contractor is responsible for moving the furniture that hinders its work. The contractor must also move the furniture that could be soiled or damage during the works.

.2 Precious objects like computers and breakable objects or valuables will be move by the Departmental Representative before the beginning of the works.

.3 If it's impossible to move the furniture, the general contractor must protect it so that it can't be damage or soiled.

.4 The general contractor shall provide moving and replacing furniture for each discipline of the contract. Expect to move or protect the furniture for 10 heat pumps by working shift.

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1. General

1.1 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 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, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify 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 and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 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.

.2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

1.6 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from 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 COORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 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 PROTECTION OF WORK IN PROGRESS

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

1.15 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1. General

1.1 SUBMITTALS

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

.2 Submit written request in advance of cutting or alteration which affects:

.1 Structural integrity of elements of project.
.2 Integrity of weather-exposed or moisture-resistant elements.
.3 Efficiency, maintenance, or safety of operational elements.
.4 Visual qualities of sight-exposed elements.
.5 Work of Owner or separate contractor.

.3 Include in request:

.1 Identification of project.
.2 Location and description of affected Work.
.3 Statement on necessity for cutting or alteration.
.4 Description of proposed Work, and products to be used.
.5 Alternatives to cutting and patching.
.6 Effect on Work of Owner or separate contractor.
.7 Written permission of affected separate contractor.
.8 Date and time work will be executed.

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures .

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

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

1.4 EXECUTION

.1 Execute cutting, fitting, and patching to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

.10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Firestopping , full thickness of the construction element.

.12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

.13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

.1 Not Used.

END OF SECTION

1. General

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times. Do not burn waste materials on site.

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

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

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

.6 Dispose of waste materials and debris off site.

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

.8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

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

.10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

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

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

.4 Remove waste products and debris including that caused by Owner or other Contractors.

.5 Remove waste materials from site. Do not burn waste materials on site.

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

.7 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 affected by works.

.9 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.10 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.11 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds at site installations.

.12 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

1.3 CLEANING FIRM FIRME DE NETTOYAGE

.1 The Contractor must hire a firm specialized in cleaning.

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. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

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 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 Inert Fill: inert waste - exclusively asphalt and concrete.

.3 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.

.4 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.5 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.6 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.

.7 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.

.8 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.9 Separate Condition: refers to waste sorted into individual types.

.10 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

.11 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 SUBMITTALS

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

.2 Prepare and submit following prior to project start-up :

.1 Submit 2 copies of Materials Source Separation Program (MSSP) description.

.3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project.

.1 Failure to submit could result in hold back of final payment.

.2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled or disposed of.

.3 For each material reused, sold or recycled from project, include amount in tonnes quantities by number, type and size of items and the destination.

.4 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

1.5 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated material in area which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.

.1 Transport to approved and authorized recycling facility or to users of material for recycling.

1.6 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 Separate and store materials produced during dismantling of structures in designated areas.

.8 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 Provide waybills for separated materials.

1.7 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.

1.8 ENVIRONMENTAL CONSIDERATIONS RELATING TO HEAT PUMPS

.1 GENERALITIES

.1 The activities must be conducted in accordance with the Federal Halocarbon Regulations. A copy of this regulation is available in the reference document in this tender.

.2 HEAT PUMPS REMOVING

.1 The contractor will own the heat pumps it has removed, and he must dispose of them in an environmentally friendly manner, in accordance with the laws and standards.
.2 The destruction of the refrigerant must be performed by the contractor, who must provide the Departmental Representative with consequent disposition certificates.
.3 The Contractor shall include all costs related to these activities in its bid.

.3 DISASSEMBLY

.1 Before disassembling the equipment, its refrigerant must be purge and recovered in a container specially designed for halocarbon.

.2 Halocarbon recovery must be performed by certified staff that has received environmental certification. Evidence of accreditation and certification shall be submitted to the Departmental Representative before starting work.

.3 A notice of disposition (available in appendix of this specification) must be affixed to the equipment. The notice must contain the following information:

- Address and name of the system owner
- Name of the system operator.
- Precise emplacement of the system before removal, disassembly or decommissioning.
- Description of the system, serial number.
- Name of the technician that removed the halocarbon.
- Certificate number of the technician.
- Name of the technician employer.
- Type and quantity of the recuperated halocarbon.
- System type and capacity.
- System final destination.

.4 No person shall remove the notice unless replaced by another containing the information referred.

.5 A copy of the notice must be given to the team operating the building at the end of each shift.

1.9 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 measures approved by Departmental Representative.

1.10 SCHEDULING

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

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 APPLICATION

.1 Do Work in compliance with MMSP.

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

3.2 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

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

3.3 CONSTRUCTION, RENOVATION AND DEMOLITION WASTE (CRD)

.1 The Government of Canada has the objective of reducing at a minimum the waste sent to burying.

.2 As part of the project, the contractor shall report is management of the CRD waste. The table "**Rapport de réacheminement des déchets**" have to be completed and handed in to the ministerial representative at the end of the project.

.3 The halocarbons recovered during the removal of the heat pumps have to be destructed by a certified company. The relevant documents proving the destruction of the halocarbons have to be supplied to the Departmental Representative as soon as possible after the destruction of the halocarbons.

3.4 DIVERSION OF MATERIALS

.1 From following list, 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 salvaged, recovered, reusable, recyclable materials is not permitted.

.3 Demolition Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Metals	100	
Wood (uncontaminated)	100	
Mechanical material	80	

.4 Construction Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Metals	100	
Wood (uncontaminated)	100	
Other		

3.5 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Schedule E - Government Chief Responsibility for the Environment:

Province	Address	General Inquires	Fax
Québec	Ministère de l'Environnement et de la Faune, Siège social 150, boul, René-Lévesque Est Québec QC G1R 4Y1	418-643-3127 800-561-1616	418-646-5974
	Conseil de la conservation et de	418-643-3818	

Province	Address	General Inquires	Fax
	l'environnement 800, place d'Youville, 19e étage Québec QC G1R 3P4		

END OF SECTION

1. General

1.1 INSPECTION AND DECLARATION

.1 Contractor's Inspection: Contractor and Subcontractors: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.

.2 Request Departmental Representative Inspection.

.2 Departmental Representative Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.

.4 Certificates required by Fire Commissioner Utility companies have been submitted.

.5 Operation of systems have been demonstrated to Owner's personnel.

.6 Work is complete and ready for final inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Owner, Departmental Representative, and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.

.5 Declaration of Substantial Performance: when Departmental Representative consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance.

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

.7 Final Payment: when Departmental Representative consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.

.8 Payment of Holdback: after issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount.

1.2 CLEANING

.1 In accordance with Section 01 74 11 - Cleaning .

.2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution not Used

.1 Not Used.

END OF SECTION

1. General

1.1 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 weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in 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.

1.2 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 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.

1.3 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

.1 Date of submission; names.

.2 Addresses, and telephone numbers of Departmental Representative 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 .

.6 Training: refer to Section 01 79 00 - Demonstration and Training .

1.4 AS-BUILTS AND SAMPLES

.1 Maintain 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.

.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.

1.5 RECORDING ACTUAL BUILDING CONDITIONS

.1 Record information on set of 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 locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.2 Field changes of dimension and detail.

.3 Changes made by change orders.

.4 Details not on original Contract Drawings.

.5 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.

1.6 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 Design-Builder'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 and 01 91 13 - General Commissioning (Cx) Requirements.

.15 Additional requirements: as specified in individual specification sections.

1.7 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.

1.8 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 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.

1.9 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 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 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials 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.

1.11 WARRANTIES AND BONDS

.1 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.

.2 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

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

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.3 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.4 Respond in a timely manner to oral or written notification of required construction warranty repair work.

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

1.12 PRE-WARRANTY CONFERENCE

.1 Meet with Departmental Representative, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Departmental Representative.

.2 Departmental Representative will establish communication procedures for:

.1 Notification of construction warranty defects.

.2 Determine priorities for type of defect.

.3 Determine reasonable time for response.

.3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.

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.

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1. General

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection et de interim completion.

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

.3 Preparation:

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

.2 Verify designated personnel are present.

.3 Ensure equipment has been inspected and put into operation in accordance with sections relative to this equipment.

.4 Ensure testing, adjusting, and balancing has been performed and equipment and systems are fully operational.

.4 Demonstration and Instructions:

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

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

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

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

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

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

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

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

1.3 QUALITY ASSURANCE

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

.1 Instruct Owner's personnel.

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

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 CSA International
  .1 CSA S350-FM1980(R2003), Code of Practice for Safety in Demolition of Structures.

1.02 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Submit the required documents and samples in accordance with section 01 33 00 – Documents/Samples to submit and section 01 74 21 – Construction/demolition waste management and disposal.

1.03 CONDITIONS FOR EXECUTION

.1 Verify the Report on Hazardous Substances and take any measures necessary to preserve the environment.

.2 If a material that looks like sprayed or troweled on asbestos, or any other material designated and listed as hazardous, is discovered during the execution of work, postpone all work, take the appropriate precautions and immediately notify the Ministry Representative.
  .1 Only recommence work after having received written instructions from the Ministry Representative.

.3 Alert the Ministry Representative before hindering access to the building or interrupting services.

.4 Demolish structures in the state they were in when the construction site was inspected, before the tender was submitted.

.5 The work referred to in this section includes the workforce, materials, and equipment required for the demolition works, as shown in the plans and described in the specifications.

.6 Tenderers must closely examine the plans, estimates and contractual documents, and the construction site to gain a first-hand understanding of the local conditions that may affect the execution of the work referred to in this section.

.7 Non-exhaustive list of elements to demolish: refer to the drawings provided with the architectural and engineering plans.

.8 No extras will be accepted due to an insufficient knowledge of the premises or due to poor coordination of the work referred to in this section.

2 PRODUCTS

2.01 MATERIAL AND EQUIPMENT

.1 The Contractor must supply all the necessary tools and equipment for the demolition. S/he must also supply and install all the necessary anti-collapse materials and protective materials for employees and the public. S/he must barricade or erect a fence to block access to the premises for as long as needed, or in accordance with safety laws.

2.02 MATERIAL

.1 Unless otherwise stated, material from the demolition must be disposed of by the General Contractor off the construction site, in a dry materials disposal site, recognized by the appropriate authorities.

.2 The General Contractor may propose cost reduction measures in his/her tender, in relation to elements of the building to be demolished which s/he may recuperate for later use (excluding this contact).

3 EXECUTION

3.01 INSPECTION

.1 Inspect the building and verify the placement and range of elements that must be removed, disposed of, diverted, recycled, recuperated, and those which must remain in place.

.2 Locate and protect public utility lines, and ensure those still in service are kept in good condition.

.3 Notify public utility companies and obtain the necessary approval from said companies before beginning the demolition work.

.4 Disconnect, seal or re-route, as needed, the existing on-site public utility lines, which may impair the demolition, as per the appropriate authorities' requirements. Locate the placement of these lines and of those previously abandoned on-site, and indicate (horizontal and vertical plans) on the as-built drawings. Support, brace and keep in place any lines and ducts discovered.

- .1 Immediately notify the Ministry Representative and the public utility company in question of any damage caused to a utility line that was intended to be conserved.
- .2 Immediately notify the Ministry Representative of the discovery of any public utility line not listed and await written instructions regarding the measures to take.

3.02 PREPARATORY WORK

.1 Protecting existing structures

.1 Take the necessary measures to prevent the movement, collapse or any other damage of structures, public utility lines, landscaping structures and parts of the buildings intended to be conserved. Ensure the shoring and bracing of structures as needed.
.2 As far as possible, limit dust and noise produced by the demolition work, and inconveniences caused to occupants.
.3 Protect the building's mechanical and electrical equipment, systems and installations, as well as public utility lines.
.4 Supply dust screens, tarpaulins, guards, support elements and any other necessary protection equipment.
.5 Carry out demolition work in accordance with section 01 35 30 – Health and safety.

.2 Demolition/removal work

.1 Remove indicated elements and structures.
.2 Remove hard surface coverings, selvage and gutters.
.1 Cut adjacent surfaces excluded from the demolition work at right angles using a saw or any other means approved by the Ministry Representative.
.2 Protect load-transferring devices and adjacent joints.
.3 Remove existing building components to allow for the execution of new construction.
.4 Resize the framing headers of partially demolished building components in accordance with tolerances specified by the Ministry Representative to facilitate the installation of new components.

.3 Patching and repairs

.1 Following the demolition work, repair the existing parts of the building that have been damaged or altered. These repairs must be completed using similar materials. Repairs must be watertight and uniform. If the existing materials are no longer available, the Contractor must submit materials of equivalent quality and appearance that will not lead to additional costs to the Ministry Representative for approval.
.2 The previsions of the previous paragraphs also apply to parts of the building that have been accidentally damaged during the work, in general.
.3 Wherever mechanical, electrical or other equipment has been dismantled, insulate and waterproof, where applicable, and then carry our repair work on exposed surfaces.
.4 Fit tightly around lines, sleeves, air ducts and electrical conduits as well as other openings.
.5 Around wall, ceiling and fireproof panel openings, completely seal gaps using a fireproof material on all layers.
.6 Finish the surfaces by ensuring uniformity with adjacent surfaces. With continual surfaces, continue the finish until the nearest intersection of two components; in the case of a combination of elements, completely refinish.
.7 Unless otherwise indicated, conceal lines, air ducts and wiring in the walls, ceilings and floors in finished rooms and areas.

3.03 CLEAN-UP

.1 Clean-up while work is in progress: complete clean-up operations in accordance with section 01 74 11 – Clean-up.
.1 Leave the premises clean at the end of each work day.

.2 Final clean-up: remove excess materials, waste, tools and equipment from the construction site in accordance with section 01 74 11 – Clean-up.

.3 Refer to the demolition specifications and drawings to know which materials to recuperate for reuse.

.4 Apart from the specifications above, remove demolition materials from the construction site as per the requirements of the appropriate authority.

.5 Waste management: sort waste for recycling, in accordance with section 01 74 21 – Construction/demolition waste management and disposal.

.1 Remove recycling bins and recycling skip bins from the construction site and dispose of materials in the appropriate facilities.

.6 Selling or burning demolition materials on the construction site is strictly forbidden.

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Blanket insulation — Section 07 21 16

1.02 REFERENCES

.1 CSA International
- .1 CSA B111, Wire Nails, Spikes and Staples.
- .2 CSA O121, Douglas Fir Plywood.
- .3 CSA O141, Softwood Lumber.
- .4 CSA O151, Canadian Softwood Plywood.
- .5 CAN/CSA-O325.0, Construction Sheathing.
- .6 CAN/CSA-Z809, Sustainable Forest Management.

.2 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001, FSC Principle and Criteria for Forest Stewardship.

.3 Green Seal Environmental Standards (GS)
- .1 GS-11, Paints and Coatings.

.4 National Lumber Grades Authority (NLGA)
- .1 Canadian lumber grading rules.

1.03 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Submit required documents and samples in accordance with section 01 33 00 – Documents/Samples to submit.

.2 Data sheets
- .1 Submit required data sheets as well as the manufacturer's specifications and documentation regarding carpentry work. Data sheet must indicate product characteristics, performance criteria, dimensions, limitations and finish.

.3 Documents/samples to submit regarding sustainable design
- .1 Low-emission materials
  - .1 Submit a list of paints and protective sealers used inside the building, products must comply with limitations and restrictions regarding their VOC and chemical composition.
  - .2 Submit a list of all the engineered wood products and laminating adhesives used in the building, clearly indicate that they do not contain added urea-formaldehyde resins.

1.04 QUALITY ASSURANCE

.1 Timber marking: Grading etching from a Canadian Lumber Standards Accreditation Board recognized body.

.2 Plywood marking: Grading etching as per the relevant CSA standards.

.3 Plywood, OSB, and engineered wood board construction sheathing marking: Grading mark as per the relevant CSA standards.

.4 Timber must carry the Quebec Lumber Manufacturers Association's hallmark.

.5 The hallmark must indicate the name or number of the factory, category of the lumber, name of the wood type or combination of wood types, grading rules and drying conditions at time of machining.

.6 All wood parts must comply with the sizes shown in the plans.

1.05 TRANSPORT, STORAGE AND HANDLING

.1 Transport, store and handle materials and equipment in accordance with section 01 61 00 – General product requirements and manufacturer's written instructions.

.2 Delivery and acceptance: deliver materials and equipment to the construction site in their original packaging, which must be labeled with the manufacturer's name and address.

.3 Storage and handling
- .1 Store materials and equipment off the ground, indoors, in a clean, dry and well-ventilated room, in accordance with the manufacturer's recommendations.
- .2 Replace damaged materials and equipment with new materials and equipment.

2 PRODUCTS

2.01 MATERIALS/EQUIPMENT

.1 Lumber: unless otherwise indicated, softwood, S4S finish (planed on four sides), maximum moisture content 19%, in accordance with the following rules and standards:
- .1 CAN/CSA-O141.
- .2 NLGA, Canadian lumber grading rules.
- .3 CAN/CSA-Z809 or FSC or SFI certified wood boards.

.2 Furring, shims, nailing strips, nailing bases, sub-frames, battens, curb members, and floor furring.
- .1 S2S finish components are acceptable for concealed components.
- .2 Boards: "standard" or superior grading.
- .3 Dim wood: "light framing", "standard" or superior grading.
- .4 Columns and worked wood (squares): "standard" or superior grading.

.3 Boards
- .1 Douglas Fir plywood: in accordance with CSA O121, "construction" grading, "standard" category.
  - .1 Urea-formaldehyde-free materials.
- .2 Canadian softwood plywood: in accordance with CSA 0151, "construction" grading, "standard" category.
  - .1 Urea-formaldehyde-free materials.
- .3 Plywood, OSB and engineered wood boards: in accordance with CAN/CSA-0352.
  - .1 Urea-formaldehyde-free materials.

.4 Wood treatment products
- .1 Surface-applied preservation products: Amine copper quat (ACQ), coloured water-repellant preservation product.
- .2 Pentachlorophenol may only be used on wooden components that come into contact with the ground and that are subject to rotting or insect infestation. If necessary, pentachlorophenol treated wood must be sealed with two coats of an appropriate sealer.
- .3 Wooden structures treated with pentachlorophenol and inorganic arsenicals must not be used for food storage, and the wood must not come into contact with drinking water.

.5 Primers, paints, and sealers: as per the manufacturer's recommendations, depending on surface state.

2.02 ATTACHMENTS

.1 Fittings: in accordance with CAN/CSA-G164 for outdoor structures, indoor structures in very humid locations, and pressure treated or fire-resistant wooden structures.

.2 Nails, pins and staples: in accordance with CSA B111.

.3 Bolts: 12.5mm in diameter, unless otherwise indicated, with nuts and washers.

.4 Patented fixing devices: tumble type toggle bolts, expansion shields with lag screws, screws with lead or inorganic fibre dowel bushes, power load fixing devices, as recommended by the manufacturer.

.5 Screen: aluminum grill,18 x 14 bit.

3 EXECUTION

3.01 INSPECTION

.1 Condition verification: before installing carpentry components, ensure that the state of surfaces/brackets previously established in the terms of other sections or contracts is acceptable and permits you to carry out the work in accordance with the manufacturer's written instructions.
- .1 Visually inspect surfaces and brackets.
- .2 Immediately notify the Ministry Representative of all unacceptable conditions regarding load-bearing parts.
- .3 Only begin work once the unacceptable conditions have been remedied and you have received written approval from the Ministry Representative.

3.02 GENERAL

.1 To carry out safe and sound construction work, provide first grade materials, a specialized workforce, tools, handling and construction equipment, and the monitoring services needed for the work described, shown or implied in this division regarding carpentry and joinery work, including built-in furniture.

.2 Carefully examine the architectural, structural, mechanical and electrical plans, specifications and details to determine, provide, install, or in some cases, solely install, all the required

components and items solidly and in the right place. Carpentry and joinery components must be solidly fixed, fit, properly aligned, level, plumb, and installed in accordance with the plans.

.3 The scope of this work also includes the following components: blocks, filler pieces, buffers, worked blocks, nailing bases, attachment brackets, covering cants, hanging rods between plywood boards for nailing bases, bridging, painted finish, etc.

.4 All filler pieces, nailing bases, roof cants, sub-frames, etc., for common usage, which are not shown in the plans, are included in this contract when they are needed to complete the work as per the plans and specifications.

.5 Provide and install all carpentry hardware and hardware item menus needed to carry out the joinery work, such as anchorage, various nails and screws, filling materials, sealant, plastic cement, etc.

.6 The plans and specifications only show the scope of the work, they do not show all the manufacturing, installation and finishing methods. The list of work in this division is only partial and doesn't exclude the work described in other divisions of the specifications, shown on the drawings or needed to fully carry out this construction work.

.7 Build all safety structures for the workforce, such as; parapets, ladders, ramps, platforms, tiers, walkways, etc.; alter and move them as necessary while work is being carried out, in accordance with the provisions of Quebec's Commission de santé et de la sécurité au travail.

.8 Carry out all drilling, refinishing, adjustments and other tasks. Replace parts damaged during construction.

.9 Unless otherwise specified, the manufacturer must provide the required attachments for the on-site installation of manufactured units.

.10 When a subcontractor is responsible for installation, s/he must provide the materials, workforce, equipment and scaffolding required to complete the installation.

.11 The contractor must examine the drawings for all prefabricated components to show the subcontractor building them where nails and other anchorages must be placed in the cement or in other materials or components, as necessary.

.12 Carry out trimming and fitting behind and around structures, components and appliances installed by other professionals.

.13 Subcontractors responsible for carrying out part and/or certain aspects of the work referred to in this division or in the drownings must take and verify under their own responsibility all necessary on-site measures. They must take all precautions against damages caused by adverse weather and protect their work and work carried out by others during or before their work, under penalty of being held financially liable for said damages.

.14 Subcontractors must remove their waste and materials judged to be not in compliance with specifications from the construction site.

.15 If unsure, and depending on the case, contractors and subcontractors must ask the Ministry Representative, before the end of the call for tenders or the completion of work, any additional

information they deem necessary.

3.03 COOPERATION WITH OTHER PROFESSIONALS

.1 With no exceptions, to properly carry out this work, ensure full cooperation with other professionals involved.

.2 At the beginning of each subcontractor's mandate, inspect the architectural, structural, mechanical and electricals plans, specifications and details to determine with the foreman/forewoman their carpentry and joinery needs and to carry out the work as per best practices.

3.04 OTHER PROFESSIONALS' REQUIRED CARPENTRY

.1 As required by other sections of these specifications, provide and fit wood parts in partitions, exterior walls and other required areas for the attachment of plumbing and heating appliances, joinery finishes, door and window frames and other required items or appliances. Provide the screws, bolts, washers, etc. Attach these wooden parts as required and in accordance with the conditions.

.2 If necessary, fit plugs in the walls for the attachment of joinery parts.

.3 If necessary, provide and install wooden blocks for the installation of ventilator grills, etc.

.4 Coordinate with all components that are to be attached to the building (built-in furnishings, toilet attachments, plumbing appliances, etc.), to allow for the supply and installation of the appropriate bracket and fitting bases required during construction.

3.05 WIRING SUBBASE FOR ELECTRICAL APPLIANCES

.1 Provide and install the required wiring subbases for electrical appliances as per the specifications. Use 19mm-thick plywood boards, installed on a 19mm x 38mm frame, reinforced with same-thickness components at 300mm centre-to-centre, maximum.

3.06 PREPARATORY WORK

.1 Apply a preservation product to wooden components before installing them.

.2 Apply the preservation product either by dipping or using a brush. Coat the surfaces until saturated and then leave the product to soak in for at least three (3) minutes for solid wood components and one (1) minute for plywood boards.

.3 Before installing components, generously apply the preservation product using a brush to all surfaces left exposed by cutting, trimming and drilling.

.4 All wood in contact with the outdoors will have undergone a pressure treatment in the factory with an Alkaline Copper Quaternary (ACQ) based solution. All wall plates or other parts in contact with concrete will have undergone the same treatment.

3.07 INSTALLATION

.1 Carry out the work in accordance with the provisions of Quebec's Code of Construction and in as per the specifications hereafter.

.2 Install the furring and shims needed to move away from the wall and support cupboards, wall and ceiling finishing elements, coverings, selvage, soffits, exterior finish surfaces and other stipulated structures.

.3 Install furring and shims to ensure structure flatness and verticality, the accepted gap is [1:600].

.4 Install sub-frames, nailing strips and trim around bays to ensure frames and other structures are supported.

.5 Install battens and eaves boards, nailing bases for fascia boards, nailing trips, curb members and other required wooden supports, and fit them using galvanized mounting devices.

.6 Install wall plates as indicated.

.7 Do not work with particleboard without taking the necessary precautions. Use dust collectors and wear a high-grade breathing device.

.8 Assemble, anchor, mount, attach and brace components to ensure solidity and rigidity.

.9 If necessary, mill holes so that bolt heads do not easily protrude.

.10 For soft covering materials, use nailing disks as per the material manufacturer's instructions.

3.08 CLEAN-UP

.1 Clean-up while work is in progress: complete clean-up operations in accordance with section 01 74 11 – Clean-up.
  .1 Leave the premises clean at the end of each work day.

.2 Final clean-up: remove surplus materials, waste, tools and equipment from the construction site in accordance with section 01 74 11 – Clean-up.

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Carpentry – Small-scope work — Section 06 08 99
.2 Paint – Refinishing work — Section 09 91 23.01

1.02 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI A208.1-09, Particleboard.
- .2 ANSI A208.2-09, Medium Density Fibreboard (MDF) for Interior Applications.
- .3 ANSI/HPVA HP-1-10, American National Standard for Hardwood and Decorative Plywood.

.2 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
- .1 Architectural Woodwork Quality Standards, 1st edition, 2009.

.3 ASTM International
- .1 ASTM A 123/A 123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-11.3-M87, Hardboard.

.5 CSA International
- .1 CSA B111-74, Wire Nails, Spikes and Staples.
- .2 CSA O121-F08, Douglas Fir Plywood.
- .3 CSA O141-F05, Softwood Lumber.
- .4 CSA O151-F09, Canadian Softwood Plywood.
- .5 CSA O153-FM1980, Poplar Plywood.
- .6 CAN/CSA-Z809-F08, Sustainable Forest Management.

.6 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.7 National Lumber Grades Authority (NLGA)
- .1 2008 Canadian lumber grading rules.

.8 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S104-10, Standard Methods for Fire Tests of Door Assemblies.
- .2 CAN/ULC-S105-09, Specification for Fire Door Frames.

.9 Refer to the most recent publication available for each of the standards cited in this section.

1.03 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Submit the required documents/samples in accordance with section 01 33 00 – Documents/Samples to submit.

.2 Data sheets
.1 Submit required data sheets as well as the manufacturer's instructions and documentation regarding plywood, particleboard, OSB, and MDF. Data sheets must indicate the characteristics of the products, performance criteria, size, limitations and finish.

.3 Shop drawings
.1 Submitted shop drawings must bear the stamp and signature of a qualified engineer recognized or authorized to practice in Canada (in the Province of Quebec).
.2 Drawings must show construction, jointing and fastening details, profile details and any other related details.
.3 Drawings must indicate the materials, finishes, thicknesses and hardware.

.4 Samples
.1 Submit samples of each proposed joinery component for inspection and approval.
.2 Samples must be submitted to the Contractor who will use them during construction.
.3 Submit two (2) 300mm x 300mm samples.

.5 Certification: submit documents signed by the manufacturer, certifying that products, materials and equipment comply with physical characteristic and performance criteria specifications.

.6 Test reports and evaluation reports: submit reports for engineered wood component tests carried out by recognized independent laboratories, certifying that the products, materials and equipment comply with physical characteristic and performance criteria specifications.

1.04 QUALITY ASSURANCE

.1 Timber marking: Grading etching from a Canadian Lumber Standards Accreditation Board (CLSAB) recognized body.

.2 Plywood, OSB, and engineered wood board construction sheathing marking: as per the relevant CSA and ANSI standards.

.3 Wooden frames and boards with a fire-resistance rating must be certified by a Standards Council of Canada recognized body and must be labelled by said body, as per CAN/ULC-S104 and CAN/ULC-S105.

1.05 TRANSPORT, STORAGE AND HANDLING

.1 Transport, store and handle materials and equipment in accordance with section 01 61 00 – General product requirements and manufacturer's written instructions.

.2 Delivery and acceptance: deliver materials and equipment to the construction site in their original packaging, which must be labeled indicating the manufacturer's name and address.

.3 Storage and handling
.1 Store materials and equipment off the ground, indoors, in a clean, dry and well-ventilated room, in accordance with the manufacturer's recommendations.
.2 Store wooden and wood-based joinery products and components so that they are protected from marking, scratches and scuffs.
.3 Replace damaged materials and equipment with new materials and equipment.

