



SPECIFICATIONS

FISHERIES AND OCEANS CANADA DIVERSE BUILDING IMPROVEMENTS

TECHNICAL SPECIFICATIONS
ARCHITECTURE / CIVIL / STRUCTURE / MÉCANICAL / ELECTRICAL

ISSUED FOR TENDER
May 25th 2018

MPO No. R.3380-9L275
PRAA No. 170362
STANTEC No.



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DIVERSE BUILDING IMPROVEMENTS

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Alain Compéra, architect
Project Manager, Architecture

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FISHERIES AND OCEANS CANADA

Sorel Base - Diverse Building Improvements

Project: R.3380-9L275

TECHNICAL SPECIFICATIONS

Structural/Mechanical/Electrical

SIGN-OFF SHEET

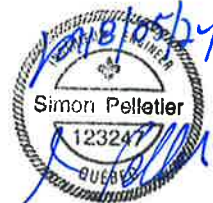
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RECORD OF REVISIONS AND ISSUES

Revision No.	Date	Description of the modification and/or of the issue
00	2018-05-25	Issued for Tender "This document shall not be use for Construction"
0A	2018-03-16	Issued for Progress 99% "This document shall not be use for Tender nor Construction"

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ARCHITECTURE – 12 DESSINS

N° plan	Titre
A01	PAGE TITRE ET LISTE DES DESSINS <i>TITLE PAGE AND DRAWINGS LIST</i>
A02	LÉGENDES, NOTES ET COMPOSITIONS TYPES <i>LEGENDS, NOTES AND TYPICAL PARTITIONS</i>
A03	PLAN DU REZ-DE-CHAUSSÉE <i>GROUND FLOOR PLAN</i>
A04	PLAN DU 1er ÉTAGE <i>FIRST FLOOR PLAN</i>
A05	PLAN DU TOIT <i>ROOF PLAN</i>
A06	ÉLÉVATION NORD ET EST (ATELIERS) - DÉMOLITION ET CONSTRUCTION <i>NORTH AND EAST ELEVATION (WORKSHOPS)- DEMOLITION AND CONSTRUCTION</i>
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A08	ÉLÉVATIONS GUÉRITE DE SÉCURITÉ - DÉMOLITION ET CONSTRUCTION <i>ELEVATIONS SECURITY BOOTH - DEMOLITION AND CONSTRUCTION</i>
A09	DÉTAILS TOITURES MÉTALLIQUES - DÉMOLITION ET CONSTRUCTION <i>ELEVATIONS (SECURITY BOOTH) - DEMOLITION AND CONSTRUCTION</i>
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A12	BORDEREAU DES PORTES ET CADRES <i>DOORS AND FRAMES SCHEDULE</i>
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STRUCTURE (1 DESSIN / DRAWING)

N° plan	Titre	Rév.
S01	Details - Ground Floor - Demolition / New Layout	00

MECHANICAL (5 DESSINS / DRAWINGS)

N° plan	Titre	Rév.
M01	Legend and Drawing List	00
M02	Plumbing / Fire Protection - Ground Floor - Demolition	00
M03	Plumbing / Fire Protection - Ground Floor - New Layout	00
M04	Plumbing / Ventilation - Ground Floor - Demolition / New Layout	00
M05	Ventilation – Roof - Demolition / New Layout	00

ELECTRICITY (7 DESSINS / DRAWINGS)

N° plan	Titre	Rév.
E01	Legend and Drawings List	00
E02	Services and Lighting - Site plan and Security Booth - New Layout	00
E03	Lighting - Ground Floor - New Layout	00
E04	Lighting - 1st Floor - New Layout	00
E05	Services - Ground Floor and Roof - New Layout	00
E06	Lighting - Ground Floor - Demoliton	00
E07	Lighting - 1st Floor - Demoliton	00