2 PRODUCTS

2.01 MATERIALS/EQUIPMENT

.1 Lumber: S4S finish (planed on four sides), maximum moisture content 19%, in accordance with the following standards and regulations:
- .1 CSA O141.
- .2 CAN/CSA-Z809 or FSC or SFI certified products.
- .3 Lumber grading rules published by the National Lumber Grading Authority (NLGA).
- .4 AWMAC regulations: lumber from the “custom” + (superior) category, moisture content as per regulations.
- .5 Lumber with a mechanical resistance rating is acceptable.
- .6 Hardwood lumber: in accordance with the following moisture content regulations:
  - .1 National Hardwood Lumber Association regulations.
  - .2 AWMAC regulations: lumber from the [“custom” (superior)] [“premium” (of choice)] category, moisture content as per with regulations.
  - .3 CAN/CSA-Z809 or FSC or SFI certified product.

.2 Wood-based boards: Urea-formaldehyde-free.
- .1 CAN/CSA-Z809 or FSC or SFI certified lumber.
- .2 Douglas Fir plywood: in accordance with CSA O121, “construction” grade, standard category.
- .3 Canadian softwood plywood: in accordance with CSA O151, “construction” grade, standard category.
- .4 Hardwood plywood: in accordance with ANSI/HPVA HP-1.
- .5 Poplar hardwood: in accordance with CSA O153, “construction” grade, standard category.
- .6 Particleboard: in accordance with ANSI A208.1
- .7 Hardboard: in accordance with CAN/CGSB-11.3
- .8 Medium-density fibreboard (MDF): in accordance with ANSI A208.2, with a 640-800kg/m^3 density.
- .9 Low-density fibreboard: in accordance with CSA-A247M.

.3 Plywood pressure-treated for wood rot.
- .1 Canadian softwood plywood: in accordance with ACNOR O151-M1978, sheathing (C/C) grade, square edges, moisture content equal to or below 15% when installed.
- .2 Treated in accordance with ACNOR O080.9 with a CCA wood preservative to obtain a minimum net retention of 0.60lbs per square foot of lumber.

2.02 ATTACHMENTS

.1 Nails, pins and staples must comply with CSA B111, galvanized as per ASTM A 123/A 123M for outdoor structures, indoor structures in very humid locations, and pressure treated or fire-resistant wooden structures, with a standard finish for other structures, also:
- .1 Use drive screws and pins.
- .2 Use hot-dip galvanized fittings for outdoor structures, indoor structures in very humid locations, and wood rot treated lumber.

.2 Bolts, nuts, washers, screws and pins: hot-dip galvanized finish, in accordance with ACNOR G164-M1981, for outdoor structures, indoor structures in very humid areas and wood rot treated

lumber.

.3 Unless otherwise specified in the drawings or this section, use the following types for interior construction:
- .1 In solid masonry or concrete, use expansion shields with lag screws, or lead or fibre dowel bushes with wood screws. In concrete, nail gun embedded studs may be used.
- .2 Only use galvanized anchorages to attach components pressure-treated for wood rot.

.4 Nail washers: flat top at least 25mm in diameter, in 26 caliber sheet metal or less, shaped to avoid cambering. Cambered or dished washers are not acceptable.

.5 Adhesives and sealant products: in accordance with section 07 92 00 – Sealant products for joints.

3 EXECUTION

3.01 INSPECTION

.1 Condition verification: before installing wood and wood-based joinery components, ensure that the state of surfaces/brackets previously established in the terms of other sections or contracts is acceptable and permits you to carry out the work in accordance with the manufacturer's written instructions.

3.02 INSTALLATION

.1 Unless otherwise indicated, carry out the work in accordance with AWMAC's quality standards.

.2 Scribe and trim components so they fit properly to surfaces and adjacent walls, to recesses and screeds, as well as to pipes, columns, sanitary and electrical appliances, power outlets, and any other protruding, penetrating or traversing objects.

.3 Joint to conceal kick spaces.

3.03 CONSTRUCTION

.1 Attaching components
- .1 Place joinery components level, plumb and square, and fix or anchor them firmly.
- .2 Choose attachment devices suitable for the size and nature of the components to assemble. Use certified devices, in accordance with the manufacturer's recommendations.
- .3 Embed finishing nail heads to allow for the filling of cavities. Where screws are used, mill smoothly and insert wooden plugs that match the material of the fixed component.
- .4 Replace joinery elements with marked surfaces from hammering or other damages.

.2 Nailing bases
- .1 Incorporate nailing bases into metal stud walls for the installation of various components and equipment that must be anchored to the wall, as well as in any other places shown on the drawings. In general, screw nailing bases to the inside of stud walls and use full-length metal sheet squares on the reverse side of the stud walls.
- .2 Provide continuous nailing bases for the installation of furniture and storage devices.

.3 In bathrooms and other similar rooms, provide nailing bases for all bathroom attachments. Coordinate the placement of installed nailing bases with the bathroom attachment section and with the Ministry Representative.

.4 Elsewhere, provide for the required nailing bases for all equipment and other items hanging from wall studs such as shelving, tall cabinets, electrical equipment, surface mechanics, bulletin boards, televisions, touch screens in conference rooms, etc. Coordinate placements with the Ministry Representative.

.5 Outdoors and in humid locations, only use nailing bases pressure-treated for wood rot.

.6 In general, use 3/1-inch-thick plywood to build nailing bases.

.7 The contractor must obtain the Ministry Representative's approval before covering the structure.

.3 Interior and exterior frames

.1 Place frames so that they are plumb, and window heads and window sills/shelving are level, and then fix into place.

.4 Boards

.1 Fit boards and selvage using a manufacturer-recommended adhesive. Seal holes left by temporary fastening nails using a filling component in the same shade as the wood.

.2 Fit boards and selvage using non-exposed fastening devices.

.3 Fit boards and selvage using screws and mill to allow for the insertion of wooden plugs that match the material of the fixed component

3.04 CLEAN-UP

.1 Clean-up while work is in progress: complete clean-up operations in accordance with section 01 74 11 – Clean-up.

.1 Leave the premises clean at the end of each work day.

.2 Final clean-up: remove surplus materials, waste, tools and equipment from the construction site in accordance with section 01 74 11 – Clean-up.

3.05 PROTECTION

.1 Protect installed materials and equipment from damages during construction work.

.2 Repair damages caused to adjacent materials and equipment during the installation of joinery components.

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Fire protection — Section 07 84 00

1.02 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM C 553, Specification for Mineral-Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .2 ASTM C 665, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .3 ASTM C 1320, Standard Practice for Installation of Mineral-Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

.2 Canadian Standards Association (CSA)/CSA International
- .1 CSA B111, Wire Nails, Spikes and Staples.

.3 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S702, Standard for Mineral-Fibre Thermal Insulation for Buildings.

1.03 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Data sheets
- .1 Submit required data sheets as well as the manufacturer's product specifications and documentation, in accordance with section 01 33 00 – Documents and samples to submit.

2 PRODUCTS

2.01 INSULATION

.1 Semi-rigid blanket rock fibre insulation: in accordance with CAN/ULC S102.
- .1 Type 1.
- .2 Thickness: as per the indications.
- .3 Density: 48kg/m^3 minimum.

2.02 ATTACHMENTS

.1 Wire nails: galvanized steel, 25mm longer than the thickness of the insulation, in accordance with CSA B111.

.2 Staples: legs at least 12mm long.

.3 Sealant products: in accordance with section 07 92 10.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

.1 Conformity: comply with the manufacturer's written requirements, recommendations and specifications, including technical bulletins and installation instructions specified in product catalogues and packaging, as well as with instructions on data sheets.

3.02 INSTALLING INSULATION

.1 Install insulation to ensure continuous thermal protection from the elements and the building's empty spaces, in accordance with ASTM C 1320.

.2 Only install insulation when underlying materials are dry.

.3 Carefully fit the insulation around components and electrical boxes, pipes, air ducts and housings which pass through it.

.4 Do not compress the insulation to fit it into the spaces.

.5 Carefully cut and trim the insulation so that it fits properly in the empty spaces. Do not use blanket insulation with any tears to the back or edges.

.6 Leave at least a 75mm clearance between the insulation and any heat-emitting component (recessed light fixtures, for example), and at least a 50mm clearance between the insulation and type A chimney walls, in accordance with CAN/ULC-S604, and type B or L exhaust ducts, in accordance with CAN/CGA-B149.1 and CAN/CGA-B149.2.

.7 Do not cover the insulation until the installation has been inspected and approved by the Ministry Representative.

3.03 CLEAN-UP

.1 Once the installed, remove surplus materials, scrap materials, tools and safety barriers from the construction site.

1 GENERAL

1.01 RELATED WORK

.1 Fire stop systems and smoke bells integrated into mechanical installations (air ducts and dampers, for example) and electrical installations (cable trays, for example) are indicated in the mechanical and electrical divisions.

1.02 REFERENCES

.1 Underwriters Laboratories of Canada (ULC)
  .1 CAN/ULC-S115, Fire Tests of Fire Stop Systems.

1.03 DEFINITIONS

.1 Fire stop components/materials: components that close openings or bushings during a fire, and/or materials that seal openings in the walls or floors, or openings for the installation of termination devices, such as outlet boxes with their mounting devices, or that direct cables, cable trays, conduits, air ducts and lines through walls.

.2 Single component fire stop systems: fire stop components or materials, subject to standardized drawings, used alone as fire protection, without high temperature insulation or other related materials/equipment.

.3 Multiple component fire stop systems: groups of specific fire stop components or materials, subject to standardized drawings and that allow for the establishment of fire stop systems on-site.

.4 Tightly sealed openings (NBC, 3.1.9.1.1 and 9.10.9.6.1): sleeves and ceiling straps embedded in the concrete, for fireproof buildings, or buildings with no annular space for combustible buildings.
  .1 Openings are said to be “tightly sealed” when they ensure fire separation, which blocks smoke and hot gasses from passing through to the non-exposed side.

1.04 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Submit the required documents and samples in accordance with section 01 33 00 – Documents and samples to submit.

.2 Data sheets
  .1 Submit required data sheets as well as the manufacturer’s product specifications and documentation. Data sheets must indicate product characteristics, performance criteria, dimensions, limitations and finish.

.3 Shop drawings
  .1 Submit shop drawings showing the location, materials, backing, anchorages, fastenings and proposed installation methods.
  .2 Construction specifications must precisely reflect the real installation conditions.

.4 Samples
  .1 Submit two (2) 300mm x 300mm samples showing the proposed materials or fire stop

systems.

.5 Quality assurance: submit the following documents in accordance with section 01 45 00 – Quality control:
- .1 Test reports: in accordance with CAN-ULC-S101 on the fire endurance of building materials, and CAN-ULC-S102 on surface burning characteristics.
  - .1 Submit reports for tests carried out by recognized independent laboratories, certifying that the fire stop products, materials and equipment comply with physical characteristic and performance criteria specifications.
- .2 Certification: submit documents signed by the manufacturer, certifying that products, materials and equipment comply with physical characteristic and performance criteria specifications.
- .3 Manufacturer's instructions: submit the installation instructions provided by the manufacturer, including any indication of specific handling, installation and cleaning methods.

1.05 TRANSPORT, STORAGE AND HANDLING

.1 Packing, transport, handling and unloading.
- .1 Transport, store and handle materials and equipment in accordance with section 01 61 00 – General product requirements and manufacturer's written instructions.
- .2 Transport, store and handle materials and equipment in accordance with the manufacturer's written instructions.
- .3 Deliver materials and equipment to the construction site in good condition and in their original, closed containers, with an inscription showing the brand, manufacture and ULC's certification.

.2 Storage and protection.
- .1 Store materials and equipment indoors as per the manufacturer's recommendations, in a clean, dry and well-ventilated place.
- .2 Replace damaged materials and equipment with new materials and equipment.

1.06 CONSTRUCTION SCHEDULE

.1 Install the fire/smoke protection material once adjacent work is completed and before finishing work is terminated.

2 PRODUCTS

2.01 MATERIALS/EQUIPMENT

.1 Fire stop and smoke bell systems: in accordance with CAN- ULC-S115.
- .1 Asbestos-free materials and systems, constituting an efficient flame, smoke and gas barrier, in accordance with CAN-ULC-S115, no larger than the opening or access point where they are to be installed.
- .2 Fire stop system fire-resistance rating: 2 hours for flooring and as per indications elsewhere (see indications in plans).

.2 Access and opening devices: ULC certified, in accordance with CAN/ULC-S115, and listed in guide no. 40 U19, published by the ULC.

.3 Fire stop system components for access point and openings: ULC certified, in accordance with CAN/ULC-S115, and listed in guide no. 40 U19, published by the ULC.

.4 The fire resistance rating of installed fire stop systems must comply with the provisions of the Quebec Construction Code.

.5 Fire stop and smoke bell systems installed at access points of concealed installations (cables, for example): elastomer joints.

.6 Fire stop and smoke bell systems installed at openings for lines, air ducts, and other mechanical materials needing acoustic and antivibration insulation: elastomer joints.

.7 Primers: as per the manufacturer's recommendations regarding the material, format and intended use.

.8 Water (if necessary): drinkable, clean and free from excessive levels of harmful substances.

.9 Holding, mounting, support, and anchoring devices: as per the manufacturer's recommendations and compatible with installed systems that have been proven and accepted by the relevant authorities.

.10 Sealant products for heading joints: Non-collapsible products.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

.1 Conformity: comply with the manufacturer's written requirements, recommendations and specifications, including technical bulletins and installation instructions specified in product catalogues and packaging, as well as with instructions on data sheets.

3.02 PREPARATORY WORKS

.1 Examine the size and state of gaps to fill to determine the thickness of the material required and the installation method to use.

.1 Ensure that surfaces are clean, dry and not frozen.

.2 Prepare the surfaces which will come into contact with the fire stop and smoke bell materials in accordance with the manufacturer's instructions.

.3 Ensure the heat insulation around pipes and ducts crossing firewalls and smoke bells is in no way damaged.

.4 If needed, cover adjacent surfaces to protect them from leaks and splashes, and remove any marks or unwanted deposits once the work is completed.

3.03 INSTALLATION

.1 Install fire stop and smoke bell systems and their components, in accordance with the manufacturer's instructions regarding proven and approved sets.

.2 To preserve the continuity and integrity of the fire protection, seal gaps and empty spaces around pipes and devices that fully or partially cross firewalls, and plug openings destined for later use as well as the joints around them.

.3 As needed, install temporary holding devices and do not remove them until the initial cure is complete and the materials have obtained a sufficient resistance.

.4 Shape exposed surfaces or smooth them with a trowel to obtain a uniform finish.

.5 Quickly remove surplus product from works in progress and already completed work.

.6 Fill gaps around pipes, duct-type smoke detectors and other fire-resistant components that pass through flooring or firewalls using fire-resistant glass mineral wool packed in to prevent the passage of air and smoke. Use a fire-stop sealant with the required fire-resistance when sealing firewall.

3.04 WORK SCHEDULE

.1 Only begin installing once all the documents/samples to submit have been examined and approved by the Ministry Representative.

.2 Fireproof flooring before installing indoor firewalls.

.3 Bonding to a metal substrate: To ensure the required bonding, fire protection must be completed before spray-applying any fireproof coating.

.4 Mechanical system piping heat insulation: composed of a fire-stop system (certified).
.1 Ensure that piping heat insulation is installed before the fire protection.

3.05 ON-SITE QUALITY CONTROL

.1 Inspections: Before concealing or covering any fire-stop systems, notify the Ministry Representative that the structure is ready for inspection.

3.06 CLEAN-UP

.1 Carry out clean-up operations in accordance with section 01 71 11 – Clean-up.

.2 Remove waste and surplus materials, and clean adjacent surfaces immediately following installation.

.3 Once the installation and inspection is complete, remove all materials, surplus materials, waste, tools and equipment from the construction site.

.4 Remove temporary holding devices once the initial cure of fire-stop and smoke bell materials is completed.

3.07 FIRE-STOP SYSTEM PLACEMENT

.1 Ensure fire and smoke protection in the following areas:
.1 Firewall feedthroughs, and feedthroughs for masonry, concrete and plasterboard walls

with a fire-resistance rating.

.2 Joints between floor tiles and curtain walls or prefabricated concrete wall paneling.

.3 The upper section of firewalls, and masonry, concrete and plasterboard walls with a fire-resistance rating.

.4 Firewall intersections, and at the intersections of masonry, concrete and plasterboard walls with a fire-resistance rating.

.5 Recessed joints and reinforcement seals in firewalls, and masonry and plasterboard walls with a fire-resistance rating.

.6 Feedthroughs for tiled flooring, ceiling and roofing with a fire-resistance rating.

.7 Firewall access openings and feedthroughs for future use.

.8 The edges of pipes and other mechanical and electrical materials passing through firewalls.

.9 Solid, sectional ducts larger than 129cm^2: fire protection carried out using a stringcourse of fireproof material placed between the retaining angle and the firewall, and the retaining angle and the duct, on either side of the firewall.

1 GENERAL

1.01 RELATED WORK

.1	Fire protection	Section 07 84 00
.2	Gypsum board finish	Section 09 21 16
.3	Mechanical-electrical	Section x

1.03 REFERENCES

.1 ASTM International
- .1 ASTM C 919, Standard Practice for Use of Sealants in Acoustical Applications.

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 19-GP-5M, Sealing Compound, One-Component, Acrylic Base, Solvent Curing.
- .2 CAN/CGSB-19.13, Sealing Compound, One-Component, Elastomeric, Chemical Curing.
- .3 CGSB 19-GP-14M, Sealing Compound, One-Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
- .4 CAN/CGSB-19.17, One-Component, Acrylic Emulsion Base Sealing Compound.
- .5 CAN/CGSB-19.24, Multicomponent, Chemical-Curing Sealing Compound.

1.04 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Submit the required documents and samples in accordance with section 01 33 00 – Documents/Samples to submit.

.2 Data sheets
- .1 Submit required data sheets as well as the manufacturer's product specifications and documentation concerning sealant products for joints. Data sheets must indicate product characteristics, performance criteria, dimensions, limitations and finish.
- .2 Manufacturer's data sheets must include information about the following:
  - .1 Caulking products.
  - .2 Primers.
  - .3 Sealing compounds (all types), including their compatibility with each other.

.3 Samples
- .1 Submit two (2) samples of each colour and type of the proposed products.
- .2 For the purposes of uniformity with adjacent materials, submit two (2) dried samples of sealant products that must be left exposed, and do so for each proposed colour, if necessary.

.4 Manufacturer's instructions
- .1 Instructions submitted must refer to each of the proposed products.

1.05 DOCUMENTS/ELEMENTS TO SUBMIT UPON COMPLETION OF WORK

.1 Submit the required documents/elements in accordance with section 01 78 00 – Documents/Elements to submit upon completion of work.

1.06 TRANSPORT, STORAGE AND HANDLING

.1 Transport, store and handle materials and equipment in accordance with section 01 61 00 – General product requirements and manufacturer's written instructions.

.2 Delivery and acceptance: deliver materials and equipment to the construction site in their original packaging, which must be labeled indicating the manufacturer's name and address, and the product's expiry date.

.3 Storage and handling
- .1 Store materials and equipment off the ground, indoors, in a clean, dry and well-ventilated room, in accordance with the manufacturer's recommendations.
- .2 Store materials so as to protect them from water, humidity and frost.

1.07 APPLICATION CONDITIONS

.1 Ambient conditions
- .1 Only apply sealant products in the following conditions:
  - .1 Room and substrate temperatures must be within the limits established by the product manufacturer or above 4.4 degrees Celsius.
  - .2 Substrate must be dry.
  - .3 You must comply with the manufacturer's recommendations regarding temperatures, humidity rate and the substrate's moisture content for the application and drying of the sealant products, as well as any special instructions regarding the use of the products.

.2 Consult the manufacturer and follow his/her instructions if the sealant product must be applied at a temperature below 5ºC.

.3 Joint width
- .1 Only apply sealant products when the joint width is wider than the minimum established by the product manufacturer for the indicated application.

.4 Substrate
- .1 Only apply sealant products once all contaminants likely to hinder product adherence have been removed from the substrate.

2 PRODUCTS

2.01 SEALANT PRODUCTS

.1 Caulking products with a strong odour, containing toxic chemicals, or that are not certified mould-resistant must not be used in air treatment devices.

.2 If using toxic products is the only option, restrict their use to places where fumes can be evacuated outside or to places they will be confined behind an air barrier system, or apply them several months before the room will be used, to allow for the evacuation of the toxic fumes over as long a period as possible.

.3 For sealant products approved for use with a specific primer, only the approved primer must be

used.

2.02 SEALANT PRODUCTS – DESCRIPTION AND PLACEMENT

.1 Apply a hybrid one-component polyurethane sealant product in accordance with CAN2-19.13, in the same colour as adjacent walls, between frames and windows and doors and exterior sheathing, around each outside-leading opening, in joints on recessed masonry walls, and in indicated places.

.2 At the foot of glass panels (including an up-flow of at least 50mm on each side), at the frame-glass junction, apply a continuous line of high-efficiency, one-compound, silicone sealant in accordance with CAN/CGSB-19.13. Colour: chosen by the Ministry Representative.

.3 At junctions between aluminum frames, and between flashing and metal strips, use a one-compound silicone sealant product, in accordance with CAN/CGSB-19.13.

.4 For indoor sealing, use a one-compound silicone sealant in accordance with CAN219.13.

.5 Carry out control joints in concrete floors using a polyurethane, self-leveling, two-component sealant, unless otherwise instructed by the Ministry Representative.

.6 Carry out indoor joints in humid locations using a ONGC-19-GP-22 conforming sealant, colour chosen by the Ministry Representative.

.7 Carry out all sealing in soundproofed partition walls using a sealing compound as per CAN/CGSB-19.21.

.8 Compressible and non-compressible preformed joint backings
- .1 Polyethylene, urethan and neoprene foam components.
  - .1 Foam extrusion filler strips.
  - .2 Oversized components from 30 to 50%.
- .2 Neoprene or butyl rubber components
  - .1 Round and full strips, Shore A 70 hardness rating.
- .3 High-density foam components.
  - .1 Gas-foamed PVC, gas-foamed polyethylene components with Shore A 20 hardness rating and a tensile strength between 140 and 200kPA, extruded polyolefin foam, with a 32kg/mu density, or neoprene with manufacturer recommended dimensions.
- .4 Bond breaker tape.
  - .1 Polyethylene tape that does not adhere to the sealant product, pressure attached.

2.03 JOINT CLEANING PRODUCTS

.1 Non-corrosive, dirt-repelling cleaning products, compatible with the joint materials and sealant products, in accordance with the sealant product manufacturer's written recommendations.

.2 Primer: in accordance with the sealant product manufacturer's written recommendations.

3 EXECUTION

3.01 INSPECTION

.1 Condition verification: before applying sealant products for joints, ensure that the state of surfaces/brackets previously established in the terms of other sections or contracts is acceptable and permits you to carry out the work in accordance with the manufacturer's written instructions.

.1 Visually inspect surfaces and brackets in the presence of the Ministry Representative.

.2 Immediately notify the Ministry Representative of any unacceptable conditions detected.

.3 Only begin applying products once the unacceptable conditions have been remedied and you have received written approval from the Ministry Representative.

3.02 SURFACE PREPARATION

.1 Verify the dimensions of the joints and the state of surfaces, to obtain an adequate width-depth ratio in view of the application of joint baking and sealant products.

.2 Remove all unwanted materials from the joint surfaces, including dust, rust, oil, grease and other foreign bodies that may impact the quality of the application.

.3 Do not apply sealant products on surfaces that have been treated with a pore filler, hardening product, water repellant product or any other type of sealer, unless prior testing has confirmed compatibility with these materials. Remove existing sealers, as necessary.

.4 Ensure joint surfaces are thoroughly dry and not frozen.

.5 Prepare surfaces in accordance with the manufacturer's instructions.

3.03 PRIMER APPLICATION

.1 Cover adjacent surfaces to prevent dirtying them before applying the primer and caulking product.

.2 Apply the primer to the lateral surface of joints immediately before applying the sealant product, in accordance with the sealant product manufacturer's instructions.

3.04 JOINT BACKER APPLICATION

.1 Apply bond breaker tape in the required locations, in accordance with the manufacturer's instructions.

.2 While compressing it by approximately 30%, apply the joint backer in accordance with the depth and profile of the joint in question.

3.05 MIXING

.1 Mix components in strict compliance with the sealant product manufacturer's instructions.

3.06 APPLICATION

.1 Sealant product application
- .1 Apply the sealant product in accordance with the manufacturer's written instructions.
- .2 Before carrying out clean joints, apply masking tape to the edges of adjacent surfaces, if needed.
- .3 Apply a continuous line of the sealant product.
- .4 Apply the sealant product using a gun with an adequate sized nozzle.
- .5 Apply sufficient pressure to perfectly fill gaps and seal joints.
- .6 Carry out joints so as to create a continuous line of sealant without any stoppages, creases, sagging, air bubbles and coated contaminants.
- .7 Before the product begins to form a skin, smooth over surfaces to give them a slightly concave look.
- .8 Remove excess product during and after the sealant application.

.2 Drying
- .1 Ensure sealant products dry and harden in accordance with the manufacturer's instructions.
- .2 Do not cover joints carried out with sealant products until they are thoroughly dry.

3.07 CLEAN-UP

.1 Clean-up while work is in progress: complete clean-up operations in accordance with section 01 74 11 – Clean-up.
- .1 Leave the premises clean at the end of each work day.
- .2 Immediately clean adjacent surfaces.
- .3 During the application of sealant products, remove surplus product and drips using recommended cleaning products, as needed.
- .4 Remove masking tape at the end of the initial application of the sealant product.

.2 Final clean-up: remove surplus materials, waste, tools and equipment from the construction site in accordance with section 01 74 11 – Clean-up.

3.08 PROTECTION

.1 Protect installed materials and equipment from damages during construction work.

.2 Repair damages caused to adjacent materials and equipment during the application of sealant products for joints.

1 GENERAL

1.01 RELATED REQUIREMENTS

.1	Carpentry	Section 06 08 99
.2	Blanket insulation	Section 07 21 16
.3	Sealant products for joints	Section 07 92 00
.4	Paint – Refinishing work	Section 09 91 23.01

1.02 REFERENCES

.1 Aluminum Association (AA)
- .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.

.2 ASTM International
- .1 ASTM C 475-02(2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .2 ASTM C 514-04(2009e1), Standard Specification for Nails for the Application of Gypsum Board.
- .3 ASTM C 557-03(2009e1), Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- .4 ASTM C 840-08, Standard Specification for Application and Finishing of Gypsum Board.
- .5 ASTM C 954-07, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- .6 ASTM C 1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .7 ASTM C 1047-09, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .8 ASTM C 1280-99, Standard Specification for Application of Gypsum Sheathing.
- .9 ASTM C 1177/C 1177M-08, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .10 ASTM C 1178/C 1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .11 ASTM C 1396/C 1396M-09a, Standard Specification for Gypsum Wallboard.

.3 Association of the Wall and Ceilings Industries International (AWCI)
- .1 AWCI Levels of Gypsum Board Finish-97.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.34-M86 (C1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .2 CAN/CGSB-71.25-M88, Adhesives, for Bonding Drywall to Wood Framing and Metal Studs.

.5 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.03 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Submit the required documents and samples in accordance with section 01 33 00 – Documents/Samples to submit.

.2 Data sheets
- .1 Submit required data sheets as well as the manufacturer's product specifications and documentation concerning gypsum board finish. Data sheets must indicate product characteristics, performance criteria, dimensions, limitations and finish.

1.04 TRANSPORT, STORAGE, HANDLING

.1 Transport, store and handle materials and equipment in accordance with section 01 61 00 – General product requirements and manufacturer's written instructions.

.2 Delivery and acceptance: deliver materials and equipment to the construction site in their original packaging, which must be labeled indicating the manufacturer's name and address.

.3 Storage and handling
- .1 Store gypsum board finish indoors, in a dry, clean, and well-ventilated room, in accordance with the manufacturer's recommendations.
- .2 Store gypsum board finish so as to protect it from marks, scratches and scuffs.
- .3 Protect from adverse weather, other materials and damages that may be caused during construction or other activities.
- .4 Handle plasterboard so as to not damage its surface or edges.
- .5 Protect the surfaces of pre-finished aluminum components with protective packaging. Do not use adhesive paper or spray sealants that are difficult to remove after exposure to the sun or adverse weather.
- .6 Replace faulty or damaged materials and equipment with new materials and equipment.

1.05 AMBIENT CONDITIONS

.1 Maintain the room temperature between 10 and 21 degrees Celsius for the 48 hours following plasterboard jointing, during jointing, and for at least 48 hours following the completion of the joints.

.2 Install the plasterboard and carry out jointing on dry and non-frosty surfaces.