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PART 1 - GÉNÉRAL

1.0 Work covered by contract documents

- .1 Work covered by this contract include, without limitation, various improvement and renovation works to existing buildings of the Canadian Coast Guard base (CCG) 15 Prince Street, Sorel, Quebec, including :
 - .1 Building envelope optimization.
 - .2 The modernization of plumbing, ventilation ducts and heating.
 - .3 Lighting upgrades (interior and exterior).
 - .4 Maintenance and optimization of the two curtain walls and two skylights.
 - .5 The optimization of windows and masonry on all buildings (Administration, workshops and security booth).
 - .6 Exterior doors and frames replacement.
 - .7 Painting of existing metal elements.
 - .8 Exterior metallic roofs replacement.
 - .9 Replacement of rubber dock bumpers and dock seals.
 - .10 Modifications to security booth concrete slab.
 - .11 Foundation exterior plaster repairs.
 - .12 Roof repair and patching work related to the roof ventilation unit replacement.
 - .13 Any other work indicated on drawings, not listed above.
- .2 All related works and site restoration are included in the actual scope of work.

1.1 Work by others

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from the Departmental Representative.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to the Departmental Representative, in writing, any defects which may interfere with proper execution of Work.

1.2 Future work

- .1 Insure that Work avoids encroachment into areas required for future work.

1.3 Work Sequence

- .1 Construct Work in stages to accommodate the Departmental Representative's use of premises during construction.
- .2 Co-ordinate Progress Schedule and co-ordinate with the Departmental Representative Occupancy during construction works.
- .3 Required stages:
 - .1 Renovation work applies to the roofs of buildings indicated.
 - .2 Activities and operations will be maintained at all times inside the buildings and detention buildings adjacent to worksite.
 - .3 Work will be performed according to the timelines and project milestones set out in Section 01 32 16.07 - Work Sequencing – Bar Chart (GANTT).
- .4 Refer to work sequences described in Section 01 14 00.
- .5 Maintain fire access/control.

1.4 Contractor use of premises

- .1 Limit use of premises for Work , to allow:
 - .1 Operations and use of adjacent buildings by Departmental Representative;
- .2 The area reserved for the Contractor is delimited to the plans.
- .3 Co-ordinate use of premises under direction of Departmental Representative.
- .4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .5 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.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.5 Departmental Representative Occupancy

- .1 Departmental Representative will occupy the buildings adjacent to the work during entire construction period for execution and will pursue his normal activities outside the construction site secured areas.
- .2 Co-operate with Departmental Representative in scheduling operations to minimize conflict and to facilitate the Departmental Representative usage.

1.6 Existing Services

- .1 Contractor will maintain electrical and water services to buildings adjoining work area.
- .2 Notify in writing Departmental Representative, at least (2) two working days in advance, of intended interruption of services and obtain required permission.
- .3 Where Work involves breaking into or connecting to existing services, give Departmental Representative two (2) days' notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian vehicular traffic and operations.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.
- .7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing
- .8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

- .9 Record locations of maintained, re-routed and abandoned service lines.
- .10 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.7 Period of work

- .1 The work must be carried out from the award of the contract.
 - .1 Exterior works should be done as quickly as possible.
 - .2 The Contractor is authorized to carry out interior work between 4:00 pm and 6:00 am the next day. The premises must be clean and accessible the next day.
 - .3 Outdoor work can be done at any time.
 - .4 Contractor shall obtain approval for work areas, five working days before beginning of work by the Departmental Representative.

1.8 Required Documents

- .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 Site instructions.
 - .10 Copy of Approved Work Schedule.
 - .11 Health and Safety Plan and Other Safety Related Documents.
 - .12 Other documents as specified.
 - .13 Official authorizations from regulatory authorities such as CPN, PPP, etc.
 - .14 Environmental protection plan.

1.9 Interpretation of the documents

- .1 Dimensions and measurements :
 - .1 Before starting any work, the Contractor shall verify measurements and on-site dimensions and notify Departmental Representative of any differences there may be detected between the drawings and the existing conditions or any changes that should be made to the drawings for the required adjustment.
 - .2 Do not scale from drawings.
- .2 Complementary documents and implied work :
 - .1 The division of work between the various specialized Mechanical Contractors is only to assist these contractors to know the scope of their work to prepare their bids. Any claim based on the division of work will be rejected by Departmental Representative and shall be addressed to the General Contractor responsible for all the work.
 - .2 The intent of the Contract Documents is to include all labor, all products and all services required for the execution of the work by the General Contractor accordance with those documents.
 - .1 The specifications and drawings are complementary so that what is required in each document is part of the other.
 - .2 Work not described but required for carrying out the work are implicitly included.