.3 Ensure that the areas of the building with gypsum board finish are well-ventilated, in order to evacuate the excessive humidity that could prevent the jointing material from drying immediately after being applied.

2 PRODUCTS

2.01 MATERIAL/EQUIPMENT

.1 Standard boards: as per ASTM C 1396/C 1396/M, standard type, thickness as indicated in plans, 1200mm wide and of maximum useful length, with squared framing headers at the ends and rounded framing headers on the sides.

.2 Profiles for metal furring, suspension, fastening wires, recessed parts and anchorages: as per the indications in the plans.

.3 Profiles for drywall furring: galvanized steel, 0.5mm-thick core, for screw attaching plasterboard.

.4 Soft drywall furring: galvanized steel, 0.5mm-thick core, for flexible plasterboard attachment.

.5 Nails: as per ASTM C 514.

.6 Stud adhesive: as per CAN/CGSB-71.25 and ASTM C 557.

.7 Laminating adhesive: in accordance with the manufacturer's recommendations, asbestos-free.

.8 Casing beads, cornerites, recessed joints and selvage: as per ASTM C 1047, galvanized metal, 0.5mm-thick, perforated wings, one-piece.

.9 Sealant products: in accordance with section 07 92 00 – Sealant products for joints.

.10 Polyethylene: as per CAN/CGSB-51.34, type 2.

.11 Jointing compound: as per ASTM C 475, asbestos-free.

3 EXECUTION

3.01 INSPECTION

.1 Condition verification: before installing gypsum board finish, ensure that the state of surfaces/brackets previously established in the terms of other sections or contracts is acceptable and permits you to carry out the work in accordance with the manufacturer's written instructions.
- .1 Visually inspect surfaces and brackets in the presence of the Ministry Representative.
- .2 Immediately notify the Ministry Representative of all unacceptable conditions detected.
- .3 Only begin installation once the unacceptable conditions have been remedied and you have received written approval from the Ministry Representative.

3.02 INSTALLATION

.1 Mount components square, plumb and level, and securely attach them as indicated in the plans. Ensure that joints are tight, aligned and securely in place. Shape mitred corners and adjust them, leaving no rough or irregular edges. Attach components using contact adhesive along the length of the item.

.2 Install casing beads at the junction between plasterboard and surfaces with no batten strips, as well as in the various indicated places. Seal joints using a sealant product.

.3 To ensure there is no thermal bridge, install insulation strips around plasterboard and casing bead edges, and at their junction with metal window and exterior door frames.

.4 Make recessed joints from prefabricated components inserted into the gypsum board finish and attached at both sides of the joint.

.5 Install a continuous polyethylene dust screen at the bottom of and around recessed joints.

.6 Ensure recessed joints are square and aligned.

.7 Make expansion joints in accordance with the specifications, in the building's expansion and construction joints placement. Cover with a continuous dust screen.

.8 Ensure expansion joints are square and aligned.

.9 Finish joints between boards and interior angles using the following products: jointing compound, tape and sealant for tape. Apply the products in accordance with the manufacturer's recommendations and smooth by thinning to the same level as the surface of the boards.

.10 Cover angle-beads, recessed joints and, if necessary, packing, with two coats of jointing compound and one coat of sealant tape, smoothed and thinned to the same level as the surface of the boards.

.11 Fill depressions left by screws with the jointing compound and sealant tape until obtaining a uniform surface, flush to adjacent plasterboard surfaces, to ensure depressions will be invisible once finished.

.12 Lightly sand irregular edges and other imperfections. Do not sand adjacent surfaces.

.13 Once the installation is completed, the structure must be smooth, level or plumb, free from cocking or other imperfections, and ready to be covered with a finishing plaster.

3.03 CLEAN-UP

.1 Clean-up while work is in progress: complete clean-up operations in accordance with section 01 74 11 – Clean-up.
- .1 Leave the premises clean at the end of each work day.
- .2 Final clean-up: remove surplus materials, waste, tools and equipment from the construction site in accordance with section 01 74 11 – Clean-up.

3.06 PROTECTION

.1 Protect installed materials and equipment from damages during construction work.

.2 Repair damages caused to adjacent materials and equipment during the installation of joinery components.

1 GENERAL

1.01 RELATED REQUIREMENTS

.1	Gypsum board finish	Section 09 21 16
.2	Mechanical-electrical divisions	See engineer

1.02 REFERENCES

.1 ASTM International
- .1 ASTM C 841-03(2008e1), Standard Specification for Installation of Interior Lathing and Furring.
- .2 ASTM C 847-12, Standard Specification for Metal Lath.
- .3 ASTM C 933-11, Standard Specification for Welded Wire Lath.
- .4 ASTM C 1032-06(2011), Standard Specification for Woven Wire Plaster Base.
- .5 ASTM C 1047-10a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Base Veneer.
- .6 ASTM C 1063-12a, Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.34-M86, Vapour barrier, polyethylene sheet for use in building construction.
- .2 CAN/CGSB-7.1-98, Lightweight Steel Wall Framing Components.

1.03 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Submit the required documents and samples in accordance with section 01 33 00 – Documents/Samples to submit.

.2 Data sheets
- .1 Submit required data sheets as well as the manufacturer's product specifications and documentation concerning the installation of furring and lathing. Data sheets must include product characteristics, performance criteria, dimensions, limitations and finish.

1.04 TRANSPORT, STORAGE AND HANDLING

.1 Transport, store and handle materials and equipment in accordance with section 01 61 00 – General product requirements and manufacturer's written instructions.

.2 Delivery and acceptance: deliver materials and equipment to the construction site in their original packaging, which must be labeled indicating the manufacturer's name and address.

.3 Storage and handling
- .1 Store materials and equipment indoors in a clean, dry and well-ventilated room, in accordance with the manufacturer's recommendations.
- .2 Store furring and lathing so as to protect it from marks, scratches and scuffs.
- .3 Replace faulty or damaged materials and equipment with new materials and equipment.

2 PRODUCTS

2.01 MATERIAL/EQUIPMENT

.1 Metal furring components: sections, hanger rods, attachments, anchorages, fastenings, as per ASTM C 841.

.2 Polyethylene sheet as per CAN/CGSB-51.34, type 2, 0.15mm-thick.

.3 Metal attachments (corner beads, baseboard screeds, cornerites, casing beads): as per ASTM C 1047.

.4 Expansion joints: casing beads fitted back to back, as per ASTM C 1047, specially-made zinc plated or copper coated, 0.45mm-thick steel plate sets, with flexible air packing.

3 EXECUTION

3.01 INSPECTION

.1 Condition verification: before installing furring and lathing, ensure that the state of surfaces/brackets previously established in the terms of other sections or contracts is acceptable and permits you to carry out the work in accordance with the manufacturer's written instructions.
- .1 Visually inspect surfaces and brackets in the presence of the Ministry Representative.
- .2 Immediately notify the Ministry Representative of all unacceptable conditions detected.
- .3 Only begin installation once the unacceptable conditions have been remedied and you have received written approval from the Ministry Representative.

3.02 PREPARATORY WORK

.1 Use galvanized metal brackets, components, angle irons and lathing in humid locations, as well as on exterior walls and soffits.

.2 Do not install lathing on sub-frames, anchorages, shims or electrical and mechanical installations, until they have been inspected and accepted by the Ministry Representative.

.3 Ensure that finished structures and solid, square, level and plumb, and that they comply with the dimensions and configurations in the plastering plan.
- .1 Allow clearance for the thermal contraction and expansion of components.

.4 Leave sufficient clearance under load-bearing beams and slabs to prevent the transmission of structural loading on to vertical furring.

3.03 INSTALLING FURRING AND LATHING

.1 Unless otherwise indicated, carry out the construction work related to furring and lathing in accordance with ASTM C 841.

.2 Ceiling furring
- .1 Ensure bracket sections are installed level, the admissible gap is 3mm per 3.5m in

length. Install bracket sections to structure separations and changes in direction.

.2 Install furring sections on the edges of openings for access panels, lighting fixtures, diffusers, grills.

.3 Install furring wherever a vertical partition crosses a ceiling or ends at a ceiling.

.4 Install furring above suspended ceilings, for the installation of fire stop/acoustic screens and plenums.

.5 For openings in concrete, fit anchorages and suspensions to baking rods using loops embedded at least 50mm or with approved attachments.

.6 Strengthen outdoor soffit suspensions and vestibule ceiling suspensions to prevent any upward movement caused by the wind.

.7 Install continuous galvanized drip moulds along exterior soffits.

.8 Do not attach suspensions to steel covered brackets.

.3 Wall furring

.1 For walls, install steel furring, as indicated.

.2 Install furring around all openings, flush-mounted equipment, cupboards and access panels, also install on reveals.

.1 Consult equipment suppliers to find out required clearances.

.3 As indicated, construct partitions and install technical chases/ducts to conceal exposed beams, columns, pipes and service lines.

.1 Install 19mm sections at corners 300mm centre-to-centre.

.4 Carefully fit ends and edges, without applying pressure, and offset the end joints of successive courses.

.5 Embed hollow metal frames onto furring in plastered walls.

.6 On exterior walls, install asphalt felt nosing before installing furring strips.

.4 Plasterboard lathing

.1 Carry out lathing on the ceiling first, then on the walls.

.2 Abut plasterboard onto plasterboard without tightening, trim carefully around power outlets, ducts and openings.

.6 Expansion/control joints

.1 Grounds placed back to back at 6mm intervals, on a continuous, 0.15mm-thick, polyethylene damp-proof membrane, attached on both sides of joints.

.2 Fit 150mm x 450mm metal lath bracing at all corners of openings larger than $0.1m^2$ for masonry, plasterboard lathing, and solid insulation brackets.

.3 Install cornerites in interior corners on all walls for plastering, except for on suspended ceilings.

.1 Attach cornerites to hold lathing in place while you plaster.

.2 Do not attach bracing to structural components.

.4 Install metal lathing at least 200mm-wide on bracket joints made from other material.

.5 Install sheathing paper under the plaster reinforcement on surfaces to be covered with cement plaster.

.1 Install sheathing paper horizontally.

.2 Overlap the paper by 50mm on side joints and by 100mm on end joints.

.3 Attach the plaster reinforcement to beams fitted 400mm centre-to-centre using galvanized large-headed roofing nails, installed 100mm centre-to-centre vertically.

.6 Install all attachments square, plumb or level, and fit them as per the plans.

.1 Use full-length parts as often as possible.

.2 Ensure joints are tight, aligned and well secured.
.3 Shape mitered corners and fit them properly, leaving no rough edges.
.4 Fit components 220mm centre-to-centre.

.7 Install corner mouldings to exterior corners using 300mm centre-to-centre fittings.

.8 Also install casing beads around the edges of suspended ceilings, at the junction between a sealant and an exposed surface made from a different material (masonry, concrete, wood, metal), at the exposed edges of plastered surfaces, at the junction between load-bearing components and a sealant applied on a non-load-bearing component, as well as in indicated places.

.9 Install metal screed above plinths and paneling.

.10 Carry out expansion joints, formed of two (2) flush-mounted angle irons embedded back to back in the sealant and fitted, separately, to each side of the joint.

.11 Install a continuous polyethylene damp-proof membrane under expansion/control joints.

.12 Carry out expansion joints in the places indicated in the plans.

.13 Ensure expansion joints are straight and level.

.14 Install plaster frames and rings around openings for electrical and mechanical appliances.

.15 Firmly attach plaster frames and rings to furring and lathing.

3.04 CLEAN-UP

.1 Clean-up while work is in progress: complete clean-up operations in accordance with section 01 74 11 – Clean-up.
.1 Leave the premises clean at the end of each work day.
.2 Final clean-up: remove surplus materials, waste, tools and equipment from the construction site in accordance with section 01 74 11 – Clean-up.

3.05 PROTECTION

.1 Protect installed materials and equipment from damages during construction work.

.2 Repair damages caused to adjacent materials and equipment during the installation of furring and lathing.

1 GENERAL

1.01 SUMMARY

.1 Section content
- .1 Materials/equipment and installation method for acoustic components to be fitted to a substrate or integrated into a suspended ceiling.

.2 Related requirements

.1	Gypsum board finish	Section 09 21 16
.2	Furring and lathing	Section 09 22 14
.3	Suspension system for acoustic ceilings	Section 09 53 00.01
.4	Paint – Refinishing work	Section 09 91 23.01

1.02 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM C 423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- .2 ASTM E 1264, Standard Classification for Acoustical Ceiling Products.
- .3 ASTM E 147, Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.34, Vapour barrier, polyethylene sheet for use in building construction, incorporating amendment number 1.
- .2 CAN/CGSB-92.1, Sound Absorptive Prefabricated Acoustical Units.

.3 Canadian Standards Association (CSA)/CSA International
- .1 CSA B111, Wire Nails, Spikes and Staples.

.4 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies.

1.03 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Submit required samples in accordance with section 01 33 00 – Documents and samples to submit.

.2 Submit two (2) 300mm x 300mm samples of each type of acoustic component.

1.04 QUALITY ASSURANCE

.1 Regulatory bodies' requirements
- .1 Ceiling/floor and roof/ceiling assemblies with fire-resistance ratings where indicated in plans: certified by a Canadian certifying body, certified by the Standards Council of Canada.

.2 Health and safety

.1 Take the necessary construction health and safety measures in accordance with section 01 35 29.06 – Health and safety.

1.05 TRANSPORT, STORAGE AND HANDLING

.1 Protect absorbent materials used or stored on-site from damp-caused damages.

.2 Store replacement material/equipment in the location designated by the Ministry Representative.

1.06 CONDITIONS FOR IMPLEMENTATION

.1 Leave moisture-releasing structures to dry before installing.

.2 Before and during work, maintain a constant temperature of at least 15 degrees Celsius and a relative humidity rate between 20 and 40% in the area where the work is being carried out.

.3 Before using materials, store for 48 hours in the area they will be used.

1.07 REPLACEMENT MATERIAL/EQUIPMENT

.1 Provide replacement acoustic components in accordance with section 01 78 00 – Documents/Elements to submit upon completion of work.

.2 Provide an additional number of acoustic components equivalent to 2% of the gross area of the ceiling, for each type and model of acoustic component used.

.3 Ensure that replacement material/equipment comes from the same manufacturing batch as that used in the work.

.4 Clearly identify each type of acoustic component, indicating the colour and texture.

.5 Deliver the replacement material/equipment to the Ministry Representative once the work referred to in this section is completed.

2 PRODUCTS

2.01 MATERIAL/EQUIPMENT

.1 Acoustic components for suspended ceilings: in accordance with CAN/CGSB-92.1 and/or ASTM E 1264.

.1 **Type A (laboratory sector):**

.1 Identical pattern, texture, colour and size to existing components, for completion or finishing. Washable finish, white.

.2 **Type B (±50% of offices, conference rooms, corridors, open areas, etc.):**

.1 Identical pattern, texture, colour and size to existing components, for completion or finishing.
Existing model: “Armstrong” #1762C

Fine Fissured, Second Look III, white.

.3 **Type C (±50% of offices):**

.1 Identical pattern, texture, colour and size to existing components, for completion or finishing.
Existing model: “Armstrong” #1762C
Fine Fissured, Second Look III, paint beige.

.2 Staples, nails and screws: in accordance with CSA B111, anti-corrosion finish, as per the acoustic component manufacturer’s recommendations.

.3 Assembly clamps: specially designed to attach suspension system tiles, and to be used in an installation with a fire-resistant coating.

3 EXECUTION

3.01 INSPECTION

.1 Installing acoustic panels and tiles before professionals have inspected the installations that will be concealed by the ceiling is strictly prohibited.

3.02 INSTALLING COMPONENTS ON THE SUSPENSION SYSTEM

.1 Fit the acoustic panels and tiles to the suspension system.

.2 If the ceilings have a fire-resistance rating, fit the panels to the exposed frame using assembly clamps; protect ceiling fixtures, diffusers, return-air grills and other devices in accordance with the provisions of the certifying bodies.

3.03 INSTALLING COMPONENTS ON A SOLID SUBSTRATE

.1 Arrange acoustic components in parallel with the building’s placement line, so that the components on the edges retain at least 50% of their original width and so that the pattern is facing the same direction. Refer to the ceiling plan.

3.04 COORDINATION OF THE WORK

.1 Coordinate these provisions with those in section 09 53 00.01 – Suspension systems for acoustic ceilings.

.2 Coordinate ceiling installation work with the sections referring to lighting, diffusers, speakers and sprinkler heads to be installed in the acoustic ceiling.

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Gypsum board finish — Section 09 21 16

.2 Acoustic components for ceilings — Section 09 51 13

1.02 REFERENCES

.1 ASTM International
- .1 ASTM C 635/C 635M, Standard Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- .2 ASTM C 636/C 636M, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

1.03 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Submit the required documents and samples in accordance with section 01 33 00 - Documents/Samples to submit.

.2 Data sheets
- .1 Submit required data sheets as well as the manufacturer's specifications and documentation regarding suspension systems for acoustic ceilings. Data sheets must indicate product characteristics, performance criteria, dimensions, limitations and finish.

.3 Samples
- .1 Submit samples for each type of suspension system for inspection and approval.
- .2 Submit a representative model of the proposed ceiling suspension system.
- .3 Each sample must show installation and assembly details, wall connections, recessed fixtures, fishplates, housing type, finish and acoustic component installation method.

1.04 QUALITY ASSURANCE

.1 Suspension systems with fire-resistance ratings where indicated in plans: certified by a Canadian certifying body, certified by the Standards Council of Canada.

1.05 TRANSPORT, STORAGE AND HANDLING

.1 Transport, store and handle materials and equipment in accordance with section 01 61 00 – General product requirements and manufacturer's written instructions.

.2 Delivery and acceptance: deliver materials and equipment to the construction site in their original packaging, which must be labeled indicating the manufacturer's name and address.

.3 Storage and handling
- .1 Store materials and equipment off the ground, indoors, in a clean, dry and well-ventilated room, in accordance with the manufacturer's recommendations.
- .2 Store rails and tiles for acoustic ceilings so that they are protected from marks, scratches and scuffs.
- .3 Replace damaged materials and equipment with new materials and equipment.

2 PRODUCTS

2.01 DESIGN CRITERIA

.1 Design requirements: Maximum flexion: rise 1/360 of the charge, determined by flexion tests described in ASTM C 635/ASTM C635M.

2.02 MATERIALS/EQUIPMENT

.1 Systems for average loads: as per ASTM C 635/ASTM C635M.

.2 System component manufacturing materials: commercial grade hot-dip galvanized steel.

.3 Suspension systems without a fire-resistance rating, made up of the following components:

.4 Suspension lines: soft annealed and galvanized steel wire.
- .1 3.6mm diameter for tiled ceilings.
- .2 As per the ULC design provisions for ceilings with a fire-resistance rating.
- .3 2.6mm diameter for ceilings.

.5 Suspension line anchorage: specially made.

.6 Staples, nails and screws: in accordance with ACNOR B111, anticorrosion finish, as per the acoustic component manufacturer's recommendations.

.7 Bearing U-sections: 38mm x 10mm, 1.2mm-thick galvanized steel.

.8 Attachments: fishplates, fasteners, metal wire attachments, wall-ceiling joint staples and mouldings, for flush-mount installation, needed for a full suspension system installation, in accordance with the manufacturer's recommendations.

.9 Products:

Type A (laboratory sector):

Suspension system recuperated from the existing one. If needed, provide new sections that match the existing ones. Verify on-site for each work zone in question. White.

Type B (±50% offices, conference rooms, corridors, open areas, etc.):

Suspension system recuperated from the existing one. If needed, provide new sections that match the existing ones. Verify on-site for each work zone in question. White.

Type C (±50% offices):

Suspension system recuperated from the existing one. If needed, provide new sections that match the existing ones. Verify on-site for each work zone in question. Paint beige.

3 EXECUTION

3.01 INSPECTION

.1 Condition verification: before installing acoustic ceiling rails and tiles, ensure that the state of surfaces/brackets previously established in the terms of other sections or contracts is acceptable and permits you to carry out the work in accordance with the manufacturer's written instructions.

.1 Visually inspect surfaces and brackets.

.2 Ensure perfect coordination with mechanical-electrical contractors.

.3 Immediately notify the Ministry Representative of all unacceptable conditions detected or any integration problems you are likely to encounter while carrying out the work.

.4 Only begin installation once the unacceptable conditions have been remedied and you have received written approval from the Ministry Representative.

.5 Undertake all work needed at no cost to remedy the problems that were not detected before the work began.

3.02 INSTALLATION

.1 Manufacturer's instructions: Conformity: comply with the manufacturer's written requirements, recommendations and specifications, including technical bulletins and installation instructions specified in product catalogues and packaging, as well as instructions on data sheets.

.2 Unless otherwise indicated, install system components in accordance with ASTM C 636/C 636M.

.3 Install suspension systems in accordance with the manufacturer's instructions and the design requirements approved by certifying bodies.

.4 Do not install a suspended ceiling system until professionals have verified and approved the installations that will be concealed in the ceiling.

.5 Fit suspension lines to the upper roof frame using fitting methods in accordance with the manufacture's indications and the existing conditions.

.6 Place suspension lines 1200mm centre-to-centre maximum, and at least 150mm from the edges of the main T-sections.

.7 Trace two perpendicular bisecting lines on the ceiling to ensure installation is symmetrical to the periphery of the room. Fit the system so that the width of the framing header components is no less than 50% of the standard width of components, as per to the as-built ceiling drawings, if the latter is provided in the plans.

.8 Coordinate the installation of the system components with the placement of other components installed in the ceiling.

.9 Install the wall-ceiling joint mouldings that will define the exact height of the ceiling.

.10 Suspension grids must be perfectly square and aligned for tiles. Ensure the suspension grid is level.

.11 Once completed, the system must be able to support all additional loads, for example, light fixtures, diffusers, grills and speakers.

.12 For light fixtures and diffusers, allow for additional suspension lines installed 150mm maximum from each angle, and 600mm maximum from each fixture.

.13 To obtain a solid assembly, join the transversal and bearing sections.

.14 Install selvage around openings for light fixtures, diffusers and speakers as well as at different ceiling levels.

.15 Finished ceiling framing headers should be square along walls and should not surpass a flatness deviation of 1:1000.

.16 Expansion joints

.1 Parallelly install, 50mm away from each other, along the building's expansion joint, two main bearing T-sections. Fit acoustic panels/tiles to these, and leave a width difference under 25% between the two sections.

.17 Once installation is complete, clean the surfaces of any dirtied or discoloured components. Remove or replace any damaged or badly installed components.

3.03 CLEAN-UP

.1 Clean-up while work is in progress: complete clean-up operations in accordance with section 01 74 11 – Clean-up.

.1 Leave the premises clean at the end of each work day.

.2 Final clean-up: remove surplus materials, waste, tools and equipment from the construction in accordance with section 01 74 11 – Clean-up.

.1 Retouch painted any scratched, scraped or otherwise damaged painted surfaces.

.2 Ensure all components are fully clean. Immediately remove marks, dirt and smudges.

3.04 PROTECTION

.1 Protect installed materials and equipment from damages during construction work.

.2 Repair damages caused to adjacent materials and equipment during the installation of suspension systems for acoustic ceilings.

1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Gypsum board finish — Section 09 21 16

1.02 REFERENCES

.1 The Master Painters Institute (MPI)
- .1 The Master Painters Institute's Maintenance Repainting Manual, addressing the identification of components, the evaluation of substrates, painting systems, preparatory work, and including the List of Approved Products.
- .2 MPI Architectural Painting Specifications Manual.

.2 National Fire Code of Canada

.3 Society for Protective Coating (SSPC)
- .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

1.03 QUALITY ASSURANCE

.1 Qualification
- .1 The Contractor must have at least five (5) years' experience in the execution of similar projects, with references. As such, s/he must provide a list of the last three (3) similar projects, indicating the name and location of the project, the contractual authority responsible for the specifications, and the name of the project manager.
- .2 Paint work must be carried out by qualified workers in terms of the regulations in place in the local jurisdiction.
- .3 Apprentices may be hired if they work under the direct supervision of a qualified worker, in accordance with the trade's governing regulations.

.2 Comply with the most recent MPI requirements regarding interior refinishing work of painted surfaces, including those concerning cleaning and preparing surfaces, as well as applying primer or sealers.

.3 Products used, whether primers or sealers, paints, sealant, varnishes, stains, lacquers, filling products, diluents, solvents or any other product, must appear in the most recent version of MPI's List of Approved Products, and all products forming the chosen painting system must come from the same manufacturer.

.4 Paint products, such as linseed oil, lac, diluents and turpentine, must be of the highest quality and, depending on requirements, be compatible with the other coating products used. They must come from an approved manufacturer listed in the MPI Maintenance Repainting Manual.

.5 Conserve purchase orders, invoices and other documentation that prove, if asked by the Architect, that the products comply with the specified MPI requirements.

.6 Quality standard: surfaces examined must, under permanent lighting, satisfy the following requirements:
- .1 Walls: no defects must be visible from a distance of 1000mm, at a 90-degree angle from the examined surface.

.2 Ceilings: no defects must be visible by an observer on the ground, at a 45-degree angle from the examined surface.

.3 The colour and gloss of the top coat must be uniform across the entire examined surface.

1.04 WORK SCHEDULE

.1 Submit a schedule of the various steps of the paint work to the Owner and the Architect for approval. The schedule must be submitted at least one (1) week before the scheduled start of work.

.2 The approved schedule for repainting work in occupied buildings must be meticulously adhered to. This schedule must be previously established to the Owner's satisfaction and must allow for sufficient drying and curing time before the occupants return.

.3 Obtain the Owner's written authorization for any amendments to the work schedule.

.4 Establish the schedule to ensure that other trade bodies, if applicable, or occupants and other people inside or near the building, will not interrupt the repainting work.

1.05 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

.1 Submit the required data sheets as well as the manufacturer's instructions regarding the use or application of each paint product, sealant product, and paint diluent, in accordance with section 01 33 00 – Documents and samples to submit.

.2 Documents/Elements to submit upon completion of work

.1 Submit the required maintenance sheets and attach them to the manual mentioned in section 01 78 00 – Documents/Elements to submit upon completion of work.

.1 Submit a record of all the products used. Indicate the products each system is made up of, specifying the following information for each of them:

.1 The name, type and usage of the product (i.e. the materials and where they have been applied).

.2 The manufacturer's product number.

.3 The colour numbers.

1.06 TRANSPORT, STORAGE AND HANDLING

.1 Package, transport, store and handle paint products in accordance with section 01 61 00 – General product requirements, and in accordance with the following provisions:

.1 Transport and store paint products in their original, sealed containers, with intact labels.

.2 Labels must indicate:

.1 the manufacturer's name and address;

.2 the type of paint or sealant;

.3 compliance with pertinent standards or requirements;

.4 the colour number, as per the list of specified colours.

.3 Remove deteriorated, opened or refused products from the construction site.

.4 Handle and store products in accordance with the manufacturer's recommendations.

.5 Store products in a safe, dry and well-ventilated room, between 7 and 30 degrees Celsius. Store products away from heat sources, and store temperature-sensitive products at a lower temperature, as recommended by the manufacturer.

.6 Keep the areas used for storage, cleaning and preparation clean and in order, to the Owner's satisfaction. Once the work is completed, return said areas to their initial state, to the Owner's satisfaction.
.7 Only take the amount of product to be used on the same day out of the storage area.
.8 Fire safety requirements:
.1 Handle, store, use and dispose of flammable and combustible products and materials in accordance with the National Fire Code of Canada.

.2 Waste management and disposal
.1 Paints, stains, wood preservation products and other related products (diluents and solvents) must be treated as hazardous materials, thus their disposal is governed by various regulations. Information regarding pertinent legislative provisions can be obtained from provincial environment ministries and regional governmental bodies.
.2 Products that cannot be reused must be treated as hazardous waste and disposed of appropriately.
.3 Place hazardous or toxic products and materials, including used adhesive and sealant product containers and tubes, in areas or containers designated for the disposal of hazardous waste.
.4 To reduce the contamination of soil or water, and sanitary and pluvial sewer networks, ensure strict compliance with the following instructions:
.1 Conserve paint and other water-based product cleaning water for the collection of various matters through filtration. The cleaning water must always be recuperated after cleaning materials.
.2 Conserve cleaning products, diluents, solvents and surplus paint in the appropriate containers, and dispose of them appropriately.
.3 Conserve cloths that have been soaked with oil and solvent during paint work for the recuperation of contaminants and for either their disposal or adequate cleaning.
.4 Take the necessary measures for the disposal of contaminants, in accordance with hazardous waste regulations.
.5 Leave empty paint containers to dry before disposing of or recycling them (in areas with appropriate facilities).
.6 Properly close and seal partly used paint product containers, including adhesive and sealant product containers, and store them at a moderate temperature in a well-ventilated, fireproof room.
.5 Collect surplus paint and categorize it by type, and then send it to a paint recycling or collection facility.
.6 Protect surplus and non-contaminated finishing products that can be reused, put them to one side, and give them to the Owner.

1.07 EXECUTION CONDITIONS

.1 Heating, ventilation and lighting
.1 Before starting repainting works, ensure there is adequate, continuous ventilation, and that the heating facilities can warm the air temperature and substrate temperature to 10 degrees Celsius 24 hours before starting the work, and that they can maintain this temperature throughout the repainting process and once the work is complete, until the paint has sufficiently hardened.
.2 Ventilate closed spaces. If needed, ensure continuous ventilation for the seven (7) days following the completion of the work.

.3 Coordinate the use of the existing ventilation system with the Owner and, if needed, take the required measures for its operation during and after the work.

.4 If the permanent systems cannot be used, provide and temporarily install the necessary heating and ventilation devices. If the building's permanent system does not meet the minimum requirements, provide and install the necessary additional equipment to comply with requirements. Using gas devices for this purpose is strictly forbidden.

.5 Before starting repainting work, verify that the level of light on surfaces to paint is as least 232 lux.

.2 Room temperature, relative humidity and substrate moisture rate

.1 Unless the contractual authority responsible for the specifications, the inspection body for paint work, and the manufacturer of the product applied have previously given their explicit authorization, do not start repainting work in the following conditions:

.1 if the room and substrate temperature are below 10 degrees Celsius;

.2 if the substrate temperature is above 32 degrees Celsius, unless the paint used is specifically formulated for application in high temperatures;

.3 if the relative humidity in the work area is above 85%.

.2 Using a properly calibrated electronic moisture metre, carry out tests to determine the moisture content of substrates, unless these are already-painted concrete floors whereby the moisture content can be evaluated with a simple "hiding power check".

.3 Do not start repainting work if the maximum moisture rate of the substrate is above the following values:

.1 12% for concrete and masonry (bricks and concrete/clay blocks) and a curing period of at least 28 days;

.2 15% for wood;

.3 12% for plasterboards and plastered surfaces.

.4 Carry out tests on plastered, concrete and painted masonry surfaces to determine their alkalinity.

.3 Surface state and execution conditions

.1 Commence paint work in areas where the ambient air is free from suspended dust generated by construction work or particles blown through the ventilation systems and, thus, susceptible of altering finished surfaces.

.2 Apply paint to properly prepared surfaces with a moisture content within the range specified in this section.

.3 Apply paint once the previous coat is dry of sufficiently hardened, unless other instructions have been previously approved by the paint or sealant manufacturer.

.4 In occupied buildings, all paint work must be carried out after closing time. The work schedule must be approved by the Owner and must allow for sufficient drying and hardening time before the occupants return.

1.10 MAINTENANCE

.1 Replacement materials/equipment

.1 Provide the required replacement/spare materials/equipment in accordance with section 01 78 00 – Documents/Elements to submit upon completion of work.

.2 Submit one (1) four-litre (4-litre) container of each type and each colour of finishing product from the same production batch as those used. Identify the product type and colour in accordance with the specified list of colours and paint system.

2 PRODUCTS

2.01 MATERIALS

.1 Paint products appearing in the latest edition of MPI's List of Approved Products can be used for this repainting work.

.2 Where required by the competent authorities, paint and sealant products must provide the specified fire rating to the substrates they are applied to.

.3 All products making up a paint system must come from the same manufacturer.

.4 Paint and sealant products must not contain formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium, or any of their compounds.

.5 Comply with the most recent MPI requirements concerning interior surface painting, including those regarding the preparation of surfaces and the application of primer or sealer.

.6 Products used, whether primer or sealer products, paints, sealants, varnishes, stains, lacquers, filling products, diluents, solvents or others, must appear in the List of Approved Products in the MPI Architectural Painting manual.

.7 Flash point: 61 degrees Celsius or higher for water-based sealants and recycled-water-based sealants.

2.02 COLOURS

.1 The colours to be used are the existing colours for the different elements in each of the work areas.

.2 The colours will be chosen from a complete range of colours and shades offered by the manufacturers.

.3 If the products are from a limited colour range, the colours of the products used will be selected from said limited range.

.4 For the repainting of two-coat (2-coat) paint systems, the first coat must be a slightly paler shade than the top coat to facilitate the visual identification of each coat.

.5 For three-coat (3-coat) paint systems, the second coat must be a slightly paler shade than the top coat to facilitate the visual identification of each coat.

2.03 MIXING AND COLOURING

.1 Products must be coloured before they are delivered to the construction site. This operation cannot take place on-site without the Architects written authorization.

.2 Mix paste, powder or catalytic hardening paints in accordance with the manufacturer's instructions.

.3 If necessary, add some diluent, do not exceed the manufacturer's recommendations. Kerosene,

or any other type of organic solvent, must not be used to dilute water-based paints.

.4 Dilute paint-gun applied paints in accordance with the manufacturer's instructions. If the instructions are not indicated on the container, obtain written instructions from the manufacturer and send a copy to the Architect.

.5 Before and during application, carefully mix paint in its container to remove lumps and to ensure the complete dispersion of pigments, and uniformity of colour and gloss.

2.04 GLOSS AND SHEEN LEVELS

.1 The gloss and sheen level of paint refers to the gloss and sheen level of applied paint, as per MPI's most recent gloss levels:

Gloss level	Gloss at 60 degrees	Sheen at 85 degrees
G1 – Matte finish	0 to 15	Over 10
G2 – Velvet-like finish	0 to 10	10 to 35
G3 – Eggshell-like finish	10 to 25	10 to 35
G4 – Satin-like finish	20 to 35	Under 35
G5 – Semi-gloss	35 to 70	
G6 – Gloss	70 to 85	
G7 – High gloss	Over 85	

.2 The gloss level of painted surfaces must comply with the provisions and indications for top coat specifications.

2.05 PAINT SYSTEMS FOR REPAINTING WORK

.1 For all systems proposed below, ensure that the finished product has the same gloss and sheen level as similar, already-painted adjacent surfaces. If necessary, use an equivalent product with the appropriate gloss and sheen level, and submit the data sheet to the Architect for approval.

.2 INT 3.1 – Concrete vertical surfaces, including horizontal soffits:
- .1 Apply one (1) coat of Sico Expert 870-130 latex primer-sealer (for new surfaces if applicable).
- .2 Apply two (2) coats of Sico Expert 875 series 100% acrylic latex low VOC, melamine finish (20 to 30% gloss).

.3 INT 3.2 – Concrete horizontal surfaces, such as floors and stairs:
- .1 Roughen all existing paint before repainting.
- .2 Deeply clean all surfaces to be painted, rinse thoroughly and leave to completely dry.
- .3 Apply two (2) coats of Sico 261 series 100% acrylic and polyurethane latex (10 to 20% gloss).

.4 INT 4.2 – Concrete masonry units: blocks and bricks:
- .1 On new surfaces, apply one (1) coat of Sico Expert 675-115 concrete block filler.
- .2 Apply two (2) coats of Sico Expert 875 series 100% acrylic latex low VOC, melamine finish (20 to 30% gloss).

.5 INT 5.1 – Structural steel and metal fabrications:
.1 Apply two (2) coats of Sico 261 series 100% acrylic and polyurethane latex.

.6 INT 5.3 – Galvanized metal:
INT 5.3A – Indoor handrails:
.1 Apply one (1) coat of Devoe's Devflex 4020 waterborne primer.
.2 Apply two (2) coats of Devoe's Devflex 4216 high performance waterborne acrylic semi-gloss enamel (50 to 60% gloss).
INT 5.3B –Doors, frames and pipes
.1 Apply one (1) coat of Corrostop Ultra 635-045 latex primer for galvanized metal.
.2 Apply two (2) coats of Sico Expert 875 series 100% acrylic latex low VOC, melamine finish (20 to 30% gloss).

.7 INT 6.3 – Dressed lumber: doors, door frames, moulding
.1 Seal resin knots and veins with one coat of gum lac.
.2 Apply one (1) coat of Sico Expert 890-114 primer.
.3 Apply two (2) coats of Sico Expert 875 series 100% acrylic latex low VOC, melamine finish (20 to 30% gloss).

.8 INT 9.2 – Plaster and gypsum board:
.1 Apply one (1) coat of Sico Expert 870-130 latex primer-sealer.
.2 Walls and dropped ceilings:
Apply two (2) coats of Sico Expert 875 series 100% acrylic latex low VOC, melamine finish (20 to 30% gloss).
.3 Ceilings:
Apply two (2) coats of Sico Expert 873 series 100% acrylic latex low VOC, velvet finish (5 to 12% gloss).

.9 Ext 5.3 – Galvanized metal:
.1 Apply one (1) coat of Corrostop Ultra 635-045 latex primer for galvanized metal.
.2 Apply two (2) coats of Sico 261 series 100% acrylic and polyurethane latex.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

.1 Conformity: comply with the manufacturer's written requirements, recommendations and specifications, including technical bulletins and handling, storage and application instructions, as well as instructions on data sheets.

3.02 INSPECTION

.1 Indoor surfaces to be repainted must be inspected by the painting contractor and by the paint work inspection body, who will notify the Architect in writing of any problems before the paint work commences or following the preparation of surfaces if any issues with the substrate are discovered at this stage.

.2 If substrate deterioration is between DSD-1 and DSD-3 before the preparation of surfaces to be repainted, or DSD-4 after preparatory work, the surfaces with issues must be, after reaching a mutual understanding, be repaired or replaced before the repainting work begins.

.3 Where “special” repainting procedures must be used, or where non-MPI certified systems or products must be used, the paint or plaster manufacturer is responsible for the certifications of surfaces and conditions for the application of the specific paints and plaster, as well as the on-site supervision, inspection and approval, if necessary, of applied paints and plaster, at no additional cost to the Owner.

3.03 PREPARATORY WORK

.1 Unless otherwise indicated, prepare indoor surfaces and carry out paint work in accordance with the provisions of the MPI Maintenance Repainting Manual for existing surfaces, and the MPI Architectural Painting Specification Manual for new surfaces.

.2 Apply paint products in accordance with the manufacturer’s written instructions.

.3 Clean and prepare indoor surfaces, including the surfaces to be repainted, in accordance with the provisions of the MPI Maintenance Repainting Manual. Refer to this document for specific requirements that supplement the following:

- .1 Remove dust, dirt, and foreign matter using a vacuum cleaner and by wiping down surfaces with clean, dry cloths.
- .2 Wash surfaces with a biodegradable detergent and clean, hot water, using a stiff bristle brush to dislodge dirt, oil, and other contaminants from surfaces.
- .3 Rinse scrubbed surfaces with clean water until no foreign matters remain.
- .4 Leave surfaces to drain fully and completely dry. Allow a sufficient drying time and check the moisture level of surfaces using an electronic moisture metre before beginning the paint work.
- .5 Used water-based cleaning products rather than organic solvents for surfaces repainted with water-based paints.
- .6 Once dry, many water-based paints cannot be removed using water. You must, however, restrict the use of kerosene and other organic solvents as far as possible when removing these paints.
- .7 Galvanized metal:
  - .1 If there is rust present, remove it using Corrostop Ultra 653-104 rust remover, then touch-up using Sico Expert 922-260 alkyd antirust coating.
  - .2 Treat surfaces with Corrostop Ultra 653-104 metal cleaner to ensure better paint adherence after removing all grease and oil build-up using Polyprep 875-104.
  - .3 Apply one (1) coat of Corrostop Ultra 635-045 latex primer.
  - .4 Note: Do not use muriatic acid (hydrochloric), vinegar (acetic acid), copper sulphate or any other preparation not intended to treat galvanized metal.
- .8 Aluminium and light alloy:
  - .1 Clean the surface using Corrostop Ultra 635-104 metal cleaner.
  - .2 Apply one (1) coat of Sico Expert 922-260 alkyd primer, or Corrostop Ultra 635-045 latex primer, but never use a red lead primer.
  - .3 Note: For galvalume, use Corrostop Ultra 635-045 latex primer.
- .9 Copper:
  - .1 Clean using Corrostop Ultra 625-104 rust remover and metal cleaner.
  - .2 Roughen stainless steel using metal sandpaper.
  - .3 No primer required: Apply finishing paint directly to clean metal.
- .10 Clean existing ferrous metal surfaces in the following manner:
  - .1 The surface must be dry, clean and free from dust, oil, grease, wax, salt and chipped paint.

.2 Remove chipped paint and rust using a scraper, steel brush or sandpaper.
.3 Sand the entire surface to remove any sheen and homogenize the surface.
.4 Prime and finish the surface using the appropriate system depending on the location and the instructions in the plans.

.4 Clean metal substrates to be painted or repainted by removing rust, dirt, oil, grease, and foreign matters in accordance with MPI's requirements. Remove contaminants from surfaces to be repainting as well as from their corners and crevices using clean brushes, a clean, dry jet of compressed air, or by scrubbing and then cleaning with a vacuum cleaner.

.5 Before applying primer or sealer, and before applying each subsequent coat, ensure that cleaned surfaces have not become contaminated with salts, acid, alkalis, corrosive chemical products, grease, oil or solvents. Retouch the primer or sealer as needed, apply the primer or sealer, paint and any other treatment product as quickly as possible following cleaning before surfaces can deteriorate.

.6 Sand and dust surfaces between each coat, as needed, to ensure maximum adherence of the following coat, and to eliminate all defects visible from 1000m.

3.04 EXISITING CONDITIONS

.1 Before beginning the work, examine the on-site conditions and existing indoor substrates to be repainted, and notify the Architect and General Contractor in writing, if necessary, of any damage, defects, or unsatisfactory or unfavourable conditions to the substrates that may harm the execution of the work.

.2 Using a properly calibrated electronic moisture metre, carry out tests to determine the moisture content of substrates, the moisture content of concrete must be evaluated with a simple "hiding power check". Notify the Architect and the General Contractor of the results of these tests. The maximum moisture content must not exceed the specified values.

.3 Do not begin repainting work until the unsatisfactory conditions or defects have been corrected and the painting contractor has declared the condition of the substrates to be acceptable.

.4 The degrees of surface deterioration must be evaluated following the criteria and identification elements defined in the MPI Maintenance Repainting Manual. The degrees of deterioration and their descriptions are as follows:

Degree of deterioration	Description
DSD-O	Sound surface or previous coating where there is no damage to the surface and any visual (aesthetic) defects do not affect the film's protective properties.
DSD-1	Slight degree of surface deterioration. Decolouration, reduced gloss, slight surface contamination, small scratches.
DSD-2	Moderate degree of surface deterioration. Small sections left exposed, flaking, small cracks and soiling.
DSD-3	Severe degree of surface deterioration. Sections left exposed, splits, scratches, abrasion, perforations, cracks.
DSD-4	Unsound surface. Substrate needs to be repaired or replaced.

3.05 PROTECTION

.1 Protect the building's indoor surfaces and nearby equipment and furnishings that should not be painted from splashes, marks and other damage using covers or other non-dirtying hiding components. If the surfaces in question are damaged, clean them and return them to their original state.

.2 Protect items fixed in place, such as fire resistance certification labels on doors and frames.

.3 Protect material and components with factory-applied finishing products.

.4 Ensure the general public and building occupants in or near the building are protected.

.5 Before beginning paint work, remove cover plates from electrical equipment, light fixtures, visible hardware on doors, bathroom accessories and all other attachments, and bracket-installed components. Store these items safely and reinstall them once the paint work is completed.

.6 If necessary, cover or remove furniture and transportable equipment to facilitate paint work. Return these components and equipment to their original location as the work progresses.

.7 As the work progresses, place "FRESH PAINT" signs in occupied areas, to the Owner's satisfaction.

3.06 APPLICATION

.1 Ensure paints are stirred well to obtain a homogenous consistency and that no deposits are left at the bottom of the container. If diluting the paint is recommended, only use the manufacturer recommended diluent. All paints, stains, varnishes and other finishing products must be applied uniformly to obtain the specified texture, finish and colour, without drips, brush marks, missing spots, or any other defects.

.2 Apply paint using the method best suited to the state of the substrate, using either brushes or rollers. Unless otherwise indicated, apply the product in accordance with the manufacturer's instructions. The chosen application method must be approved by the Owner before starting the work.

.3 Paintbrush and roller application
- .1 Apply a uniform coat of paint using an appropriate paintbrush and/or roller.
- .2 Ensure paint gets into cracks, crevices and corners.
- .3 For surfaces and corners which are impossible to paint using a paintbrush, apply paint using a paint gun, pad or sheepskin. When you cannot paint certain surfaces or corners with a roller, use a paintbrush a pad or sheepskin.
- .4 Remove sags and drips using a paintbrush and/or roller, and go over any marks left. Roller-painted surfaces must not show any roller marks or surplus paint, unless these have been approved.
- .5 Remove sags, drips and brush marks from finished surfaces and repaint them.

.4 Apply coats of paint continuously and leave surfaces to dry and harden adequately between each coat, leaving at least the minimum manufacturer-recommended time. The thickness of each coat's dry film must not be below the manufacturer-recommended minimum. Repaint bare surfaces and surfaces with a too-thin film before applying the next coat.

.5 Leave surfaces to dry and harden adequately before cleaning and before applying each subsequent coat, leaving at least the minimum manufacturer-recommended time.

.6 Sand down and remove dust from surfaces between each coat to prevent visible defects.

.7 Finish or repaint surfaces above and below the line of vision in accordance with the provisions for adjacent surfaces, including areas such as the inside of closets and cupboards, and protruding components.

.8 Finish or repaint all surfaces of doors to be repainted, including the top, bottom and side edges.

.9 Finish or repaint the insides of closets and cupboards in accordance with the instructions for visible surfaces.

.10 Unless otherwise indicated, finish and repaint alcoves and storage to match existing surfaces.

3.07 ELECTRICAL AND MECHANICAL EQUIPMENT

.1 Unless otherwise indicated, repainting work also includes visible elements of indoor electrical and mechanical equipment which has already been painted or which is indicated in the documents (boards, electrical conduits, pipes, air ducts, brackets and suspensions).

.2 Unless otherwise indicated in the work schedule or elsewhere, retouch marks and scratches on elements of electrical and mechanical equipment to be repainted, and then apply a coat of paint so that the colour and gloss of these surfaces match the adjacent surfaces.

.3 Do not paint data plates or information cards.

.4 Do not paint electrical conduits, pipework, air ducts, brackets, suspensions or any other visible elements of electrical and mechanical equipment whose original finish is not painted.

.5 Do not paint automatic sprinkler heads.

.6 Do not paint transformers or the equipment inside power distribution substations.

.7 Quality standard: surfaces examined must, in natural sunlight at midday, meet the following requirements:
- .1 Walls: no visible defects from a distance of 1000mm, at a 90-degree angle from the examined surface.
- .2 Soffits: no visible defects from ground level, at a 45-degree angle from the examined surface.
- .3 The colour and gloss of the top coat must be uniform across the entire examined surface.

3.08 CLEAN-UP

.1 Carry out cleaning operations as per section 01 74 11 – Clean-up, and in accordance with the following instructions:
- .1 Remove paint drips, smears, splashes, dribbles and excess paint as work progresses, using materials and methods that will not damage the finished surface.
- .2 Ensure excess materials and debris are quickly removed from the work zone, as well as tools, materials and equipment that are no longer needed.
- .3 Remove combustible waste and empty paint containers from the construction site at the end of each work day, and safely dispose of them, as required by the relevant authorities.
- .4 Clean used material and equipment. Remove cleaning water used for water-based products, solvents used for oil-based products, and all cleaning and protection equipment and materials (cloths, drop cloths, masking tape, etc.), paint products, diluents, and strippers, as per the health and safety requirements of the relevant authorities and as per the instructions in this section.
- .5 Clean paint materials and equipment in sealed containers for the disposal and collection of particulate matter. Once cleaning work is completed, collected residue must be recycled or disposed of using a method approved by the relevant authority.
- .6 Recycle non-used paint and sealant products as per the instructions provided.

3.9 SITE RESTORATION

.1 Clean and restore hardware components removed while painting.

.2 Remove protective elements and warning signs as soon as possible once work is completed.

.3 Remove splashes from repainted surfaces. Remove smears and flecks using a compatible solvent as work progresses.

.4 Protect freshly painted surfaces from drips and dust, and avoid scratching new surfaces.

.5 Restore rooms used for storage, handling paints and for cleaning used tools and equipment to their original state, to the Owner's satisfaction.

1. General

1.1 SLEEVES, DRILLING AND APERTURES

.1 Except otherwise indicated wherever piping run through walls, floors, ceiling, roof, etc. present contractor shall provided for sleeves which he will install prior to concrete pouring. If contractor fail to do so, all drilling shall be done with an approved method. No jack drill allowed.

All drilling under 6''Ø are under the present contractor's responsibility.

.2 All drilling over 6''Ø under general contractor's responsibility.

.3 All stripping in walls, ceiling or floors for piping, wires to be under general contractor's responsibility.

.4 All underpinning around apertures under general contractor's responsibility.

.5 Specialty contractor shall indicate every location of drilling or shipping the general contractor's.

.6 When drilling to be performed in structural elements such as beams, obtain authorization form structural engineer.

.7 Sleeves and drilling shall have a diameter which considers piping dimension plus any insulation and fire proofing (service penetration assemblies). When sleeves to be installed in floors, these shall exceed for ½'' (18mm) sleeves to be scheduled 40 steel with center anchors. Gauge 16 welded sleeves may be used if Ø does not match standard piping Ø.

.8 When sleeves to be installed in drilled holes, fix with expansive concrete compound between work and sleeve. Seal with silicon compound.

.9 Any space between wires conduits and control cables to be filled by present contractor as following :

.1 in foundation floors or floors underground fill with fire proof and water tight compound (non hardening type).

.2 When fire rated work, use CNB approved compound which shall stay put and stop any smoke or flame when exposed to fire. Those compound to be CSA ULC approved and rated with SP number (service penetration assemblies) contractor to present technical bulleting of used compounds.

.3 In other work such as acoustic partitions, fill with fiber glass wool and weather proof and fire proof, non hardening compound.

.4 Make sure compound used to be compatible with PVC and CPVC'S piping.

.10 When visible joints to be covered with chromed clamps.

1.2 PLATES AND CLAMPS

.1 Provide for clamps where piping runs through wall, ceilings or floors.

.2 Provide for chromed clamps where visible.

.3 Clamp to cover all opening.

.4 When sleeve exceed finished floor, clamp to cover exceeding part.

.5 Attach to pipe or finished surface, but not on insulation.

1.3 EQUIPMENT LOCATION

.1 Equipment, outlet and apparatuses location as shown on DWG'S is to be considered approximate. Exact location to be coordinated on site with architect and other contractors.

.2 Install any equipment in order to minimize space occupancy out to maintain secured, useful space for maintenance purposes.

.3 Make sure that maintenance can be performed with the less possible displacement of couplings, junctions, etc.

.4 Only clear dimensions on DWG'S to be prioritaty.

1.4 OUTLET LOCATION

.1 Any mechanical outlet screen, connector, heat coil, etc. may be relocated in a 3 m radius and prior to their installation, without any credit or extra cost.

1.5 SUPPORT AND APPARATUSES FRAMING

.1 Provide for any support or framing required for each section apparatures.

.2 Thore supports to be built using steel channels, welded and assembled as per union trade and codes and regulation.

1.6 DIELECTRIC COUPLING

.1 Provide for dielectric coupling when jointing piping of different metallic composition.

.2 Provide for unions for DN nominal pipe diameter his under 2 and clamps for DN nominal pipe diameter over 2.

.3 Provide for felt or rubber packer to prevent any contract between element of different metallic composition.

2. Products

2.1 NOT USED

3. Execution

3.1 DEMONSTRATION

.1 Departmental representative may use some apparatures parts and system for test purposes contractor to provide manpower materials and equipment related to tests to be performed.

.2 Supply any tools, materials and qualified instructors required to provide users maintenance crew, training during normal working hours. This for controls trouble shooting maintenance. This duty to be performed before final acceptation of works.

.3 Dielectric materials shall be provided with instructions manual, shop drawings and audio visual aids.

.4 Requirements regarding training hours are indicated in each section.

.5 Departmental representative will record on video all training session.

1. General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.2 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.
.2 Rating System Addenda for New Construction and Major Renovations LEED Canada-NC Version 1.0-Addendum 2007.
.3 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

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 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 in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

2. Products

2.1 NOT USED

.1 Not Used.

3. Execution

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufactuer'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.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

3.4 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.5 AIR VENTS

.1 Install automatic air vents at high points in piping systems.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

3.6 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.

3.7 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

.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 otherwise indicated.
- .4 Valves accessible for maintenance without removing adjacent piping.
- .5 Install globe valves in bypass around control valves.
- .6 Use ball or butterfly valves at branch take-offs for isolating purposes except where otherwise specified.
- .7 Install butterfly valves between weld neck flanges to ensure full compression of liner.
- .8 Use chain operators on valves NPS 2 1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.

.15 Check Valves:
- .1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and elsewhere as indicated.
- .2 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.

3.8 SLEEVES

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

.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: Provide space for firestopping. 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.

3.9 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.10 PREPARATION FOR FIRE STOPPING

.1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00 - Fire Stopping

.2 Uninsulated unheated pipes not subject to movement: No special preparation.

.3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging fires topping material or installation.

.4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

3.11

3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.

.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 manufacturer

3.13 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Departmental Representative

.2 Request written approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

3.14 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 and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

1. General

1.1 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
- .1 ANSI/ASME B31.1-2007, Power Piping.
- .2 ANSI/ASME B31.3-2006, Process Piping.
- .3 ANSI/ASME Boiler and Pressure Vessel Code-2007:
  - .1 BPVC 2007 Section I: Power Boilers.
  - .2 BPVC 2007 Section V: Nondestructive Examination.
  - .3 BPVC 2007 Section IX: Welding and Brazing Qualifications.

.2 American National Standards Institute/American Water Works Association (ANSI/AWWA)
- .1 ANSI/AWWA C206-03, Field Welding of Steel Water Pipe.

.3 American Welding Society (AWS)
- .1 AWS C1.1M/C1.1-2000(R2006), Recommended Practices for Resistance Welding.
- .2 AWS Z49.1-2005, Safety in Welding, Cutting and Allied Process.
- .3 AWS W1-2000, Welding Inspection Handbook..

.4 Canadian Standards Association (CSA International)
- .1 CSA W47.2-M1987(R2008), Certification of Companies for Fusion Welding of Aluminum.
- .2 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
- .3 CSA B51-03(R2007), Boiler, Pressure Vessel and Pressure Piping Code.
- .4 CSA-W117.2-2006, Safety in Welding, Cutting and Allied Processes.
- .5 CSA W178.1-2008, Certification of Welding Inspection Organizations.
- .6 CSA W178.2-2008, 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 to manufacturer.
  - .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 Departmental Representative's name, address.

.3 Packaging Waste Management: remove for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

2. Products

2.1 ELECTRODES

.1 Electrodes: in accordance with CSA W48 Series.

3. Execution

3.1 APPLICATION

.1 Departmental Representative's Instructions: comply with Departmental Representative'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 B31.1 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, 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 Review weld quality requirements and defect limits of applicable codes and standards with Engineer before work is started.

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

.3 Do not conceal welds until they have been inspected, tested and approved by inspector.

.4 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 5 % of welds in accordance with "Inspection and Test Plan" by non-destructive visual examination and magnetic particle (hereinafter referred to as "particle") tests

.2 Hydrostatically test welds to ANSI/ASME B31.1.

.3 Visual examinations: include entire circumference of weld externally and wherever possible internally.

.4 Failure of visual examinations:
.1 Upon failure of welds by visual examination, perform additional testing as directed by Engineer of total of up to 10% of welds, selected at random by Engineer

.5 Full radiographic tests for piping systems.
.1 Spot radiography:
.1 Conduct spot radiographic tests of up to 10 % of welds, selected at random by Departmental Representative from welds which would be most difficult to repair in event of failure after system is operational.
.2 Radiographic film:
.1 Identify each radiographic film with date, location, name of welder, and submit to Departmental Representative. Replace film if rejected because of poor quality.
.3 Interpretation of radiographic films:
.1 By qualified radiographer.
.4 Failure of radiographic tests:
.1 Extend tests to welds by welder responsible when those welds fails tests.

3.6 DEFECTS CAUSING REJECTION

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

.2 In addition, chilled water systems
.1 Undercutting greater than 0.8 mm adjacent to cover bead on outside of pipe.
.2 Undercutting greater than 0.8 mm adjacent to root bead on inside of pipe.
.3 Undercutting greater than 0.8 mm at combination of internal surface and external surface.
.4 Incomplete penetration and incomplete fusion greater than total length of 38 mm in 1500 mm length of weld depth of such defects being greater than 0.8 mm.
.5 Repair cracks and defects in excess of 0.8 mm in depth.
.6 Repair defects whose depth cannot be determined accurately on basis of visual examination or radiographic particle tests.

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 and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

1. General

1.1 SECTION INCLUDES

.1 Materials and installation for thermometers and pressure gauges in piping systems.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

.3 Section 23 05 53.01 - Mechanical Identification.

1.3 REFERENCES

.1 American Society of Mechanical Engineers (ASME).
- .1 ASME B40.100-01, Pressure Gauges and Gauge Attachments.
- .2 ASME B40.200-01, Thermometers, Direct Reading and Remote Reading.

.2 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-14.4-M88, Thermometers, Liquid-in-Glass, Self Indicating, Commercial/Industrial Type.
- .2 CAN/CGSB-14.5-M88, Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

1.4 SUBMITTALS

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

.2 Submit shop drawings and product data.

.3 Submit manufacturer's product data for following items:
- .1 Thermometers.
- .2 Pressure gauges.
- .3 Stop cocks.
- .4 Syphons.
- .5 Wells.

1.5 HEALTH AND SAFETY

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

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Collect, separate and place in designated containers for reuse and recycling paper plastic corrugated cardboard packaging SteelMetal Plastic in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

.4 Place materials defined as hazardous or toxic waste in designated containers.

.5 Ensure emptied containers are sealed, labelled and stored safely for disposal away from children.

2. Products

2.1 GENERAL

.1 Design point to be at mid point of scale or range.

.2 Ranges: as indicated.

2.2 DIRECT READING THERMOMETERS

.1 Industrial, variable angle type, liquid filled, 125 mm scale length: to CAN/CGSB 14.4 ASME B40.200.

2.3 REMOTE READING THERMOMETERS

.1 100 mm diameter mercury-free: to CAN/CGSB-14.5 ASME B40.200 accuracy within one scale division, brass movement, stainless steel capillary, stainless steel spiral armour, stainless steel bulb and polished brass or stainless steel case for wall mounting.

2.4 THERMOMETER WELLS

.1 Copper pipe: copper or bronze.

.2 Steel pipe: brass or stainless steel.

2.5 PRESSURE GAUGES

.1 112 mm, dial type: to ASME B40.100Grade 2A, stainless steel phosphor bronze bourdon tube having 0.5% accuracy full scale unless otherwise specified.

.2 Provide:
- .1 Siphon for steam service.
- .2 Snubber for pulsating operation.
- .3 Diaphragm assembly for corrosive service.
- .4 Gasketted pressure relief back with solid front.
- .5 Bronze stop cock.
- .6 Oil filled for high vibration applications.

3. Execution

3.1 GENERAL

.1 Install so they can be easily read from floor or platform. If this cannot be accomplished, install remote reading units.

.2 Install between equipment and first fitting or valve.

3.2 THERMOMETERS

.1 Install in wells on piping. Provide heat conductive material inside well.

.2 Install in locations as indicated and on inlet and outlet of:
- .1 Heat exchangers.
- .2 Water heating and cooling coils.
- .3 Water boilers.
- .4 Chillers.
- .5 Cooling towers.
- .6 DHW tanks

.3 Install wells as indicated only for balancing purposes.

.4 Use extensions where thermometers are installed through insulation.

3.3 PRESSURE GAUGES

.1 Install in following locations:
- .1 Suction and discharge of pumps.
- .2 Upstream and downstream of PRV's.
- .3 Upstream and downstream of control valves.
- .4 Inlet and outlet of coils.
- .5 Inlet and outlet of liquid side of heat exchangers.
- .6 Outlet of boilers.
- .7 In other locations as indicated

.2 Install gauge cocks for balancing purposes, elsewhere as indicated

.3 Use extensions where pressure gauges are installed through insulation.

3.4 NAMEPLATES

.1 Install engraved lamicoid nameplates as specified in Section 23 05 53.01 - Mechanical Identification identifying medium.

1. General

1.1 SUMMARY

.1 Section Includes:
- .1 Bronze - valves.

.2 Related Sections:
- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 47 17 - Sustainable Requirements: Contractor's Verification.
- .5 Section 01 35 29.06 - Health and Safety Requirements.
- .6 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).
- .1 ANSI/ASME B1.20.1-1983(R2001), Pipe Threads, General Purpose (Inch).
- .2 ANSI/ASME B16.18-2001, Cast Copper Alloy Solder Joint Pressure Fittings.

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 276-04, Specification for Stainless Steel Bars and Shapes.
- .2 ASTM B 62-02, Specification for Composition Bronze or Ounce Metal Castings.
- .3 ASTM B 283-99a, Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
- .4 ASTM B 505/B 505M-02, Specification for Copper-Base Alloy Continuous Castings.

.3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
- .1 MSS-SP-25-1998, Standard Marking System for Valves, Fittings, Flanges and Unions.
- .2 MSS-SP-80-2003, Bronze Gate Globe, Angle and Check Valves.
- .3 MSS-SP-110-1996, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets.
- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit data for valves specified in this section.

.3 Closeout Submittals:
- .1 Submit maintenance 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 DISPOSAL

.1 Waste Management and Disposal:

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

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

1.6 MAINTENANCE

.1 Extra Materials:

.2 Furnish following spare parts:
- .1 Valve seats: one for every 10 valves each size, minimum 1.
- .2 Discs: one for every 10 valves, each size. Minimum 1.
- .3 Stem packing: one for every 10 valves, each size. Minimum 1.
- .4 Valve handles: 2 of each size.
- .5 Gaskets for flanges: one for every 10 flanged joints.

2. Products

2.1 MATERIALS

.1 Valves:
- .1 Except for specialty valves, to be single manufacturer.
- .2 All products to have CRN registration numbers.

.2 End Connections:
- .1 Connection into adjacent piping/tubing:
  - .1 Steel pipe systems: Screwed ends to ANSI/ASME B1.20.1.
  - .2 Copper tube systems: Solder ends to ANSI/ASME B16.18.

.3 Lockshield Keys:
- .1 Where lockshield valves are specified, provide 10 keys of each size: malleable iron cadmium plated.

.4 Check Valves:
- .1 Requirements common to check valves, unless specified otherwise:
  - .1 Standard specification: MSS SP-80.
  - .2 Connections: screwed with hexagonal shoulders.
- .2 NPS 2 and under, swing type, bronze disc, Class 125:
  - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
  - .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
- .3 NPS 2 and under, swing type, bronze disc:
  - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
  - .2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
- .4 NPS 2 and under, swing type, composition disc, Class 200:
  - .1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
  - .2 Disc: renewable rotating disc of number 6 composition to suit service conditions, bronze two-piece hinge disc construction.
- .5 NPS 2 and under, horizontal lift type, composition disc, Class 150:
  - .1 Body: with integral seat, union bonnet ring with hex shoulders, cap.
  - .2 Disc: renewable PTFE or no. 6 composition rotating disc in disc holder having guides top and bottom, of bronze to ASTM B 62.
- .6 NPS 2 and under, vertical lift type, bronze disc, Class 125:
  - .1 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.

.5 Ball Valves:
.1 NPS 2 and under:
.1 Body and cap: cast high tensile bronze to ASTM B 62.
.2 Pressure rating: Class125, 860 kPa steam.
.3 Connections: Screwed ends to ANSI B1.20.1 and with hexagonal shoulders.
.4 Stem: tamperproof ball drive.
.5 Stem packing nut: external to body.
.6 Ball and seat: replaceable stainless steel solid ball and teflon seats.
.7 Stem seal: TFE with external packing nut.
.8 Operator: removable lever handle.

3. Execution

3.1 INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Remove internal parts before soldering.

.3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

1. General

1.1 SUMMARY

.1 Section
.1 Valves (gate valves, globe valve and check valves) in cast steel.

.2 Related Section :
.1 Section 01 33 00 - Submittal Procedures.
.2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
.3 Section 01 35 29.06 - Health and Safety Requirements.
.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 Mechanical Engineers (ASME).
.1 ANSI/ASME B16.5-2003, Pipe Flanges and Flanged Fittings.
.2 ANSI/ASME B16.10-1992, Face-to-Face and End-to-End Dimensions Valves.
.3 ANSI/ASME B16.25-1997, Buttwelding Ends.
.4 ANSI/ASME B16.34-1996, Valves - Flanged, Threaded and Welding End.

.2 American Petroleum Institute (API).
.1 API 598-1996, Valve Inspection and Testing.

.3 American Society for Testing and Materials International, (ASTM).
.1 ASTM A 49-01, Specification for Heat-Treated Carbon Steel Joint Bars.
.2 ASTM A 193/A 193M-04, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
.3 ASTM A 194/A 194M-03b, Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
.4 ASTM A 216/A 216M-1993(03), Specification for Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service.
.5 ASTM B 85-03, Specification for Aluminum-Alloy Die Castings.

.4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
.1 MSS SP-25-1998, Standard Marking System for Valves, Fittings, Flanges and Unions.
.2 MSS SP-61-2003, Pressure Testing of Steel Valves.

1.3 SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets
.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures
.2 Submit data for valves specified this section.
.3 Submit product data in accordance with Section 01 33 00 - Submittal Procedures

.3 Closeout Submittals:
.1 Submit maintenance 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 DISPOSAL

.1 Waste Management and Disposal:

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

.3 Collect and separate for disposal paper plastic packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

2. Products

2.1 MATERIAL

.1 Valves:
.1 Except for specialty valves, to be of single manufacturer.
.2 Valves to be individually tested.

.2 Requirements common to valves, unless specified otherwise:
.1 Pressure-temperature ratings: to ANSI B16.34.
.2 Inspections and tests: to API 598.
.3 Pressure Testing: to MSS SP-61.
.4 Flanged valves:
.1 Face-to-face dimensions: to ANSI B16.10.
.2 Flange dimensions: to ANSI B16.5 with 1.6 mm raised face.
.5 Butt-weld valves:
.1 End-to-end dimensions: to ANSI B16.10.
.2 End dimensions: to ANSI B16.25 bored for standard pipe schedule
.6 Handwheel: non-heating type with raised rim of die-cast aluminum alloy to ASTM B 85 or malleable iron to ASTM A 49.
.7 Markings: to MSS SP-25.
.8 Identification:
.1 Plate showing catalogue number, size, material of body disc, stem seat, fluid, pressure-temperature rating.
.2 Body markings: manufacturer, size, primary service rating, material symbol.
.9 CRN registration number required for all products.

2.2 GATE VALVES

.1 NPS 2 1/2 - 12, rising stem, OS&Y, solidor flexible wedge disc, flanged orbutt-weld ends, Class 150or 300:
.1 Body and multiple-bolted integral yoke and bonnet: cast steel to ASTM A 216/A 216M WCB, with full length disc guides designed to ensure correct re-assembly.
.2 Body/bonnet joint: Flat Male-female face with corrugated metallic gasket.
.3 Bonnet studs: to ASTM A 193/A 193M Type B7.
.4 Bonnet nuts: to ASTM A 194/A 194M Type 2H.
.5 Stuffing box: including non-galling two-piece ball jointed packing gland, with swing-type eye bolts and nuts.
.6 Gland packing: containing corrosion inhibitor to prevent stem pitting.
.7 Yoke sleeve: Ni-Resist, minimum melting point above 954 degrees C.

.8 Hydraulic grease fitting: for lubrication of yoke sleeve bearing surfaces.
.9 Disc: with disc stem ring to connect to stem, guided throughout its travel.
.1 NPS 2 1/2 - 6: Solid corrosion and heat resistant 13% chromium steel with minimum hardness of 350 HB.
.2 NPS 8 and larger: Carbon steel faced with corrosion and heat resistant 13 chromium steel with minimum hardness of 350 HB.
.10 Seat ring: seamless carbon steel with hard-faced cobalt-chromium-tungsten alloy seating surface, slipped in, seal welded, ground to match disc.
.11 Stem: heat treated corrosion and heat resistant 13% chromium steel with accurately-cut precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut, T-head disc-stem connection.
.12 Operator: see elsewhere this section.

2.3 GLOBE VALVES

.1 NPS 2 1/2 - 12, rising stem, OS&Y, flangedor butt-weld ends, Class 150 300:
.1 Body and multiple-bolted integral yoke and bonnet: cast steel to ASTM A 216/A 216M WCB.
.2 Body/bonnet joint: Flat orMale-female face with corrugated metallic gasket.
.3 Bonnet studs: to ASTM A 193/A 193M Type B7.
.4 Bonnet nuts: to ASTM A 194/A 194M Type 2H.
.5 Stuffing box: including non-galling two-piece ball-jointed packing gland, with swing-type eye bolts and nuts.
.6 Gland packing: containing corrosion inhibitor to prevent stem pitting.
.7 Yoke bushing: Ni-Resist, minimum melting point above 954 degrees C.
.8 Hydraulic grease fitting: for lubrication of yoke sleeve bearing surfaces.
.9 Disc: Plug type with 15 degrees taper seat and bottom guideor ball type with 35 degrees taper seat.
.10 Seat rings: with 1.6 mm thick cobalt-chromium-tungsten alloy facings with minimum hardness of 375 HB (cold), slipped in, seal welded, ground to match disc.
.11 Stem: heat treated corrosion and heat resistant 13% chromium steel with bonnet bushing, long engagement with yoke bushing for accurate seating, accurately-cut precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut.
.12 Operator: see elsewhere this section.

2.4 VALVE OPERATORS

.1 Handwheel: on all valves except as specified.

.2 Handwheel with chain operators: on valves installed more than 2400 mm above floor in Boiler Rooms and Mechanical Equipment Rooms.

2.5 BYPASSES FOR GATE AND GLOBE VALVES

.1 Locations: on valves as indicated.

.2 Position of bypass valve on main valves:.

.3 Size of bypass valve:
.1 Main valve up to NPS 8: NPS 3/4.
.2 Main valve NPS 10 and over: NPS 1.

.4 Type of bypass valves:
.1 On gate valve: globe, with bronze disc, bronze trim, to Section 23 05 23.01 - Valves - Bronze.
.2 On globe valve: globe, with bronze disc, bronze trim, to Section 23 05 23.01 - Valves - Bronze.

2.6 CHECK VALVES

.1 NPS 2 1/2 and over, flangedor butt-weld ends, Class150 300: swing check.
- .1 Body and multiple-bolted cap: cast steel to ASTM A 216/A 216M WCB.
- .2 Cap studs: to ASTM A 193/A 193M Type B7.
- .3 Cap nuts: to ASTM A 194/A 194M Type 2H.
- .4 Body/cap joint: male-female face with corrugated metallic gasket.
- .5 Disc: heat treated corrosion and heat resistant 13% chromium steel.
- .6 Seat rings: heat treated corrosion and heat resistant 13% chromium steel, slipped in, seal welded, ground to match disc.

2.7 SILENT CHECK VALVES

.1 Construction:
- .1 Body: Cast steel to ASTM with integral seat.
- .2 Pressure rating: Class 125or 250.
- .3 Connections: Flanged orWafer ends.
- .4 Double bronze disc with SS seat and stem. Renewable disc, seat, stem and spring. Spring rating must match system design for silent operation and installation.
- .5 Stainless steel spring, heavy duty.
- .6 Seat: regrindable.

3. Execution

3.1 INSTALLATION

.1 Install in accordance with Departmental Representative's recommendations in upright position with stem above horizontal.

3.2 COMMISSIONING

.1 As part of commissioning activities, develop schedule of valves and record thereon identifier, location, service, purchase order number and date, Departmental Representative, identification data specified above.

1. General

1.1 SUMMARY

.1 Section Includes:
- .1 Plug Valves - Lubricated plug valves, Eccentric plug valves.

.2 Related Sections:
- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 35 29.06 - Health and Safety Requirements.
- .4 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).
- .1 ANSI/ASME B1.20.1-1983(R2001), Pipe Threads, General Purpose (Inch).
- .2 ANSI/ASME B16.1-1998, Cast Iron Pipe Flanges and Flanged Fittings.
- .3 ANSI/ASME B16.11-2001, Forged Fittings, Socket-Welding and Threaded.
- .4 ANSI/ASME B16.25-1997, Buttwelding Ends.
- .5 ANSI/ASME B16.34-1996, Valves - Flanged, Threaded and Welding End.
- .6 ANSI/ASME B16.10-2000, Face to Face and End to End Dimensions of Valves.

.2 American Society for Testing and Materials International (ASTM).
- .1 ASTM A 126-95(2000), Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
- .2 ASTM B 62-02, Specification for Composition Bronze or Ounce Metal Castings.
- .3 ASTM B 209-04, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.3 Manufacturer's Standardization Society of the Valves and Fittings Industry Inc. (MSS).
- .1 MSS SP-78-1998, Cast Iron Plug Valves, Flanged and Threaded Ends.

1.3 SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets
- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures
- .2 Submit product data in accordance with Section 01 33 00 - Submittal Procedures
- .3 Submit data for valves specified this Section.

.3 Closeout Submittals:
- .1 Submit maintenance 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 DISPOSAL

.1 Waste Management and Disposal:

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

.3 Collect and separate for disposal paper plastic corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

2. Products

2.1 MATERIAL

.1 Valves:
- .1 Except for specialty valves, to be of single manufacturer.
- .2 Products to have CRN registration number.

2.2 ECCENTRIC PLUG VALVES - SCREWED ENDS

.1 General:
- .1 Dead-tight shut-off on liquids and gases at pressure differentials up to 1.2 MPa in forward direction, 520 kPa in reverse direction.

.2 Up to NPS 2, screwed ends:
- .1 Body: cast iron to ASTM B 209 Class B
- .2 Plug:
  - .1 NPS 1/2 and 3/4: bronze to ASTM B 62
  - .2 NPS 1 to NPS 2: bronze to ASTM B 62
- .3 Bearings: permanently lubricated, bronze to ASTM B 62 in upper and lower journals.
- .4 Seals: double-seal consisting of:
  - .1 Plastic seat coating between plug and body.
  - .2 Resilient seal moulded into groove in plug face.
  - .3 Seal materials: BUNA Stem seals for gas network with HYCAR plug seals for petroleum.

2.3 LUBRICATED PLUG VALVES

.1 Principle of operation:
- .1 Special sealing compound used to effect tight seal. When line pressure applied to valve in closed position, parallel plug forced against downstream side of valve. The metal-to-metal contact and sealing compound ensures leak-tight seal.

.2 Testing to specifications: MSS SP-78 for non-shock pressure at specified temperature.

.3 End connections:
- .1 NPS ½ to 2: screwed ends.
- .2 NPS 2½ to 12: flanged ends.

.4 Valve:
- .1 Body: cast iron to ASTM A 126 Class B semi-steel.
- .2 Pressure rating: NPS ½ to 12:
  - .1 Screwed end valves: screwed to NPT standards.
  - .2 Flanged end valves: flanged to ANSI B16.1 Class 125, 125 psig @232 degrees C 200 psig from -28 degreesC to 65 degreesC. Flanged valves NPS 2-8 face dimensions in accordance with ANSI B16.10 short pattern, making them interchangeable with Class 125or 250 flanged cast iron gate valves.
  - .3 Hydrostatic tests: body 300 psig. Seat: 100 psig.
- .3 Plug: cylindrical or tapered, with regular venturi orround pattern port - 90 degrees from full open to fully closed, complete with PFTE thrust ring: 100% full port.
- .4 Number of ports: as indicated 2 3 4.
- .5 Ends: with hexagon shoulders, ends screwed to ANSI B1.20.1 Flanged to ANSI B16.1 butt welding to ANSI B16.25 socket-welding to ANSI B16.11.

.6 Lubrication system, nickel-plated.
.7 Lubricant: to suit type, temperature and pressure of contained fluid.
.8 Provide sealing compound injection gun designed for use with pre-packed sealing compound cartridges and valve fitted with button head nipples and combination sealing screws.
.9 Feeding system: lubricant forced into lubrication grooves between seating surfaces of plug and body to form positive seal, leakproof operation, and corrosion preventing film. Lubricant receptacle to hold additional lubricant. Lubricant screw for lubrication. Check valve to prevent reverse flow of lubricant. O-rings between body and plug.

.5 Operator:
.1 Up to NPS 5: manual lever.
.2 NPS 6 - 8: CGA approved gear-operated handwheel.
.3 NPS 6 - 12: gear-operated handwheel with screwed bottom cover.
.4 NPS 14 - 24: gear-operated handwheel with fully enclosed gearing automatic - electrical

.6 3-port and 4 port valves:
.1 To be supplied transflow pattern, to allow reduced flow through ports during rotation of plug from one position to another.
.2 Limit stops: to be provided omitted.

.7 Accessories: lubricant gun.

3. Execution

3.1 INSTALLATION OF LUBRICATED PLUG VALVES

.1 Install with line pressure acting to hold plug against body ports which are to be cut-off from higher pressure.

3.2 COMMISSIONING OF LUBRICATED PLUG VALVES

.1 Determine the type of sealing compound for particular application.

.2 Open and close valve at least 3 times to ensure distribution of sealing compound evenly and to ensure tight shut-off.

.3 When operating valve, ease valve off body to ensure that plug is free to float.

.4 Determine frequency of re-lubrication during commissioning of remainder of system.

1. General

1.1 SUMMARY

.1 Section Includes:
- .1 Concrete housekeeping pads, hangers and supports for mechanical piping, ducting and equipment.

1.2 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
- .1 ANSI/ASME B31.1-04, Power Piping.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A 125-1996(R2001), Specification for Steel Springs, Helical, Heat-Treated.
- .2 ASTM A 307-04, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 ASTM A 563-04a, 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 SP 58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
- .2 ANSI/MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.
- .3 MSS SP 89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

.6 Underwriter's Laboratories of Canada (ULC)

1.3 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 MSS SP 58. ASME B31.1 or
- .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 SP 58.

.2 Performance Requirements:
- .1 Design supports, platforms, catwalks, hangers, to withstand seismic events as specified

1.4 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 Submit shop drawings and product data for following items:
.1 Bases, hangers and supports.
.2 Connections to equipment and structure.
.3 Structural assemblies.

.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 Manufacturer will make available 1 copy of systems supplier's installation instructions.

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

2. Products

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP 58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

.1 Finishes:
.1 Pipe hangers and supports: painted with zinc-rich paint after manufacture.
.2 Use electro-plating galvanizing processor hot dipped galvanizing process when subject to weather.
.3 Ensure steel hangers in contact with copper piping are 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 and carbon steel retaining clip
.1 Rod: 9 mm UL listed 13 mm FM approved.
.2 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 and FM approved to MSS-SP 58 and MSS-SP 69

.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 FM approved to MSS SP 69.
- .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 FM approved.

.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 plateUL listed FM approved to MSS SP 69.

.5 Shop and field-fabricated assemblies:
- .1 Trapeze hanger assemblies:
- .2 Steel brackets:

.6 Hanger rods: threaded rod material to MSS SP 58:
- .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.

.7 Pipe attachments: material to MSS SP 58:
- .1 Attachments for steel piping: carbon steel blackgalvanized.
- .2 Attachments for copper piping: copper plated black steel.
- .3 Use insulation shields for hot pipework.
- .4 Oversize pipe hangers and supports on hot pipework.

.8 Adjustable clevis: material to MSS SP 69 UL listed FM approved, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
- .1 Ensure "U" has hole in bottom for rivetting to insulation shields

.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP 69.

.10 U-bolts: carbon steel to MSS SP 69 with 2 nuts at each end to ASTM A 563.
- .1 Finishes for steel pipework: blackor galvanized.
- .2 Finishes for copper, glass, brass or aluminum pipework: blackor galvanized with formed portion plastic coated

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 69.

2.3 RISER CLAMPS

.1 Steel or cast iron pipe: galvanizedor black carbon steel to MSS SP 58, type 42, UL listed FM approved.

.2 Copper pipe: carbon steel copper plated to MSS SP 58, type 42.

.3 Bolts: to ASTM A 307.

.4 Nuts: to ASTM A 563.

2.4 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:
- .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP 69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 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 SP 69.

2.5 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A 125, 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.

2.6 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 2 springs in series in single casing.

.3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger

.4 Steel alloy springs: to ASTM A 125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 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.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.9 HOUSE-KEEPING PADS

.1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment; chamfer pad edges.

2.10 OTHER EQUIPMENT SUPPORTS

.1 Fabricate equipment supports from structural grade steel.

.2 Submit structural calculations with shop drawings.

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.

3.3 HANGER SPACING

.1 Plumbing piping: to Canadian Plumbing Code Provincial Code 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, but not less than one hanger at joints.

.6 Within 300 mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.1 m	1.8 m
1-1/2	2.7 m	2.4 m
2	3.0 m	2.7 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 SP 69.

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 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.

1. General

1.1 SUMMARY

.1 Section Includes:
.1 Vibration isolation materials and components, seismic control measures and their installation.

.2 Related Sections:
.1 23 05 49.01 – seismic restraint system (SRS)- type P2 buildings.

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 13-2002, Standard for the Installation of Sprinkler Systems.

.3 National Building Code of Canada (NBC) - 1995

1.3 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 two 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 the Province of Quebec, Canada.
.2 Provide separate shop drawings for system shop drawings complete with performance and product data.
.3 Provide detailed drawings of seismic control measures for equipment and piping.

.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.
.1 Departmental Representative will make available 1 copy of systems supplier'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.

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

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 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.

.6 Performance: as indicated.

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 with deflection indicator.

.6 Performance: as indicated.

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 gussetted 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.

2.11 SEISMIC CONTROL MEASURES

.1 General:
.1 Following systems and/or equipment to remain operational during and after earthquakes: none
.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 and or 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.

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 manufacturers 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 Twice during the installation, at 25% and 60% completion stages.
.4 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 including sound curves.

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.

1. General

1.1 SUMMARY

.1 Section Includes:

.1 Seismic restraint systems for statically supported and vibration isolated equipment and systems; including laboratory fume hoods, BSC's, incinerators, kitchen equipment, electrical light fixtures, transformers, MCC's, UPS, diesel generators, standby power, fire protection, communications, equipment and systems, both vibration isolated and statically supported.

.2 Related Sections:

.1 23 05 48 – vibration and seismic controls for HVAC piping and equipment.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.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]

1.3 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.

1.4 SYSTEM 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 Québec.

1.5 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 the province of Québec, Canada.

.3 Submit design data including:

.1 Full details of design criteria.

.2 Working drawings (prepared to same standard of quality and size as documents forming these bid documents, materials lists, schematics, full specifications for components of each SRS to be provided.

.3 Design calculations (including restraint loads resulting from seismic forces in accordance with National Building Code, detailed work sheets, tables).

.4 Separate shop drawings for each SRS and devices for each system, equipment.

.5 Identification of location of devices.

.6 Schedules of types of SRS equipment and devices.

.7 Details of fasteners and attachments to structure, anchorage loadings, attachment methods.

.8 Installation procedures and instructions.

.9 Design calculations including restraint loads to NBC and Supplement.

.10 Detailed work sheets, tables . Simplified, conservative assumptions may acceptable.

.11 Detailed design of SRS including complete working drawings prepared to same standard of quality and size as Contract Documents, materials lists, design calculations, schematics, specifications.

.4 Submit additional copy of shop drawings and product data to Structural Engineer for review of connection points to building structure.

.5 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 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

.6 Closeout Submittals:

.1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - Closeout Submittals.

1.6 QUALITY ASSURANCE

.1 Health and Safety:

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

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

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

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

.2 Waste Management and Disposal:

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

2. Products

2.1 SRS MANUFACTURER

.1 SRS from one manufacturer regularly engaged in SRS production.

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.

.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.

.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.

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] [Engineer] [Consultant] [_____], 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.

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 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.

3.3 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 Twice during the installation, at 25% and 60% completion stages.

.4 Upon completion of installation.

.3 Submit manufacturer's reports to Departmental Representative within 3 days of manufacturer representative's review.

.2 Inspection and Certification:

.1 SRS: inspected and certified by Seismic Engineer upon completion of installation.

.2 Provide written report to Departmental Representative with certificate of compliance.

.3 Commissioning Documentation:

.1 Upon completion and acceptance of certification, hand over to Departmental Representative complete set of construction documents, revised to show "as-built" conditions.

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.

1. General

1.1 REFERENCES

.1 Canadian Gas Association (CGA)
- .1 CSA/CGA B149.1-05, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
- .2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA)
- .1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.
- .2 NFPA 14-2003, Standard for the Installation of Standpipe and Hose Systems.

1.2 SUBMITTALS

.1 Product Data:

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

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:
- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures
- .2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.3 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

.2 Waste Management and Disposal:
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal
- .2 Dispose of unused paint coating material at official hazardous material collections site approved by Departmental Representative
- .3 Do not dispose of unused paint coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

2. Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by

manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:
.1 Equipment: manufacturer's name, model, size, serial number, capacity.
.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:
.1 Hazardous: red letters, white background.
.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:
.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:
.1 Terminal cabinets, control panels: use size # 5
.2 Equipment in Mechanical Rooms: use size # 9

.5 Identification for PWGSC Preventive Maintenance Support System (PMSS):
.1 Use arrangement of Main identifier, Source identifier, Destination identifier.
.2 Equipment in Mechanical Room:
.1 Main identifier: size #9.
.2 Source and Destination identifiers: size #6.
.3 Terminal cabinets, control panels: size #5.
.3 Equipment elsewhere: sizes as appropriate.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Before starting work, obtain written approval of identification system from Departmental Representative.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:
.1 Natural gas: to CSA/CGA B149.1

.2 Propane gas: to CSA/CGA B149.1
.3 Sprinklers: to NFPA 13.
.4 Standpipe and hose systems: to NFPA 14.

2.5 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:
.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
.3 Legend:
.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:
.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:
.1 To full circumference of pipe or insulation.
.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:
.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
.2 Other pipes: pressure sensitive plastic-coated clothor vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:
.1 Where not listed, obtain direction from Departmental Representative
.2 Colours for legends, arrows: to following table:

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

.3 Background colour marking and legends for piping systems:

Contents	Background colour Marking	Legend
Raw water	Green	RAW WATER
River water	Green	RIVER WATER
Sea water	Green	SEA WATER
City water	Green	CITY WATER
Treated water	Green	TREATED WATER

Brine	Green	BRINE
Condenser water supply	Green	COND. WTR. SUPPLY
Condenser water return	Green	COND. WTR. RETURN
Chilled water supply	Green	CH. WTR. SUPPLY
Chilled water return	Green	CH. WTR. RETURN
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
High temp HW Htg. supply	Yellow	HTHW HTG. SUPPLY++
High temp HW Htg. return	Yellow	HTHW HTG. RETURN++
Make-up water	Yellow	MAKE-UP WTR
Boiler feed water	Yellow	BLR. FEED WTR
Steam _____ kPa	Yellow	_____ kPa STEAM
Steam condensate (gravity)	Yellow	ST.COND.RET (GRAVITY)
Steam condensate (pumped)	Yellow	ST.COND.RET (PUMPED)
Safety valve vent	Yellow	STEAM VENT
Intermittent blow-off	Yellow	INT. BLOW-OFF
Continuous blow-off	Yellow	CONT. BLOW-OFF
Chilled drinking water	Green	CH. DRINK WTR
Drinking water return	Green	CH. DRINK WTR. CIRC
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Waste water	Green	WASTE WATER
Contaminated lab waste	Yellow	CONT. LAB WASTE
Acid waste	Yellow	ACID WASTE (add source)
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
No. _____ fuel oil suction	Yellow	# _____ FUEL OIL
No. _____ fuel oil return	Yellow	# _____ FUEL OIL
Engine exhaust	Yellow	ENGINE EXHAUST
Lubricating oil	Yellow	LUB. OIL
Hydraulic oil	Yellow	HYDRAULIC OIL
Gasoline	Yellow	GASOLINE
Natural gas	to Codes	
Propane	to Codes	
Gas regulator vents	to Codes	
Distilled water	Green	DISTILL. WTR
Demineralized water	Green	DEMIN. WATER
Chlorine	Yellow	CHLORINE
Nitrogen	Yellow	NITROGEN
Oxygen	Yellow	OXYGEN
Compressed air (<700kPa)	Green	COMP. AIR _____ kPa
Compressed air (>700kPa)	Yellow	COMP. AIR _____ kPa
Vacuum	Green	VACUUM

Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS
Carbon dioxide	Red	CO2
Instrument air	Green	INSTRUMENT AIR

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.

2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.8 LANGUAGE

.1 Identification in English and French.

.2 Use one nameplate and label for each language

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 TIMING

.1 Provide identification only after painting and interior finishing works have been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC or CSA registration plates as required by respective agency.

.3 Identify systems, equipment to conform to PWGSC PMSS.

3.4 NAMEPLATES

.1 Locations:
.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:
.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:
.1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On 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 manufacturer Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

1. General

1.1 GENERAL

.1 Sections 23 05 01 to 23 05 53.01 and 23 08 01 to 23 65 16 are part of the contract of the contractor.

1.2 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.

1.3 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to manufacturer within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.4 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems to meet specified performance requirements

and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.5 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.6 COORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.7 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to manufacturer adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Departmental Representative in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.8 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.9 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by manufacturer for verification of TAB reports.

1.10 START OF TAB

.1 Notify manufacturer 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weatherstripping, sealing, and caulking.

.5 Pressure, leakage, other tests specified elsewhere Division 23.

.6 Provisions for TAB installed and operational.

.7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
  .1 Proper thermal overload protection in place for electrical equipment.
  .2 Air systems:
    .1 Filters in place, clean.
    .2 Duct systems clean.
    .3 Ducts, air shafts, ceiling plenums are airtight to within specified

tolerances.
.4 Correct fan rotation.
.5 Fire, smoke, volume control dampers installed and open.
.6 Coil fins combed, clean.
.7 Access doors, installed, closed.
.8 Outlets installed, volume control dampers open.

.3 Liquid systems:
.1 Flushed, filled, vented.
.2 Correct pump rotation.
.3 Strainers in place, baskets clean.
.4 Isolating and balancing valves installed, open.
.5 Calibrated balancing valves installed, at factory settings.
.6 Chemical treatment systems complete, operational.

1.11 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:
.1 Other HVAC systems: plus 5 %, minus 5 %.
.2 Hydronic systems: plus or minus 10 %.

1.12 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2 % of actual values.

1.13 INSTRUMENTS

.1 Prior to TAB, submit to manufacturer list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Engineer

1.14 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.15 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Departmental Representative prior to submission of formal TAB report, sample of rough TAB sheets. Include:
.1 Details of instruments used.
.2 Details of TAB procedures employed.
.3 Calculations procedures.
.4 Summaries.

1.16 TAB REPORT

.1 Format in accordance with referenced standard

.2 TAB report to show results in SI units and to include:
.1 Project record drawings.
.2 System schematics.

.3 Submit 6 copies of TAB Report to manufacturer for verification and approval, in English French both official languages in D-ring binders, complete with index tabs.

1.17 VERIFICATION

.1 Reported results subject to verification by Departmental Representative

.2 Provide personnel and instrumentation to verify up to 30 % of reported results.

.3 Number and location of verified results as directed by Departmental Representative.

.4 Pay costs to repeat TAB as required to satisfaction of Departmental Representative

1.18 SETTINGS

.1 After TAB is completed to satisfaction of Departmental Representative replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.19 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by Departmental Representative

1.20 AIR SYSTEMS

.1 Standard: TAB to most stringent of this section or TAB standards of AABC NEBB SMACNA ASHRAE.

.2 Do TAB of systems, equipment, components, controls specified Division 23

.3 Qualifications: personnel performing TAB current member in good standing of AABC or NEBB qualified to standards of AABC or NEBB.

.4 Quality assurance: perform TAB under direction of supervisor qualified by to standards of AABC or NEBB.

.5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.6 Locations of equipment measurements: to include as appropriate:
- .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
- .2 At controllers, controlled device.

.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.21 OTHER TAB REQUIREMENTS

.1 General requirements applicable to work specified this paragraph:
- .1 Qualifications of TAB personnel: as for air systems specified this section.
- .2 Quality assurance: as for air systems specified this section.

.2 Laboratory fume hoods:
- .1 Standard: Treasury Board of Canada Handbook of Occupational Health and safety, 4th edition Canada Labour Code
- .2 TAB procedures: as described in standard.

.3 Building pressure conditions:
- .1 Adjust HVAC systems, equipment, controls to ensure specified pressure

conditions during winter summer design conditions

.4 Zone pressure differences:
- .1 Adjust HVAC systems, equipment, controls to establish specified air pressure differentials, with systems in every possible combinations of normal operating modes.

.5 Smoke management systems:
- .1 Test for proper operation of all smoke and fire dampers, sensors, detectors, installed as component parts of air systems specified Division 23.
- .2 Emergency evacuation: see post-occupancy TAB activities specified below

.6 Measurement of noise and vibration from equipment specified in Division 23.

1.22 POST-OCCUPANCY TAB

.1 Measure DBT, WBT (or %RH), air velocity, air flow patterns, NC levels, in occupied zone of following areas:

.2 Emergency evacuation: participate in full scale emergency evacuation exercises. Repeat smoke management tests at this time

.3 Participate in systems checks twice during Warranty Period - #1 approximately 3 months after acceptance and #2 within 1 month of termination of Warranty Period.

2. Products

2.1 NOT USED

.1 Not used.

3. Execution

3.1 NOT USED

.1 Not used.

1. General

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and methods for pressure testing ducts over 5m in length, forming part of a supply, return or exhaust ductwork system directly or indirectly connected to air handling equipment.

.2 Related Sections:
- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
- .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 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.

1.3 SUBMITTALS

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

.2 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties. Include pressure test information and results as follows:
- .1 Submit proposed report form and test report format to Departmental Representative for approval at least one month before proposed date of first series of tests. Do not start tests until approval received in writing from Departmental Representative.
- .2 Prepare report of results and submit to Departmental Representative within 24 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.
- .3 Include test reports in final TAB report.
- .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 Manufacturer's field reports specified.

1.4 QUALITY ASSURANCE

.1 Pre-Installation Meetings:
- .1 Convene pre-installation meeting one week prior to beginning work of this Section in accordance with Section 01 32 16.07 - Construction Progress

Schedules - Bar (GANTT) Chart.
.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Co-ordination with other building subtrades.
.4 Review manufacturer's installation instructions and warranty requirements.

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 months 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.

2.2 EQUIPMENT LEAKAGE TOLERANCES

.1 Equipment and system components such as VAV boxes, duct heating leakage: 2%.

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 Fittings, branch ducts, tap-ins.

.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 and duct on downstream side of VAV box: leakage 2%.
.3 Large low pressure duct systems up to 500 Pa: leakage 2%.
.4 HP duct systems up to 1000 Pa pressure classification, including upstream side of VAV boxes: leakage 1%.

.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.

.4 Flexible connections to VAV boxes.

3.5 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services.

.1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its 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, or other Work, on which the Work of this Section depends, is complete but before installation begins.
.2 Twice during progress of Work at 25% and 60% complete.
.3 Upon completion of the Work, after cleaning is carried out.
.4 Obtain reports, within 3 days of review, and submit, immediately, to Departmental Representative.

.3 Performance Verification:
.1 Departmental Representative to witness tests and to verify reported results.
.2 To be certified by same TAB agency approved by Departmental Representative to undertake TAB on this project.

3.6 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

1. General

1.1 SUMMARY

.1 Section Includes.
- .1 Materials and installation for steel piping, valves and fittings for hydronic systems in building services piping

.2 Related Sections.
- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 35 29.06 - Health and Safety Requirements.
- .4 Section 01 78 00 - Closeout Submittals.
- .5 Section 23 05 17 - Pipe Welding.
- .6 Section 23 05 23.01 - Valves - Bronze.
- .7 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME).
- .1 ASME B16.1-98, Cast Iron Pipe Flanges and Flanged Fittings.
- .2 ASME B16.3-98, Malleable Iron Threaded Fittings.
- .3 ASME B16.5-03, Pipe Flanges and Flanged Fittings.
- .4 ASME B16.9-01, Factory-Made Wrought Buttwelding Fittings.
- .5 ASME B18.2.1-03, Square and Hex Bolts and Screws (Inch Series).
- .6 ASME B18.2.2-87(R1999), Square and Hex Nuts (Inch Series).

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 47/A 47M-99, Standard Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A 53/A 53M-02, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- .3 ASTM A 536-84(1999)e1, Standard Specification for Ductile Iron Castings.
- .4 ASTM B 61-02, Standard Specification for Steam or Valve Bronze Castings.
- .5 ASTM B 62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .6 ASTM E 202-00, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

.3 American Water Works Association (AWWA).
- .1 AWWA C111-00, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Canadian Standards Association (CSA International).
- .1 CSA B242-M1980(R1998), Groove and Shoulder Type Mechanical Pipe Couplings.
- .2 CAN/CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in cooperation with the Canadian Welding Bureau).

.5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS).
- .1 MSS-SP-67-025, Butterfly Valves.
- .2 MSS-SP-70-98, Cast Iron Gate Valves, Flanged and Threaded Ends.
- .3 MSS-SP-71-97, Cast Iron Swing Check Valves Flanged and Threaded Ends.
- .4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.
- .5 MSS-SP-85-02, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3 SUBMITTALS

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

.2 Closeout Submittals.
.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals and include following:

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 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 Collect and separate for disposal paper plastic packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
.4 Fold up metal and plastic banding, flatten and place in designated area for recycling.

2. Products

2.1 PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade B as follows:
.1 serie 40

2.2 PIPE JOINTS

.1 NPS2 and under: screwed fittings with PTFE tape or lead-free pipe dope

.2 NPS2-1/2 and over: welding fittings and flanges to CAN/CSA W48

.3 Roll grooved: standardor rigid coupling to CSA B242.

.4 Flanges: plain or raised face, slip-on weld neck to AWWA C111

.5 Orifice flanges: slip-on raised face, 2100 kPa.

.6 Flange gaskets: to AWWA C111

.7 Pipe thread: taper.

.8 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2

.9 Roll grooved coupling gaskets: type EPDM

2.3 FITTINGS

.1 Screwed fittings: malleable iron, to ASME B16.3, Class 150

.2 Pipe flanges and flanged fittings:
.1 Cast iron: to ASME B16.1, Class 125
.2 Steel: to ASME B16.5.

.3 Butt-welding fittings: steel, to ASME B16.9.

.4 Unions: malleable iron, to ASTM A 47/A 47M and ASME B16.3

.5 Fittings for roll grooved piping: malleable iron to ASTM A 47/A 47M ductile iron to ASTM A 536.

2.4 VALVES

.1 Connections:
- .1 NPS2 and smaller: screwed ends.
- .2 NPS2.1/2 and larger: Flanged grooved ends.

.2 Gate valves: to MSS-SP-70 to MSS-SP-80 Application: Isolating equipment, control valves, pipelines
- .1 NPS2 and under:
  - .1 Mechanical Rooms Class 125 rising stem, split wedge disc, as specified Section 23 05 23.01 - Valves - Bronze
  - .2 Elsewhere: Class 125, non- rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves - Bronze
- .2 NPS21/2 and over:
  - .1 Mechanical Rooms: rising stem,or split wedge disc, lead free bronze trim, - Valves - Cast Iron: Gate, Globe, Check
    - .1 Operators:
  - .2 Elsewhere: Non- rising stem, solid wedge disc, lead free bronze trim, - Valves - Cast Iron: Gate, Globe, Check

.3 Butterfly valves: to MSS-SP-67 Application: Isolating cells or section of multiple component equipment (eg. multi-section coils, multi-cell cooling towers)
- .1 NPS21/2 and over: Lug type Grooved ends: as specified Section 23 05 17 - Pipe Welding

.4 Globe valves: to MSS-SP- 80 85 Application: Throttling, flow control, emergency bypass
- .1 NPS2 and under:
  - .1 Mechanical Rooms: with PTFE disc, as specified Section 23 05 23.01 - Valves - Bronze
  - .2 Elsewhere: Globe, with composition disc, as specified Section 23 05 23.01 - Valves - Bronze
- .2 NPS21/2 and over:
  - .1 With composition lead free bronze disc, lead free bronze trim, - Valves - Cast Iron: Gate, Globe, Check

.5 Balancing, for TAB:
- .1 Sizes: Calibrated balancing valves, as specified this section.
- .2 NPS2 and under:
  - .1 Mechanical Rooms : Globe, with plug disc as specified Section 23 05 23.01 - Valves - Bronze
  - .2 Elsewhere: Globe, with plug disc as specified Section 23 05 23.01 - Valves - Bronze

.6 Drain valves: Gate, Class 125 non-rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves - Bronze

.7 Bypass valves on gate glove valves NPS8 and larger: NPS3/4 Globe, with PTFE disc as specified Section 23 05 23.01 - Valves - Bronze

.8 Swing check valves: to MSS-SP-71
- .1 NPS2 and under:
  - .1 Class 125 swing, with composition disc, as specified Section 23 05 23.01 - Valves - Bronze
- .2 NPS21/2 and over:

.1 Flanged Grooved ends

.9 Silent check valves:
.1 NPS2 and under:
.1 As specified Section 23 05 23.01 - Valves - Bronze
.2 NPS21/2 and over:
.1 Flanged Grooved ends: Valves - Cast Iron: Gate, Globe, Check

.10 Ball valves:
.1 NPS2 and under: as specified Section 23 05 23.01 - Valves - Bronze

.11 Lubricated Plug Valves
.1 NPS2 and under:
.2 NPS21/2 and over:
.1 Valves - Cast Iron: Gate, Globe, Check

3. Execution

3.1 PIPING INSTALLATION

.1 Install pipework in accordance with Section 23 05 05 - Installation of Pipe Work

3.2 CIRCUIT BALANCING VALVES

.1 Install flow measuring stations and flow balancing valves as indicated.

.2 Remove handwheel after installation and when TAB is complete.

.3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.3 CLEANING, FLUSHING AND START-UP

.1 In accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems

3.4 TESTING

.1

.2 For glycol systems, retest with ethylene propylene glycol to ASTM E 202, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

3.5 BALANCING

.1 Balance water systems to within plus or minus 5 % of design output.

.2 Refer to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

3.6 GLYCOL CHARGING

.1 Provide mixing tank and positive displacement pump for glycol charging.

.2 Retest for concentration to ASTM E 202 after cleaning.

1. General

1.1 REFERENCES

.1 American Society of Mechanical Engineers (ASME)
- .1 ASME-04(2007), Boiler and Pressure Vessel Code.

.2 ASTM International Inc.
- .1 ASTM A 47/A 47M-99(2004), Standard Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A 278/A 278M-01(2006), Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F (350 degrees C).
- .3 ASTM A 516/A 516M-06, Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.
- .4 ASTM A 536-84(2004), Standard Specification for Ductile Iron Castings.
- .5 ASTM B 62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.

.4 Canadian Standards Association (CSA International)
- .1 CSA B51-03(R2003), Boiler, Pressure Vessel, and Pressure Piping Code.
- .2 CSA B51-03(R2005), Boiler, Pressure Vessel, and Pressure Piping Code, Supplement #1.

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 expansion tanks, air vents, separators, valves, and strainers, 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 Quebec, Canada.

1.3 CLOSEOUT SUBMITTALS

.1 Submit maintenance and operation data in accordance with Section 01 78 00 - Closeout Submittals

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 paddling and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

2. Products

2.1 AUTOMATIC AIR VENT

.1 Standard float vent: brass body and NPS 1/8 connection and rated at 690 kPa working

pressure.

.2 Industrial float vent: cast iron body and NPS 1/2 connection and rated at 860 kPa working pressure.

.3 Float: solid material suitable for 115 degrees C working temperature

2.2 FLEXIBLE JOINTS

.1 Flexible joints : double strand stainless steel, as per indications.

.2 Tolerance to equal or less than 400ºC, built for 1035 kPa pressure.

.3 Chemically neutral material for unions, vapour resistant ; shall not absorb humidity.

.4 Threaded unions, clamps shall be CAT. 150, MPA stee,l as per ANSI.

.5 Coupling shall absorb lateral displacement of 150mm, flexible sections shall be at least 6 times nominal diameter.

2.3 RUBBER JOINTS

.1 EPDM Body, Ø as per indications.

.2 Min operating pressure 1276 KPA, max temp 150ºC.

.3 CAT 150 clamp couplings

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 Run drain lines and blow off connections to terminate above nearest drain.

.2 Maintain adequate clearance to permit service and maintenance.

.3 Should deviations beyond allowable clearances arise, request and follow Departmental Representative's directive.

.4 Check shop drawings for conformance of tappings for ancillaries and for equipment operating weights.

3.3 STRAINERS

.1 Install in horizontal or down flow lines.

.2 Ensure clearance for removal of basket.

.3 Install ahead of each pump.

.4 Install ahead of each automatic control valve larger than NPS 1 and radiation except at radiation and as indicated.

3.4 AIR VENTS

.1 Install at high points of systems.

.2 Install gate valve on automatic air vent inlet. Run discharge to nearest drain or service sink.

3.7 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 and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

1. General

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

.2 Related Sections:
- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .3 Section 07 84 00 - Firestopping.
- .4 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
- .5 Section 23 05 94 - Pressure Testing of Ducted Air Systems.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 480/A 480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
- .2 ASTM A 635/A 635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
- .3 ASTM A 653/A 653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Department of Justice Canada (Jus).
- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33 .

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).

.5 National Fire Protection Association (NFPA).
- .1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.
- .2 NFPA 90B-02, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .3 NFPA 96-01, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
- .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, 1997.
- .2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.
- .3 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

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

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal

Procedures.

.2 Product Data: submit WHMIS MSDS for:
- .1 Sealants.
- .2 Tape.
- .3 Proprietary Joints.

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 Take necessary measures to insure construction occupational health and safety.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Store and manage hazardous materials in appropriate manner.

.3 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, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Separate for reuse and recycling and place in designated containers Steel Metal, Plastic waste in accordance with Waste Management Plan.
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

2. Products

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C
250	C
125	C
125	Unsealed

.2 Seal classification:
- .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.

.2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant tape or combination thereof.
.3 Class C: transverse joints and connections made air tight with gaskets, sealant tape or combination thereof . Longitudinal seams unsealed.
.4 Unsealed seams and joints.

2.2 SEALANT

.1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

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

2.6 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows.
.1 Rectangular: standard radius or short radius with single thickness turning vanes Centreline radius: 1.5 times width of duct.
.2 Round: smooth radius five piece. Centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:
.1 To 400 mm: with double thickness turning vanes.
.2 Over 400 mm: with double thickness turning vanes.

.4 Branches:
.1 Rectangular main and branch: with radius on branch 1.5 times width of duct 45 degrees entry on branch.
.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 or short radiused elbows as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area.
.1 Maximum included angles: as for transitions.

2.6 FIRE STOPPING
.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Firestopping.

.2 Fire stopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A 653/A 653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.

.3 Joints: to ASHRAE and SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

2.8 STAINLESS STEEL

.1 To ASTM A 480/A 480M, Type 304.

.2 Finish: No. 4 .

.3 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.

.4 Joints: to ASHRAE and SMACNA.

2.9 ALUMINUM

.1 To ASHRAE and SMACNA. Aluminum type: 3003-H-14.

.2 Thickness, fabrication and reinforcement: to ASHRAE et SMACNA as indicated.

.3 Joints: to ASHRAE and SMACNA.

2.10 BLACK STEEL

.1 To ASTM A 635/A 635M.

.2 Thickness: 1.2 mm or as indicated.

.3 Fabrication: ducts and fittings to ASHRAE and SMACNA.

.4 Reinforcement: as indicated.

.5 Joints: continuous weld.

2.11 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
  .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
    .1 Maximum size duct supported by strap hanger: 500.
  .2 Hanger configuration: to ASHRAE and SMACNA.
  .3 Hangers: galvanized steel angle with black or galvanized steel rods to ASHRAE and SMACNA and following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

.4 Upper hanger attachments:
- .1 For concrete: manufactured concrete inserts.
- .2 For steel joist:manufactured joist clamp or steel plate washer.
- .3 For steel beams: manufactured beam clamps:

3. Execution

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE, SMACNA and as indicated.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .1 Insulate strap hangers 100 mm beyond insulated duct .Ensure diffuser is fully seated.

.3 Support risers in accordance with ASHRAE and SMACNA or as indicated.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with ASHRAE and SMACNA or as follows:

Duct Size	Spacing
(mm)	(mm)
to 1500	3000
1501 and over	2500

3.3 WATERTIGHT DUCT

.1 Provide watertight duct for:
- .1 Dishwasher exhaust.
- .2 Fresh air intake.
- .3 Minimum 3000 mm from duct mounted humidifier in all directions.
- .4 As indicated.

.2 Form bottom of horizontal duct without longitudinal seams.
- .1 Solder joints of bottom and side sheets.
- .2 Seal other joints with duct sealer.

.3 Slope horizontal branch ductwork down towards fume hoods served.

.1 Slope header ducts down toward risers.

.4 Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and 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.

3.5 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 Do leakage tests in sections.

.4 Make trial leakage tests as instructed to demonstrate workmanship.

.5 Do not install additional ductwork until trial test has been passed.

.6 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.

.7 Complete test before performance insulation or concealment Work.

1. General

1.1 SUMMARY

.1 Section Includes:
.1 Materials and installation for duct accessories including flexible connections, access doors, vanes and collars.

.2 Sustainable requirements for construction and verification.

.2 Related Sections:

.1 Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
.2 Section 01 33 00 - Submittal Procedures.
.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 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 95.

1.3 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. Indicate the following:
.1 Flexible connections.
.2 Duct access doors.
.3 Turning vanes.
.4 Instrument test ports.
.2 Submit WHMIS MSDS. Indicate VOC's for adhesive and solvents during application and curing.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
.1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.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 Manufacturer's Field Reports: manufacturer's field reports specified.

.7 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 Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Co-ordination with other building subtrades.
.4 Review manufacturer's installation instructions and warranty requirements.

.2 Health and Safety:

.1 Take necessary measures to insure construction occupational health and safety

1.5 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.
.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
.4 Separate for reuse and recycling and place in designated containers Steel Metal,Plastic waste in accordance with Waste Management Plan (WMP).
.5 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

2. Products

2.1 GENERAL

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

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.

.2 Material:
.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 _____ degrees C to plus 90 _____ degrees C, density of 1.3 _____ kg/m².

2.3 ACCESS DOORS IN DUCTS

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene or foam rubber.

.4 Hardware:
- .1 Up to 300 x 300 mm: two sash locks complete with safety chain.
- .2 301 to 450 mm: four sash locks complete with safety chain .
- .3 451 to 1000 mm: piano hinge and minimum two sash locks.
- .4 Doors over 1000 mm: piano hinge and two handles operable from both sides.
- .5 Hold open devices.
- .6 300 x 300 mm glass viewing panels.

2.4 URNING VANES

.1 Factory or shop fabricated single thickness with or without trailing edge, to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

2.6 SPIN-IN COLLARS

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to co-responding round duct standards.

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.
.3 Minimum distance between metal parts when system in operation: 75 mm.
.4 Install in accordance with recommendations of SMACNA.
.5 When fan is running:
.1 Ducting on sides of flexible connection to be in alignment.
.2 Ensure slack material in flexible connection.

.2 Access Doors and Viewing Panels:
.1 Size:
.1 As indicated.
.2 Locations:
.1 Fire and smoke dampers.
.2 Control dampers.
.3 Devices requiring maintenance.
.4 Required by code.
.5 Reheat coils.
.6 Elsewhere as indicated.

.3 Instrument Test Ports:
.1 General:
.1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
.2 Locate to permit easy manipulation of instruments.
.3 Install insulation port extensions as required.
.4 Locations:
.1 For traverse readings:
.1 Ducted inlets to roof and wall exhausters.
.2 Inlets and outlets of other fan systems.
.3 Main and sub-main ducts.
.4 And as indicated.
.2 For temperature readings:
.1 At outside air intakes.
.2 In mixed air applications in locations as approved by Departmental Representative.
.3 At inlet and outlet of coils.
.4 Downstream of junctions of two converging air streams of different temperatures.
.5 And as indicated.

.4 Turning vanes:
.1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 CLEANING

.1 Perform cleaning operations as specified in section and in accordance with manufacturer's recommendations.

.2 Upon completion and verification of performance of installation, remove excess materials, rubbish, tools and equipment.

1. General

1.1 SUMMARY

.1 Section Includes:
.1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.

.2 Sustainable requirements for construction and verification.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA)
.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-1985.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures
. Include product characteristics, performance criteria, and limitations.
.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures .
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions.
.1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

1.4 QUALITY ASSURANCE

.1 Health and Safety Requirements:
.1 Take necessary measures to insure construction occupational health and safety.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in an appropriate manner.
.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal .

2. Products

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SPLITTER DAMPERS

.1 Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.

.2 Single thickness construction.

.3 Control rod with locking device and position indicator.

.4 Rod configuration to prevent end from entering duct.

.5 Pivot: piano hinge.

.6 Folded leading edge.

2.3 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm as indicated.

.3 Locking quadrant with shaft extension to accommodate insulation thickness .

.4 Inside and outside nylon end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

.3 Maximum blade height: 100 mm as indicated.

.4 Bearings: pin in bronze bushings self-lubricating nylon.

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

.7 Maximum leakage : 3% at operation system pressure.

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.

.2 Install in accordance with recommendations of SMACNA and in accordance with

manufacturer's instructions.

.3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 Dampers: vibration free.

.6 Ensure damper operators are observable and accessible.

.7 Corrections and adjustments conducted by Engineer.

3.3 FIELD QUALITY CONTROL

.1 Tests:

.1 Tests to demonstrate that system is functioning as specified.

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.

1. General

1.1 SUMMARY

.1 Section Includes:
.1 Materials and installation of flexible ductwork, joints and accessories.

.2 Related Sections:
.1 Section 01 33 00 - Submittal Procedures.
.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 Department of Justice Canada (Jus).
.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
.2 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
.1 Material Safety Data Sheets (MSDS).

.4 National Fire Protection Association (NFPA).
.1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.
.2 NFPA 90B-02, Standard for Installation of Warm Air Heating and Air-Conditioning Systems.

.5 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).
.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 95 (Addendum No.1, November 1997).
.2 SMACNA IAQ Guideline for Occupied Buildings under Construction, 1st Edition 1995.

.6 Underwriters' Laboratories Inc. (UL).
.1 UL 181-96, Standard for Factory-Made Air Ducts and Air Connectors.

.7 Underwriters' Laboratories of Canada (ULC).
.1 CAN/ULC-S110-1986(R2001), Fire Tests for Air Ducts.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal .
.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins 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 CEPA, TDGA, Regional and Municipal regulations.
.6 Ensure emptied containers are sealed and stored safely.
.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

2. Products

2.1 GENERAL

.1 Factory fabricated to CAN/ULC-S110.

.2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.

.3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

2.2 METALLIC - UNINSULATED

.1 Type 1: spiral wound flexible aluminum stainless steel, as indicated.

.2 Performance:
.1 Factory tested to 2.5 kPa without leakage.
.2 Maximum relative pressure drop coefficient: 3 .

2.3 METALLIC - INSULATED

.1 Type 2 : spiral wound flexible aluminum with factory applied, 37 mm thick flexible glass fibre thermal insulation with vapour barrier and vinyl or reinforced mylar/neoprene laminate or aluminum jacket, as indicated.

.2 Performance:
.1 Factory tested to 2.5 kPa without leakage.
.2 Maximum relative pressure drop coefficient: 3.

2.4 NON-METALLIC - UNINSULATED

.1 Type 3 : non-collapsible, coated mineral base fabric aluminum foil mylar type, mechanically bonded to, and helically supported by, external steel wire, as indicated.

.2 Performance:

.1 Factory tested to 2.5 kPa without leakage.
.2 Maximum relative pressure drop coefficient: 3 .

2.5 METALLIC ACOUSTIC INSULATED - MEDIUM PRESSURE

.1 Type 5 : Spiral wound, flexible perforated aluminum with factory applied 37 mm thick flexible mineral fibre thermal insulation and sleeved by aluminum, foil/mylar laminate Type M vapour barrier, as indicated.

.2 Performance:
.1 Factory tested to 2.5 kPa without leakage.
.2 Maximum relative pressure drop coefficient: 3.
.3 Acoustical performance: Minimum attenuation (dB/m) to following table:

	Frequency (Hz)				
Duct Diam:	125	250	500	1000	2000
100	0.6	3	12	27	0
150	1.2	3	12	22	27
200	2.0	5	12	19	20
300	2.4	5	12	16	15

2.6 METALLIC - ACOUSTIC INSULATED - HIGH PRESSURE

.1 Type 6 : Spiral wound, flexible perforated aluminum with factory applied 37 mm thick flexible mineral fibre thermal insulation and encased in spiral wound flexible aluminum jacket, as indicated.

.2 Performance:
.1 Factory tested to 2.5 kPa without leakage.
.2 Maximum relative pressure drop coefficient: 3.
.3 Acoustical performance: minimum attenuation (dB/m) to following table:

	Frequency (Hz)				
Duct Diam:	125	250	500	1000	2000
100	0.6	3	12	27	0
150	1.2	3	12	22	27
200	2.0	5	12	19	20
300	2.4	5	12	16	15

2.8 NON-METALLIC - ACOUSTIC INSULATED

.1 Type 7: non-collapsible, coated mineral base perforated fabric type helically supported by and mechanically bonded to steel wire with factory applied flexible mineral fibre acoustic insulation and encased in aluminum foil/mylar laminate Type M vapour barrier, as indicated .

.2 Performance:
.1 Factory tested to 2.5 kPa without leakage.
.2 Maximum relative pressure drop coefficient: 3 _____.
.3 Acoustical performance: Minimum attenuation (dB/m) to following table:

	Frequency (Hz)				
Duct Diam:	125	250	500	1000	2000
100	0.6	3	12	27	0
150	1.2	3	12	22	27
200	2.0	5	12	19	20
300	2.4	5	12	16	15

3. Execution

3.1 DUCT INSTALLATION

.1 Install in accordance with: CAN/ULC-S110 UL-181 NFPA 90A NFPA 90B SMACNA.

1. General

1.1 SECTION INCLUDES

.1 Materials and installation for acoustic duct lining.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM C 423-02a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- .2 ASTM C 916-85(2001)e1, Standard Specification for Adhesives for Duct Thermal Insulation.
- .3 ASTM C 1071-00, Standard specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
- .4 ASTM C 1338-00, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- .5 ASTM G 21-96(2002), Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

.2 Department of Justice Canada (Jus).
- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).

.4 National Fire Protection Association (NFPA).
- .1 NFPA 90A-02, Standard for the Installation of Air Conditioning and Ventilating Systems.
- .2 NFPA 90B-02, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

.5 North American Insulation Manufacturers Association (NAIMA).
- .1 NAIMA AH116-5th Edition, Fibrous Glass Duct Construction Standards.

.6 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA).
- .1 SMACNA, HVAC DCS, HVAC, Duct Construction Standards, Metal and Flexible-95 (Addendum No.1, Nov. 97).
- .2 SMACNA IAQ Guideline for Occupied Buildings 95.

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

.8 Underwriter's Laboratories of Canada (ULC).
- .1 CAN/ULC-S102-03-EN, Methods of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.4 SUBMITTALS

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

.2 Submit WHMIS MSDS - Material Safety Data Sheets.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in an appropriate manner.

.2 Protect on site stored or installed absorptive material from moisture damage.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins 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 CEPA , TDGA , Regional and Municipal regulations.

.6 Ensure emptied containers are sealed and stored safely.

.7 Fold up metal banding, flatten and place in designated area for recycling.

2. Products

2.1 DUCT LINER

.1 General:
- .1 Mineral Fibre duct liner: air surface coated mat facing.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with CAN/ULC-S102 and NFPA 90A NFPA 90B.
- .3 Recycled Content: EcoLogo certified with minimum 35 % by weight recycled content.
- .4 Fungi resistance: to ASTM C 1338 ASTM G 21.

.2 Rigid:
- .1 Use on flat surfaces where indicated .
- .2 25mm thick, to ASTM C 1071 , Type 2, fibrous glass rigid board duct liner.
- .3 Density: 48 kg/m³ minimum.
- .4 Thermal resistance to be minimum 0.76 (m². degrees C)/W for 25 mm thickness 1.15 (m².degrees C)/W for 38 mm thickness 1.53 (m².degrees C)/W for 50 mm thickness when tested in accordance with ASTM C 177, at 24 degrees C mean temperature.
- .5 Maximum velocity on faced air side: 20.3 m/sec.
- .6 Minimum NRC of 0.70 at 25 mm thickness based on Type A mounting to ASTM C 423.

.7 Recycled Content: EcoLogo certified containing minimum 45 % by weight recycled content.

.3 Flexible:
.1 Use on round or oval surfaces surfaces indicated.
.2 25 mm thick, to ASTM C 1071 Type 1, fibrous glass blanket duct liner.
.3 Density: 24 kg/m³ minimum.
.4 Thermal resistance to be minimum 0.37 (m².degrees C)/W for 12 mm thickness 0.74 (m².degrees C)/W for 25 mm thickness 1.11 (m².degrees C)/W for 38 mm thickness 1.41 (m².degrees C)/W to 50 mm thickness when tested in accordance with ASTM C 177, at 24 degrees C mean temperature.
.5 Maximum velocity on coated air side: 25.4 m/sec.
.6 Minimum NRC of 0.65 at 25 mm thickness based on Type A mounting to ASTM C 423.

2.2 ADHESIVE

.1 Adhesive: to NFPA 90A and NFPA 90B ASTM C 916.

.2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29 degreesC to plus 93 degreesC.

.3 Water-based fire retardant type.

2.3 FASTENERS

.1 Weld pins 2.0 mm diameter, length to suit thickness of insulation. Polymer Nylon Metal retaining clips, 32 mm square.

2.4 JOINT TAPE

.1 Poly-Vinyl treated open weave fiberglass membrane 50 mm wide.

2.5 SEALER

.1 Meet requirements of NFPA 90A andNFPA 90B.

.2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68 degrees C to plus 93 degrees C.

3. Execution

3.1 GENERAL

.1 Do work in accordance with SMACNA HVAC DCS NAIMA FGDLS and as indicated except as specified otherwise.

.2 Line inside of ducts where indicated.

.3 Duct dimensions, as indicated, are clear inside duct lining.

3.2 DUCT LINER

.1 Install in accordance with manufacturer's recommendations, and as follows:
.1 Fasten to interior sheet metal surface with 100 coverage of adhesive to ASTM C 916.

.1 Exposed leading edges and transverse joints to be factory coated or coated with adhesive during fabrication.

.2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425 mm on centers impact driven mechanical fasteners to compress duct liner sufficiently to hold it firmly in place.

.1 Spacing of mechanical fasteners in accordance with SMAC HVAC DCS NAIMA AH116.

.2 In systems, where air velocities exceeds 20.3 m/sec, install galvanized sheet metal noising to leading edges of duct liner.

33 JOINTS

.1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:

.1 Bed tape in sealer.

.2 Apply two coats of sealer over tape.

.2 Replace damaged areas of liner at discretion of Departmental Representative Consultant.

.3 Protect leading and trailing edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

1. General

1.1 SUMMARY

.1 Section Includes:
.1 Supply, return and exhaust grilles and registers, diffusers and linear grilles, for commercial and residential use.

1.2 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.3 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 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures .

.2 Indicate following:
.1 Capacity.
.2 Throw and terminal velocity.
.3 Noise criteria.
.4 Pressure drop.
.5 Neck velocity.
.6 _____.

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

.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.
.1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

1.4 QUALITY ASSURANCE

.1 Health and Safety Requirements: 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.

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

1.6 MAIINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
.2 Include:
.1 Keys for volume control adjustment.
.2 Keys for air flow pattern adjustment.

2. Products

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated

.2 Frames:
.1 Full perimeter gaskets.
.2 Plaster frames where set into plaster or gypsum board and as specified.
.3 Concealed fasteners.

.3 Concealed manual volume control damper operators.

.4 Colour: standard as directed by Departmental Representative Engineer Consultant

2.2 MANUFACTURED UNITS

.1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

2.3 SUPPLY GRILLES AND REGISTERS

.1 See plan notes.

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 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.

1. General

1.1 SUMMARY

.1 Section Includes:
.1 Filters and filter gauges for various types of mechanical air handling equipment.

.2 Sustainable requirements for construction and verification.

1.2 REFERENCES

.1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA)
.1 ANSI/NFPA 96-04, Ventilation Control and Fire Protection of Commercial Cooking Operations.

.2 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
.1 ASHRAE 52.1-1992, Gravimetric And Dust Spot for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter (ANSI Approved).

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-115.10-M90, Disposable Air Filters for the Removal of Particulate Matter from Ventilating Systems.
.2 CAN/CGSB-115.11-M85, Filters, Air, High Efficiency, Disposable, Bag Type.
.3 CAN/CGSB-115.12-M85, Filters, Air, Medium Efficiency, Disposable, Bag Type.
.4 CAN/CGSB-115.13-85, Filter Media, Automatic Roll.
.5 CAN/CGSB-115.14-M91, High Efficiency Cartridge Type Supported Air Filters for the Removal of Particulate Matter from Ventilating Systems.
.6 CAN/CGSB-115.15-M91, High Efficiency Rigid Type Air Filters for Removal of Particulate Matter from Ventilating Systems.
.7 CAN/CGSB-115.16-M82, Activated Carbon for Odor Removal from Ventilating Systems.
.8 CAN/CGSB-115.18-M85, Filter, Air, Extended Area Panel Type, Medium Efficiency.
.9 CAN/CGSB-115.20-95, Polarized Media Air Filter.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.5 Underwriters' Laboratories of Canada
.1 ULC -S111-95, Standard Method of Fire Tests for Air Filter Units.
.2 ULC-S649-1993, Exhaust Hoods and Related Controls for Commercial and Institutional Kitchens.

1.3 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 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:
.1 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 Quebec, Canada.

.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.
.1 Departmental Representative Engineer Consultant will make available 1 copy of systems supplier's installation instructions.

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

1.4 QUALITY ASSURANCE

.1 Health and Safety Requirements: 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.

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

1.6 MAINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
.2 Furnish list of individual manufacturer's recommended spare parts for equipment such as frames and filters, addresses of suppliers, list of specialized tools necessary for adjusting, repairing or replacing for inclusion in operating manual.
.3 Spare filters: in addition to filters installed immediately prior to acceptance by Departmental Representative , supply 1 complete set of filters for each filter unit or filter bank in accordance with section 01 78 00 - Closeout Submittals .

2. Products

2.1 GENERAL

.1 Media: suitable for air at 100% RH and air temperatures between minus 40 and 50 degrees C.

.2 Number of units, size and thickness of panels, overall dimensions of filter bank, configuration and capacities: as indicated.

.3 Pressure drop when clean and dirty, sizes and thickness: as indicated on schedule.

2.2 ACCESSORIES

.1 Holding frames: permanent "T" section or channel section construction of galvanized steel or extruded aluminum same material as casing/hood, 1.6 mm thick, except where specified.

.2 Seals: to ensure leakproof operation.

.3 Blank-off plates: as required, to fit all openings and of same material as holding frames.

.4 Access and servicing: through doors/panels on each side and/or from downstream face of filter bank.

2.3 FIBROUS GLASS PANEL FILTERS

.1 Disposable fibrous glass media: to CAN/CGSB-115.10 with adhesive.

.2 Holding frame: 1.2 mm minimum thick galvanized steel with 3 mm diameter hinged wire mesh screen.

.3 Performance: minimum average synthetic dust weight arrestance 70% to ASHRAE 52.1.

.4 Fire rated: to ULC -S111.

.5 Nominal thickness: See plan notes.

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 GENERAL

.1 Install in accordance with manufacturer's recommendations and with adequate space for access, maintenance and replacement.

3.3 REPLACEMENT MEDIA

.1 Replace media with new upon acceptance.

.2 Filter media new and clean, as indicated by pressure gauge, at time of acceptance.

1. General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

.1 Air-Conditioning and Refrigeration Institute (ARI)
- .1 ARI 210/240-[1994], Standard for Unitary Air Conditioning and Air-Source Heat Pump Equipment.
- .2 ARI 325-[98], Standard for Ground Water - Source Heat Pumps.

.2 American National Standards Institute/Air-Conditioning and Refrigeration Institute (ANSI/ARI)
- .1 ANSI/ARI 320-[1993], Standard for Water-Source Heat Pumps.

.3 American National Standards Institute/National Fire Protection Association (ANSI/NFPA)
- .1 ANSI/NFPA 90A-[1999], Installation of Air Conditioning and Ventilating Systems.

.4 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
- .1 ASHRAE Standard 15-[2001], Safety Standard for Refrigeration Systems.

.5 Canadian Standards Association (CSA International)
- .1 CAN/CSA-C273.3-[M91(R2001)], Performance Standard for Split-System Central Air-Conditioners and Heat Pumps.
- .2 CAN/CSA-C446-[M90], Performance of Ground and Water Source Heat Pumps.
- .3 CAN/CSA-C655-[M91], Performance Standard for Internal Water-Loop Heat Pumps.
- .4 CAN/CSA-C656-[M92(R1998)], Performance Standard for Single Package Central Air Conditioners and Heat Pumps.

.6 Environment Canada, (EC)/Environmental Protection Services (EPS)
- .1 EPS 1/RA/2-[1996], Code of Practice for Elimination of Fluorocarbons Emissions from Refrigeration and Air Conditioning Systems.
- .2 Environment Canada-[1994], Ozone-Depleting Substances Alternatives and Suppliers List.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with Sections 01 33 00 - Submittal Procedures.

.2 Indicate:
- .1 Capacities.
- .2 ARI Ratings.
- .3 Sound Power levels.
- .4 Installation instructions.
- .5 Start-up Instructions.
- .6 O&M, Instructions.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste

Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

1.5 WARRANTY

.1 For heat pumps, the 12 months warranty period on all parts and labor, by the general contractor.

.2 5 years warranty on compressor parts.

2. Products

2.1 GENERAL

.1 Heat pumps: EPS 1/RA/2, CSA approved and carry ARI or CSA certification seal.

2.2 REFRIGERANTS

.1 Type of Refrigerant: HFC-410a.

2.3 DRAIN PANS

.1 Design and construct condensate drain pans under indoor coils so that no water can accumulate and install to allow for easy cleaning.

2.6 INCREMENTAL WATER SOURCE HEAT PUMP

.1 General:
- .1 Horizontal and cabinet type, as indicated, consisting of factory-assembled package containing fan, air-to-refrigerant coil, compressor, 4-way reversing valve, water-to-refrigerant heat exchanger, controls for use with HFC-410a.

.2 Performance: [as indicated].
- .1 Certified in accordance with CAN/CSA-C655.
- .2 Ratings in accordance with CAN/CSA-C655.

.3 Basic unit:
- .1 Compressor: welded hermetic type with internal vibration isolation. Controls to prevent compressor short cycling.
- .2 Air-to-refrigerant coil: aluminum plate fins mechanically bonded to copper or aluminum tubing with joints brazed and with controls factory installed.
- .3 Water-to-refrigerant heat exchanger: circular tube-in-tube type with steel outer tube, copper or cupro-nickel integral finned inner tube tested for maximum w.p. of 2 MPa or tube in shell for flooded evaporator.
- .4 Refrigerant piping: factory assembled, tested charged with R410a] sealed, thermal expansion valve, pilot operated refrigerant reversing valve, high pressure and low temperature safety cut-outs.
- .5 Water piping within unit: factory assembled and tested to 1.4 MPa.
- .6 FPT connections: gate valve tested to 1.4 MPa WOG (on supply line) and ball valve tested to 2.8 MPa WOG (on return line), flexible hose with threaded swivel connections on supply and return lines to heat exchanger.
- .7 Piping connections: arranged so that only one supply and return connections to hydronic system is required on site.
- .8 Fan: centrifugal forward curved with double inlet, statically and dynamically balanced direct driven from multi-speed, factory lubricated motor.
- .9 Filters: see plan specifications.
  - .1 Provide spare filter for each unit.
- .10 Unit cabinet: constructed of heavy gauge die-formed galvanized steel with

welded corner bracing, complete with provision for connection to return ductwork, hanger brackets and vibration isolators.

.1 Console cabinet acoustically insulated.

.2 Grilles: rigid bar type with vanes factory set to deflect supply air into room.

.3 Finish: Paint less galvanized.

.11 Provide for field connection of water and electrical services.

.12 Condensate drain: pan and piping designed to ensure complete removal of water.

.1 Drain connections: minimum NPS 3/4.

.13 Controls: unit mounted with OFF-COOL-HEAT and HIGH-LOW fan speed selectors, manually adjustable thermostat with remote bulb in return air.

.14 High and low coolant pressure protection.

.4 Noise and vibration requirements:

4.1. General and standards

.1 Heat pumps must be installed so that it does not generate noise levels which may exceed TPSGC noise specifications for general office space.

.2 Criteria for general office use are between RC30 and RC40. An excess of 2 points (up to RC42) will be tolerated in small offices that have a low absorption coefficient (< 0.4) and HVAC wall unit (cabinet).

.3 Heat pumps will be installed to avoid annoying specific sound such as rumble, hissing, rattles or noise level change due to noticeable variations in intensity.

4.2 Specific recommendations

.1 The wall heat pump (cabinet) will be installed according to manufacturer’s recommendations and meet the standards of Section 4.1.1.

.2 Ensure that the specific elements of the system that are designed to reduce noise propagation in the immediate surrounding are not degraded during installation.

4.3 Thermopompes horizontales

.1 The ceiling heat pump will be installed according to manufacturer’s recommendations and meet the standards of Section 4.1.1.

.2 The docking site for the ceiling heat pump should be chosen with care to ensure that the noise generated by it will not compromise the acoustical comfort in the inhabited space nearby.

.3 Ensure that the sheet metal of the casing of the heat pump does not vibrate and does not generate additional noise.

4. Reduce noise at source and if necessary reduce noise in ducts with appropriate mufflers to insure that the noise heard in the living area involved does not exceed the index RC40.

5. Ceiling diffusers and terminal control unit (air flow controller) could also be responsible for an increase of noise at the terminal end. The ventilation contractor will be responsible to ensure that these components are installed properly.

6. In the event that the specified noise level is exceeded at the heat pump site, a proper enclosure around the unit (5/8'' gypsum board or other acceptable measures) will be required to reduce the noise at the specified level. Proper access for maintenance of the heat pump shall be provided.

7. Heat pumps shall pass a noise measurement test in accordance with a bench test procedure and standards specified by Maurice-Lamontagne institute and meet a noise criteria < 63dBA.

4.4 General recommandations

4.4.1 Ventilation ducts

.1 Square or rectangular ductworks shall be installed in a way to minimise the occurrence of harmful turbulence that are created by sudden change in direction (90° etc), by the flow control equipment, grilles and diffusers.

.2 Avoid locating 90° bend near the outlet in the room or near flow control equipment, grilles and diffusers. Select diffuser with low noise making turbulence.

.3 Ensure that the sheet metal enclosure of the heat pumps and of the ductwork are free of audible vibrations.

.5 Acceptable products / Horizontal heat pumps: Climate master, McQuay or substitutes approved by addendum, in accordance with the instructions to tenderers.

.6 Acceptable products / Cabinet heat pumps: Trane, McQuay or substitutes approved by addendum, in accordance with the instructions to tenderers.

2.7 ADDITIONNAL HEAT PUMPS

.1 Provide (3) three additional cabinet heat pumps (Brand : Trane, model : C-006) over the amount indicated in the draft. These units will be supplied to the owner at the end of the project.

2.8 PRODUITS ACCEPTABLES

.1 Terms of product acceptability

.1 In addition to having to meet all technical standards, the heat pumps must pass a sound test and meet the standards of the article 2.6.4.3.7 of this present section before acceptance of equivalence.

3. Execution

3.1 INSTALLATION

.1 Install where indicated and in accordance with manufacturer's instructions.

.2 Install outdoor units at ground level on armoured concrete bases

.3 Fasten unit with retaining bolts.

.4 Make connection with ductwork through flexible coupler.

.5 level devices while the fans are running. Align the pipes and flexible connections. The gap between the alignment with fans on and fans off should not impose constraints on the flexible connections that can damage these.

.6 Make piping connections.

.7 Nothing to obstruct ready access to components or to prevent removal of components for servicing.

3.2 DRAIN PANS

.1 Install so that no water can accumulate and arrange for easy access for cleaning.

3.3 START-UP AND COMMISSIONING

.1 The heat pumps startup shall be made by the general contractor and he will also be responsible for ensuring that all needed contractors are on site.

.2 The manufacturer shall be present during startup and certify the performance

.3 Manufacturer to provide verbal], and written instructions to operating personnel.

.4 Submit written report to Departmental Representative.

.5 In case of failure of their devices at the startup (or before), the general contractor will see to its repair or replacement within 10 days of the discovery of the failure or the malfunction.

1. GENERAL

1.1 SUMMARY

.1 Section Contents
- .1 General requirements applicable to the building Energy Management Systems (EMS), common to the NMS dealing with EMS.
- .2 Sustainable development requirements dealing with construction and control.

.2 This contractor reports to the general contractor.

.3 Related Sections
- .1 Section 01 33 00 – Submittal Requirements.
- .2 Section 01 35 29.06 – Health and Safety.
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

1.2 RESPONSIBILITIES

.1 Section 25 shall be the responsibility of a sole contractor, designated the Control Contractor.

.2 The Control Contractor shall review all mechanical and electrical plans, especially, but not limited to, with regards to the location of equipment to which they must connect (e.g. starters, motorized damper servomotors, etc.) and the location of this equipment (sensors, valves, etc.).

1.3 CONTRACTOR AND MANUFACTURER QUALIFICATIONS

.1 For this project where a Siemens energy control and management system with no equivalent is already in place in the building, any other contractor wishing to bid for this project, with the exception of the one mentioned herein, shall submit a written request to the Departmental Representative ten (10) business days before bid deposits. The Contractor shall comply with the following requirements:

- .1 If the contractor wishing to bid is not 100% compatible with the system in place, they shall replace all existing master building controllers and terminal controllers. Moreover, any interface not offering a peer-to-peer homogeneity between controllers and Insight-type graphical software already in place shall be rejected.

- .2 Before the bid deposit, the contractor shall show the Departmental Representative, the owner and the existing onsite control contractor that the interface is 100% compatible (peer-to-peer) with the system in place, and that the same programming language is used, without the addition of a second control station.

- .3 The Departmental Representative, in collaboration with the owner, reserves the right to approve or reject the proposed interface. In addition, the use of interface protocols such as "BACnet" or “Echelon” or any other entails further programming from the manufacturer in place, which is unacceptable. The bidder shall assume all costs incurred by the demonstration of the proposed system.

- .4 The contractor shall be the authorized equipment manufacturer or distributor offering the full line of equipment required for the work package, including the communication interfaces.

- .5 In the event that a different technology should be approved as an equivalent to the one in place (100% compatible), a 10% difference shall be required as

savings for the training and inventory upgrading fees incurred as well as issues that could occur, such as overtime and system downtime.

.6 The contractor shall have qualified installation personnel.

.7 The contractor shall have qualified service personnel to respond to calls, 24/7, 365 days a year.

.8 The contractor and the manufacturer shall have more than ten (10) years experience in the production and installation of DDC-type control systems.

.9 The contractor shall hire francophone resources to perform the following tasks:

.1 Design;

.2 Project Management;

.3 Supervision;

.4 Programming;

.5 Implementation.

1.4 SCOPE OF WORK

.1 The control system shall be entirely DCC, unless otherwise indicated in the plans and specifications.

.2 The work shall include, but not limited to, the:

.1 Supply, installation and connection of new master building controllers and new terminal controllers compatible with the existing Siemens (Landis Division) System 600 with no equivalent energy control and management system;

.2 Supply, installation and connection of temperature, moisture and pressure sensors;

.3 Supply, installation and connection of communication wiring between the new master building controllers and the existing energy control and management system;

.4 Supply, installation and connection of communication wiring between the new terminal controllers and the new master building controllers;

.5 Modification and addition of panoramas in the existing graphical software (Insight);

6 Supply, installation and connection of any relay or component required for the good system operation, as indicated on the plans and described in the operation sequences.

.3 Help the balancing contractor with the following items:

.1 Minimum adjustment of fresh air flow in ventilation systems, if applicable;

.2 Minimum and maximum air flow adjustment in rooms (mechanical stop units), if applicable.

.4 The contractor shall take into account that any facility should include NEMA-1 type pannels.

.5 Unless otherwise indicated, starters, Manual/Stop/Auto selectors, fuses, fire alarm systems, indicator lights, transformer relays and overload relays shall be furnished, installed and connected by Division 26.

.6 Panel and control transformer connections shall be within the purview of this section for 120V and under. However, a power supply shall be provided and installed by Division 26 in a 1.5-m radius for all master building controllers and terminal controller transformers.

.7 All the electrical wiring for deadlock control (up to 120V) of the mechanical equipment shall be furnished and installed under this section. Auxiliary contacts shall be furnished by Division 16, but connected under this section.

.8 The following equipment shall be furnished under this section but installed under other sections:
- .1 Control valves;
- .2 Wells;
- .3 Coil TRIAC relays;
- .4 Motorized dampers (unless otherwise indicated);
- .5 Servomotors for terminal units (VAV boxes, fan coil unit, etc.);
- .6 Duct flow and pressure sensors.

1.5 SUBMITAL DRAWINGS

.1 Submit the drawings according to the section 01 33 00.

.2 Include the following items on the submittal drawings:
- .1 Control diagrams and connections;
- .2 Equipment list;
- .3 Control points list;
- .4 Programming;
- .5 Panel layout.

.3 Provide valve and damper tables including dimensions, configuration, flow and operation pressure, and the localization of each item.

.4 Provide technical documentation for each controlled equipment.

1.6 DATASHEET AND SERVICE MAINTENANCE

.1 Provide the necessary information for maintenance and include them in the maintenance manual prescribed in section 01 78 00.

.2 Provide data on the final installation (technical information and up to date submittal drawings).

1.7 WARRANTY

.1 For a period of one (1) year following the provisional acceptance of work:

.1 Ensure the proper functioning and maintenance of the regulation system, including the replacement of faulty equipment .

.2 Ensure the system and all of its components (control units, instrument and others) against failure or deterioration to keep a state of operational operation of first-order responding to all of the contract requirement.

.3 Ensure the regulation system against any defects, omissions, and latent defects either of operational or equipment, including design, programming, or installation flaws.

2. Products

2.1 GENERAL

.1 This specification is based on the specifications of Siemens (Landis Division) products with no equivalent.

.2 New products shall be grafted onto the existing Siemens (Landis Division) energy control and management system while complying with its architecture. New points and programs shall be able to integrate to the existing programming. All new points shall be available for processing by existing alarm management, report generation and trend analysis software.

.3 All the features listed for each of the components are a minimum requirement of the owner. Required quality: Siemens (Landis Division).

.4 The Control Contractor shall furnish all components required to comply with the sequences indicated in the specifications, whether or not these components are shown on the plans of this project.

.5 Unless otherwise indicated, all the components, including the valves, servomotors, sensors, etc., shall come from the same manufacturer, who shall also install, calibrate and service them.

.6 All reading components shall be carefully selected to ensure an optimal operation. They shall be sufficiently sensitive without generating reading or control loop fluctuations.

.7 All reading scales, whether local and/or at the control station, shall be in SI units.

2.2 GENERAL SYSTEM DESCRIPTION

.1 Provide a complete and independent energy control and management system, including all the components required to meet the operating requirements described herein. The system shall have expansion capabilities to meet future requirements.

.2 The control system shall be made up of the following equipment (at least one master building controller):
- .1 Master building controllers (modular or compact PXC, MBC, MEC);
- .2 Terminal controllers (compact PXC, TEC, DPM, LRC, RPC, FHC, CVM, and speed control device);
- .3 PC Control station if the client doesn't already own this license.

.3 Each controller shall be able to exchange data with any other controller on the network, as well as generate reports, initiate commands, and collect data without assistance from another controller, computer or component.

.4 The system architecture shall eliminate the network dependence on a single piece of equipement. Turning off a controller shall not affect the system performance.

.5 The system architecture shall be as shown on the plans. Controllers making up the primary communication network shall be located in mechanical rooms and shall support subnetworks.

.6 Each system shall be controlled from a single controller.

.7 Each controller shall have a minimum of 10% free space for adding modules (modular PXC, MBC and MEC) for each family of points.

.8 Each controller shall be independent and fully programmable. It shall support programs required for the operation of each of the system it manages, in compliance with the sequences indicated.

.9 A laptop shall be connected to each controller via a communication port.

.10 The control system shall integrate the following functions associated with building operation and energy management:
- .1 Distributed digital control (DDC) supporting proportional, integral plus derivative (PID) algorithms or adaptive control;
- .2 Equipment control and monitoring without additional programming (built into the processor);
- .3 Management of alarms associated with readings;
- .4 Hourly control of optimized stops/starts;
- .5 Electricity consumption reading and electric demand control;
- .6 Collection and analysis of historical data;
- .7 Trend analysis;
- .8 Four priority levels to control points (Emergency, PDL, Operator or Normal).

2.3 COMMUNICATION NETWORK

.1 Primary communication network (for building master controller).

.1 The command post and the master controllers will be link together to form a primary link for communication.
- .1 On equal footing between command posts and master building controllers (PXC, MBC or MEC);
- .2 Between the command posts (if applicable);
- .3 Between the different master building controllers.

.2 The primary network should be able to support up to 100 master building controllers, without adding signal isolator on a minimum distance of 1.2 kilometers. In a case of an application where the primary network would be longer than the specified length, signal isolator would be accepted.

.3 Each command post , whether connected permanently to the network or by phone line, will have total access to the system.

.4 The primary network will have at least the following abilities:
- .1 High speed data transmission for report issue and execution order;
- .2 Support any configuration of panel or terminal;
- .3 Buffers preventing the loss of messages or alarms;
- .4 Errors detection to ensure transmission integrity;
- .5 Clocks synchronisation, including the update of all regulators for standard or advance time.

.2 Local communication networks “LAN” (for terminal controllers).

.1 Terminal controllers will be link together to for local communication networks (LAN), supported by master building controllers.

2.4 MASTER BUILDING CONTROLLERS (MODULAR OR COMPACT PXC & MEC);

.1 TX-IO module series;

.2 The TX-IO module series supports input and output points. Four types of point modules shall be acceptable to optimize the design according to needs.

- 8 digital inputs (TXM1.8D)
- 16 digital inputs (TXM1.16D)
- 6 digital outputs with relays and bypass buttons (TXM1.6R-M)
- 8 super universal points with bypass buttons and display module (TXM1.8X-ML)

The TX-IO module series supports 3 FLN networks via the use of the TXB1.P1 module. It also allows the support of 10 TX-I/O modules via the FLN network.

For the 24V supply to the various point modules or FLN support modules, TXS1.12F4 modules are required.

The TX-IO module series can be replaced without interrupting the operation of the modular PXC module and without removing the wiring at the connection terminals.
The TX-IO module series is mounted on a DIN-type track.

2.5 TERMINAL UNITS CONTROLLERS (TEC);

.1 Each room (or terminal unit) must be controlled by its own terminal unit controller (TEC).

.2 TEC are local controllers that will be used primarily for room individual management or peculiar equipment. They must be available (but not limited to) for the following applications:

.1 heat pumps with options to choose from:

.1 One (1) Stage;

.2 Multiple compressor with inversion valve and mixing air control;

.3 Heating and cooling compressor and mixing air control;

.4 Acceptable products : 540-105 (1 stage), and 540-505 (multi-stage)

.3 Each TEC should have all the programs that would allow it to operate with all the chosen options. These programs shall be stored in its non volatile memory.

.4 The operator will be able, from is control station or a laptop, to communicate with each TEC via the room temperature probe. He may have access to the programming, modify the operation parameters, and order instant reports.

.5 Each TEC will be constantly monitored by is master building controler.

2.6 EXISTING GRAPHIC SOFTWARE (INSIGHT APOGEE)

.1 The control station will consist of a personal computer, printer and modem. These components are already in place in this project.

.2 The graphics software will run under Windows 2000 or XP thereby enable multiple application simultaneously and carry objects from one window to another.

.3 The graphic software will offer the possibility to have name points of 30 characters.

.4 The graphic software will offer the possibility to schedule automatic reports or hourly orders up to one (1) year head.

.5 The following tasks will be done using the graphic software:

.1 Monitor and control the building via dynamic schematics.

.2 Perform diagnostic and troubleshooting via dynamic schematics and logs.

.3 Perform scheduling and modifying the operation of equipment.

.4 Analyze energy consumption by monitoring the operation of equipment.

.5 Use alarms to be able to instantly identify a problem.

.6 Gather data and analyze the efficiency of the system using reports and logs.

.7 Define and program reports to be run automatically.

.8 Launch the “Backup/Restore” and “Anti-virus” application from the program manager.

.9 Launch third parties Windows applications while the graphic software will be online and communicating with the control panel network. The alarm icon will always be visible.

.6 Access to the software will be limited and will require a password. Each user will have a password which will be associated with an access level determining the task that may or may not perform. Up to 200 users will be able to have their own password and a activity report for each user can be generated.

.7 The graphic software will have a minimum of four (4) access level ranging from simple surveillance to the definition of access rights, through the command channels and editing control strategies.

.8 Graphics will be designed so that the operator will be able to converge gradually toward the equipment to visualize.

.9 The following graphics will be presented:

.1 General layout of the building.

.2 A plan view of each floor (subdivided into several sectors if the floor is to large for a better understanding.

.3 One graphic by ventilation system.

.4 One graphic by hydronic system.

.5 One graphic by room.

.10 Graphics will be presented using the following standard:

.1 16-bit colors minimum.

.2 Screen resolutions of 800 x 600 pixels.

.3 3D drawings.

.4 All physical points will be identified on the graphic. Digital and analog inputs will be read only while digital and analog outputs will be in priority (they will be controlled from graphic software).

.5 Virtual points will be identified on the graphic.

.6 Equipments with proof of operation (digital input) will be associated with the data bloc of the point so that when the equipment is on, le point will change color (example: blue).

.7 Links will be add to the graphics to be able to communicate between all graphics that share a common link. (example: Mechanical room with a ventilation system).

.8 When an equipment is in alarm, the color of the point will change (example: red) to show visually that there is an abnormal state.

2.7 CONTROL PANELS

.1 Controls shall be mounted in locked metal panels. Every instrument in the panel shall be clearly identified. All internal panel wiring shall be properly run in conduits. Each wire shall be clearly identified and brought back to terminals.

2.8 SENSORS AND CONTROL ELEMENTS

.1 Room temperature probe

.1 Output signal : Thermistor 100KΩ, 1000Ω RTD or 4/20 mA ;

.2 Range: -7ºC to 49 ºC, 13ºC to 35 ºC or 5ºC to 33 ºC;

.3 Precision: ± 0.2 ºC;

.4 Housing mount;

.5 Acceptable products: 536-195,544-760 or 536-752.

.2 Duct temperature probe

.1 Output signal : Thermistor 100KΩ, 1000Ω RTD or 4/20 mA ;

.2 Range: 4ºC to 66 ºC, -40ºC to 116 ºC or -7ºC to 49 ºC;

.3 Precision : ± 0.2 ºC;

.4 Housing mount;

.5 Acceptable product: 535-741, 544-339 or 533-376.

.3 Temperature/humidity dual room probe

.1 Output signal : 4 to 20 mA or 1 to 10V ;

.2 Range: 4°C to 32°C and,0 to 100% RH ;

.3 Precision : ± 2%;

.4 Housing mount;

.5 Acceptable product: QFA3000.DWU.

.4 Triac relay

.1 Range : depending of application;

.2 Mounted on extruded aluminum heat sink ;

.3 Relays for electric heating coil shall be mounted inside the coil control box ;

.4 Relays for electric baseboard shall be mounted in the ceiling space, near the electric baseboard (with lid);

.5 Electric supply from 15 to 250 Amps (1 or 3 phases).

.6 Operating Voltage 24 Vac

.7 Acceptable product : “CCT” series from “Cristal Contrôles”

2.9 IDENTIFICATION

.1 All of the control elements shall be identified in accordance with the identification used on the contractor control specifications. Master building controllers shall be identified using lamacoid labels and terminal controllers with P-Touch type adhesive tape.

3. Execution

3.1 INSTALLATION

.1 Install all elements in accordance with the manufacturer recommendations.

.2 All controls shall be bundled and installed properly. They shall be installed in accessible areas, while protected from potential damage. Bulbs shall be located in wells and capillary tubing shall be well protected and installed with brackets. Take tubing, duct and device insulation into account, using longer fittings or accessories, if required.

.3 Components used for measuring, sensing or transmitting temperatures, humidity, flows, pressures, etc. shall be located so as to optimize their accuracy and reliability.

3.2 SITE INSPECTION

.1 Inspect the site to:

.1 Detect anything that could impede the execution and quality of the work.

.2 Determine the clearances required for conduits and control elements.

3.3 STARTUP AND TESTING

.1 Startup shall be done onsite. A modem-activated startup shall be inacceptable and generate a refusal of work.

.2 Startup and complete system programming shall be performed according to this section and shall ensure the complete energy control and management system efficiency.

.3 Startup shall be executed by a qualified control and instrument technician or building services technician.

3.4 COORDINATION AND OTHER WORK

.1 Coordinate the execution of work with other trades.

.2 The contractor shall install and connect all the equipment according to trade practices, as indicated on approved shop drawings, and per manufacturer recommendations and municipal and provincial codes in effect.

3.5 PERSONNEL TRAINING

.1 The contractor shall provide a 4-hour training program. They shall provide all the documentation required for this training.

4. Tubing and Wiring

4.1 GENERAL

.1 Unless otherwise indicated on specifications, electrical connection work from electrical distribution panels and including conduits, boxes and wiring for the primary 120 V power supply of controls or control panels shall be under the purview of Division 26.

.1 All components shall be CSA-approved or ULC-listed, when applicable.

.2 All facilities, whether temporary or permanent, indicated on plans and in these specifications shall comply with the Canadian Electrical Code and the Bureau des examinateurs électriciens requirements as well as the requirements of Division 26 of these specifications. On the worksite, OCQ standards shall be applied.

4.2 PRODUCTS

.1 Electrical wiring and conduits

.1 Provide and install electrical wiring and conduits required for connecting the various control system components, in accordance with the Quebec Electrical Code and the Bureau des examinateurs électriciens requirements.

.2 In areas where they will be visible only or in service rooms, the use of EMT-type metal conduits at least 13-mm in size is required.

.3 Selection of Control Conductors

.1 For deadlock purposes, conductors used shall be of TEW-105°C type, stranded copper and of a gauge compliant with the Canadian Electrical Code for 24 to 120V conductors, 16 AWG gauge minimum, with a 600V insulation.

.2 DC signal conductors (analog, digital and data transmission)

.1 24-V circuits shall use stranded copper, twisted shielded pair, PVC jacketed conductors of appropriate gauge. The cable and jacket shall be classified 105°C FT4 (At-Hom29) and labeled accordingly. Cable insulation shall be at least 600V, except where superior insulation is required in accordance with the highest voltage encountered. In this case, the cable shall be selected according to the application and be preapproved by the Departmental Representative.

.2 Shielded wires shall be bundled in separate conduits from control wires over 30V. They shall also be bundled on separate connection terminals.

.3 Pulling and/or outlet boxes

.1 All boxes shall comply with dimensions required by the Canadian Electrical Code.

.2 Unless otherwise indicated, they shall be made of galvanized metal.

4.3 EXECUTION

.1 GENERAL

.1 Any control box designed by the contractor with over 100VA or 30V shall be approved by a recognized and independent agency (e.g. CSA) in accordance with the Act respecting electrical installations. The Departmental Representative shall have the right to refuse the final acceptance of work should a control box not include the seal (label) of a recognized agency.

.2 Install systems and their controls by qualified technicians holding a permit issued by the province of Québec.

.3 Identify tubing (orange tape) and/or wiring at each extremity, connection, equipment part, etc. using a marker like the Thomas & Betts model or equivalent.

.4 The tubing and wiring shall follow the building lines and be securely fastened to the equipment and the structure.

.2 Wiring

.1 In this section, the terms conductor or wiring apply to those with an output voltage of 0/30V as well as those of 120V and over.

.2 All conductors shall be continuous from their source to their connection point.

.3 All conductors shall be installed in EMT metal conduits where they are visible, such as in the following locations:

.1 In service rooms.

.2 In rooms where the conductor might be damaged.

.3 When the wiring must be made in conduits, in areas exposed to moisture, conduits and hardware shall comply with the application.

.4 When required to compensate for vibrations or expansion, a flexible conduit not exceeding 2-m in length shall be supported at each end.

.5 Conductor continuity shall be checked using an ohmmeter.

.4 Pulling and/or outlet boxes

.1 In suspended ceilings, boxes shall be installed directly onto the frame.

.2 A pulling box shall be installed every 30 m, maximum.

.3 The contractor shall be responsible for the location, with the approval of the owner.

1. General

1.1 SUMMARY

.1 Section Include:

.1 Detailed description of the system's operation sequence c/a stage periods and reset schedules

.1 command logic of each system;

.2 schematics including synoptic schematic of the systems (as displayed on work stations) chart for each system with scale diagram of starters.

1.2 SEQUENCE

- .1 Heat Pumps

Unoccupied mode

The heat pump is stopped. When the temperature drops below 17 ºC, the heat pump turns on.

Occupied mode

The controller gives permission to operate the heat pump.

Heating

The heat pump modulate when the room temperature drops below the set point to reach the set point of the room.

Cooling

The heat pump modulate when the room temperature rise above the set point to reach the set point of the room.

- .2 Heat pump with humidifier and reheat coil.

General

The controller allows operation of the heat pump when the humidity is below 30% or above 60% even when the mode is "unoccupied".

Unoccupied mode

The heat pump is stopped. When the temperature drops below 17 ºC, the heat pump turns on.

Occupied mode

The controller gives permission to operate the heat pump.

Heating

The heat pump modulate when the room temperature drops below the set point to reach the set point of the room.

Cooling

The heat pump modulate when the room temperature rise above the set point to reach the set point of the room.

Dehumidification

The heat pump starts immediately in cooling mode when the room humidity rises above the set point. The electric coil modulates to keep the set point temperature of air in the supply duct.

Humidification

When the humidity level in the room drops below the set point the valve of the humidifier modulate to keep the humidity set point in the room. The moisture sensor mudulate the steam supply when the level of relative humidity of the air supply exceeds 90%.

1. General

1.1 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 No.
- .3 CAN/CSA-C22.3 No. 1-01(Update March 2005), 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.

1.2 DEFINITIONS

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

1.3 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.

1.4 SUBMITTALS

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

.2 Shop drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, 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 of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 Submit 1 .pdf copie of drawings and product data to authority having jurisdiction.
- .6 If changes are required, notify Departmental Representative of these changes before they are made.

3 Quality Control: in accordance with Section 01 45 00 - Quality Control.
- .1 Provide CSA certified equipment and material.
- .2 Where CSA certified equipment and material is not available, submit such

equipment and material to authority having jurisdictionfor special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.5 Manufacturer's Field Reports: submit to Departmental 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.

1.5 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of Quebec 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.

.3 Site Meetings:

.1 In accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM)Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Charts.

.2 Site Meetings: as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL,in appropriate NMS Section ,schedule site visits, to review Work, at stages listed.

.1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of Work, after cleaning is carried out.

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

1.6 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.

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

1.7 SYSTEM STARTUP

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

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects

of its care and operation.

1.8 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.

2. Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment is are not available, obtain special approval from authority having jurisdiction inspection authorities 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 Departmental Representative.

.2 Porcelain enamel decal signs, 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 According to the standard of the institute.
- .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	5mm 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	25 100 mm	2 lines	6 mm high letters

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate and label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. " as directed by Departmental Representative.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system and voltage.

.9 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered, 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
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency	Red	Blue

Voice 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 "equipment green" finish.
- .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

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.

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 150mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.
- .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: 1400 mm.
.2 Wall receptacles:
  .1 General: 300 mm.
  .2 Above top of continuous baseboard heater: 200 mm.
  .3 Above top of counters or counter splash backs: 175 mm.
  .4 In mechanical rooms: 1400 mm.
.3 Panelboards: as required by Code or as indicated.
.4 Telephone and interphone outlets: 300 mm.
.5 Wall mounted telephone and interphone outlets: 1500mm.
.6 Fire alarm stations: 1500 mm.
.7 Fire alarm bells: 2100 mm.
.8 Television outlets: 300 mm.
.9 Wall mounted speakers: 2100 mm.
.10 Clocks: 2100 mm.
.11 Door bell pushbuttons: 1500 mm.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.7 FIELD QUALITY CONTROL

.1 Load Balance:
  .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
  .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
  .1 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 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 Departmental Representative.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services:
  .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  .2 Provide manufacturer's field services consisting of product use recommendations

and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.8 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1. General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA-C22.2 No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
- .2 CSA C22.2 No.65-93(R1999), Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
- .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

2. Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper copper alloy aluminum aluminum alloy sized to fit copper aluminum conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper copper alloy sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 NEMA to consist of:
- .1 Connector body and stud clamp for strandedor round copper oraluminum conductors
- .2 Clamp for strandedor round copper conductors
- .3 Clamp for stranded aluminum ACSR conductors
- .4 Stud clamp bolts.
- .5 Bolts for copper conductors
- .6 Bolts for aluminum conductors
- .7 Sized for conductors tubes as indicated.

.4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

3. Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors 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 CSA C22.2 No.65.
- .3 Install fixture type connectors and tighten. Replace insulating cap.
- .4 Install bushing stud connectors in accordance with EEMAC 1Y-2 NEMA.

1. General

1.1 PRODUCT DATA

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

1.2 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: pallets crates paddling and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 1000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE RWU90 XLPE,

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical

.2 Conductors:
- .1 Grounding conductor: copper
- .2 Circuit conductors: copper size as indicated.

.3 Insulation:
- .1 Ethylene propylene rubber EP
- .2 Cross-linked polyethylene XLPE
- .3 Rating: , 1000 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: galvanized steel

.6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project

.7 Fastenings:
- .1 One hole malleable iron straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two or more cables at 750 mm centers.
- .3 Threaded rods: 6 mm diameter to support suspended channels.

.8 Connectors:
- .1 Watertight, approved for TECK cable.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper size as indicated.

.2 Type: AC90

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Type: PVC jacket over thermoplastic armour and compliant to applicable Building Code classification for this project wet locations.

.5 Connectors: anti short connectors.

3. Execution

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical

.2 Perform tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 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 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable securely supported by staples straps hangers.

3.5 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

1. General

1.1 RELATED SECTIONS

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

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.2 Fold up metal banding, flatten and place in designated area for recycling.

2. Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, suspended

3. Execution

3.1 INSTALLATION

.1 Secure equipment to hollow orsolid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole malleable iron steel straps to secure surface conduits and cables 50 mm and smaller.

.2 Two-hole steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.7 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.

.8 For surface mounting of two or more conduits use channels at 1m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

1. General

1.1 RELATED SECTIONS

.1 26 05 00 - Common work result for electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.1-06, Canadian Electrical Code, Part 1, 20th Edition.

1.3 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.

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.

2.3 MASONRY BOXES

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

2.4 CONDUIT BOXES

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

2.5 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

2.6 SERVICE FITTINGS

.1 'High tension' receptacle fitting made of 2 piece stainless steel with brushed aluminum housing finish for 1 single,1 duplex and two duplex receptacles. Bottom plate with two knockouts for centered or offset installation. 12 x 102 mm extension piece as indicated.

.2 Pedestal type 'low tension' fitting made of 2 piece stainless steel with brushed aluminum housing finish to accommodate two amphenol jack connectors.

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.

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 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 and 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.

2. Products

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.
- .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

.3 Identify cables for exclusively dc applications.

.4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel hot dipped galvanized steel aluminum 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, with couplings with expanded ends.

.4 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.5 Flexible metal conduit: to CSA C22.2 No. 56, steel aluminum liquid-tight flexible metal.

.6 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3

2.3 CONDUIT FASTENINGS

.1 One hole malleable iron straps to secure surface conduits 50 mm and smaller.
.1 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 at 1m on centre.

.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 100 200 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

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 Conceal conduits except in mechanical and electrical service rooms in unfinished areas.

.3 Use epoxy coated conduit underground in corrosive areas.

.4 Use electrical metallic tubing (EMT) except in cast concrete.

.5 Use flexible metal conduit for connection to motors in dry areas connection to recessed

incandescent fixtures without prewired outlet box connection to surface or recessed fluorescent fixtures work in movable metal partitions.

.6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations

.7 Minimum conduit size for lighting and power circuits: NPS 3/4 19 mm.

.8 Bend conduit cold:
.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.9 Mechanically bend steel conduit over 19 mm diameter.

.10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.11 Install fish cord in empty conduits.

.12 Remove and replace blocked conduit sections.
.1 Do not use liquids to clean out conduits.

.13 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 suspendedor 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

.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.

1. General

1.1 SECTION INCLUDES

.1 Materials for moulded-case circuit breakers, circuit breakers, and ground-fault circuit-interrupters, fused circuit breakers, and accessory high-fault protectors

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.4 SUBMITTALS

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

.2 Include time-current characteristic curves for breakers with ampacity of A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

2. Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters, Fused circuit breakers, and Accessory high-fault protectors: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient

.3 Plug-in moulded case circuit breakers: 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 Circuit breakers to have minimum symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for

short circuit protection.

2.3 MAGNETIC BREAKERS DESIGN B

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 CURRENT LIMITING AND SERIES RATED THERMAL MAGNETIC BREAKERS DESIGN C

.1 Thermal magnetic breakers with current limiters.
- .1 Time current limiting characteristics of fuses limiters coordinated with time current tripping characteristics of circuit breaker.
- .2 Co-ordination to result in interruption by breaker of fault-level currents up to interrupting capacity of breaker.

.2 Series rated breakers to be manufacturer tested and listed. Breakers to be applied following manufacturer's guidelines and accepted best practice.
- .1 Breakers applied following manufacturer's guidelines and accepted best practice.

3. Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated

1. General

1.1 SECTION INCLUDES

.1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

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

.4 Section 26 05 00 – Electricity General Requirements

1.3 EFERENCES

.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.

1.4 SUBMITTALS

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

1.5 HEALTH AND SAFETY

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

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 31 - Construction/Demolition Waste Management and Disposal

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

2. Products

2.1 DISCONNECT SWITCHES

.1 Fusible, non-fusible, horsepower rated disconnect switch in CSA Enclosure to CAN/CSA C22.2 No.4 size as indicated

.2 Provision for padlocking in on-off 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.39relocatable and suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical

.2 Indicate name of load controlled on size 4 nameplate.

3. Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

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DESTRUCTION, DÉSASSEMBLAGE ET MISE HORS SERVICE D'UN SYSTÈME CONTENANT DES HALOCARBURES

No. de révision : 2

No. : FOR-HAL-05

Identification du propriétaire et du système

Nom et adresse du propriétaire : Pêches et Océans Canada – Région du Québec
104 Dalhousie, Québec

N° de l'étiquette : **LAU -** _____ Type d'appareil : _____

Marque : _____ Modèle : _____ N° de série : _____

Type d'halocarbure : _____ Masse d'halocarbure (kg) : _____

Identification de l'opérateur et localisation du système

Division responsable : _____

Personne contact : _____ No téléphone : _____

Site : _____ Édifice / bloc : _____

Étage : _____ Pièce : _____

Identification de l'entrepreneur

Nom de l'entrepreneur : _____

Adresse de l'entrepreneur : _____

Nom du technicien : _____ No téléphone : _____

No de licence / certificat : CCQ : _____ HRAI : _____ ULC _____

Aliénation du système

Méthode d'aliénation du système : ☐ Élimination du système
☐ Substitution de l'halocarbure par une substance non réglementée

Date d'aliénation : _____ Halocarbure entièrement récupéré : ☐ Oui ☐ Non

Type d'halocarbure : _____ Quantité récupérée (kg): _____

Mode d'élimination du système et/ou de l'halocarbure : _____

_____

_____

Gaz de substitution (si applicable) : _____ Poids rechargé (kg) : _____

Autres informations : _____

_____

_____

Nom (lettres majuscules) : _____ Signature : _____

Date : _____

Pêches et Océans Canada | Fisheries and Oceans Canada

ENREGISTREMENT D'UN SYSTÈME CONTENANT DES HALOCARBURES

Date d'émission: avril 2006
Dernière révision : mars 2013

N°. : FOR-HAL-01

No. de révision : 2

N° de l'étiquette : **LAU -** _____
Nom et adresse du propriétaire : Pêches et Océans Canada – Région du Québec
104 Dalhousie, Québec

Identification de l'opérateur et localisation du système

Division responsable : _____

Personne contact : _____ No téléphone : _____

Site : _____ Édifice / bloc : _____

Étage : _____ Pièce : _____

Type d'appareil

Air climatisé : ☐ Thermopompe ☐ Monobloc extérieur ☐ Monobloc intérieur ☐ Bibloc ☐ Autre : _____

☐ A.P.C.R.	☐ Appareil de réfrigération	☐ Assécheur d'air
☐ Bain réfrigérant circulant	☐ Bain thermostatique	☐ Cylindre de réserve
☐ Centrifugeuse	☐ Congélateur	☐ Fontaine d'eau froide
☐ Incubateur	☐ Réfrigérateur	☐ Refroidisseur d'eau potable
☐ Refroidisseur d'eau de mer	☐ Système d'extinction d'incendie	
☐ Thermopompe eau de mer	☐ Autre : _____	

Marque : _____ Modèle : _____

N° de série : _____

Puissance du compresseur (système de réfrigération et de climatisation seulement) (kW) : _____

Note : 1,0 tonne de réfrigération (TR) = 3,52 kW = 12 000 BTU/h = 4,72 hp

Poids du cylindre vide (si applicable) (kg): _____ Date dernier essai hydrostatique (cylindre seulement) : _____

Type d'halocarbure : _____ Quantité (kg) : _____

Informations additionnelles : _____

_____

Installation (compléter cette section seulement dans le cas d'une nouvelle installation)

Nom de l'entrepreneur : _____ Date d'installation : _____
Adresse de l'entrepreneur : _____
Nom du technicien : _____ Numéro de téléphone entrepreneur : _____
No de licence / certificat : CCQ : _____ HRAI : _____ ULC : _____

Essai de détection requis (puissance supérieure à 19 kW ou contenant 10 kg et plus d'halocarbure) : ☐ Oui ☐ Non
Si oui, joindre le rapport d'essai de détection de fuites complété (FOR-HAL-02)

Nom (lettres majuscules) : _____ Signature : _____

Date : _____