- .3 The Contractor shall not benefit at the Departmental Representative's expense or professional of manifest errors or omissions that he recognized in the tender process.

PART 2 - PRODUCTS

2.1 Not used

.1 Not used.

PART 3 - EXÉCUTION

3.1 Not used

.1 Not used.

END OF SECTION

PART 1 - GENERAL

- 1.1 Related sections**
- .1 Section 01 32 16.07 – Work Sequencing – Bar Chart (GANTT)
 - .2 Section 01 52 00 – Construction Facilities.
 - .3 Section 01 56 00 – Temporary Barriers and Enclosures.
- 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 provides temporary means to maintain security.
 - .4 Note that boats may dock at Canadian Coast Guard Booths # 9 and # 8 during working period, outside the identified area of the work.
- 1.3 Construction constraint**
- .1 The execution of the works must be established taking into account the following main constraints:
 - .1 Access availability according to weather conditions.
 - .2 Site availability for site facilities.
 - .3 Neighboring buildings and flexible hours of their operation.
 - .1 Richardson International Grain Terminal. Many truck-trailers drive on Fort Street and are waiting for unloading. The Contractor must ensure that its work does not impact the operations of truckers and the Richardson International plant. Access to the site must be marked and identified accordingly.
 - .2 Dock and ferry ramp of the Société des Transports de Québec.
 - .3 Canadian Coast Guard Base: Entries must be free at all times. Employee parking, located along the fence of Pier 10, must be clear at all times.
 - .6 The Contractor must also take into account that the Société de Transport du Québec plans to carry out major work at the ferry waiting area and at its reception building, which may cause disruption in the area during the works duration.
 - .3 Maintain existing utility services and provide site access to staff and vehicles.
 - .4 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
 - .5 Note that boats may dock at Canadian Coast Guard Booths # 9 and # 8 during working period, outside the identified area of the work.

- 1.4 Special requirements**
- .1 Carry out noise generating Work Monday to Friday from 07:00 to 18:00 hours.
 - .2 The work on the heating valves must be carried out between 18h and 7h the next day.
 - .3 Work on the exit doors (47, 51, 57 and 71) must be carried out between 18h00 and 7h00 the next day.
 - .4 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart.
 - .5 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
 - .6 Keep within limits of work and avenues of ingress and egress.
 - .7 Ingress and egress of Contractor vehicles at site is limited to access and area indicated on drawings.
 - .8 Make a topographic and photographic survey of the infrastructures prior to the works.
 - .9 If the Contractor causes damage to roads and nearby facilities, the Contractor has the full responsibility to repair or replace at its own expense and to the satisfaction of the Departmental Representative.
- 1.5 Cleaning, maintenance and environmental protection**
- .1 The Contractor shall, at all times, keep the site clear of all accumulations of materials, scrap, waste and debris, and shall perform a complete and final clean up, to the satisfaction of the Departmental Representative, during and at the end of his work.
 - .2 The Contractor is responsible for routing its waste, garbage and debris to the appropriate places.
- 1.6 Winter conditions**
- .1 Contractor is responsible for the snow removal of the construction area. The Contractor is also responsible for the snow removal of all accesses outside existing roads.
- 1.7 Weekend works**
- .1 If the Contractor anticipates work on Sundays, statutory holidays or nights, he shall give written notice to the Departmental Representative at least five (5) working days before the work. The Departmental Representative reserves the right to approve the application or impose certain conditions.

1.8 Security

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 Security escort:
 - .1 Personnel employed on this project must be escorted when executing work in non-public areas during normal working hours. Personnel must be escorted in all areas after normal working hours. (except for exterior work).
 - .2 Submit an escort request to Departmental Representative at least 3 days before service is needed. For requests submitted within time noted above, costs of security escort will be paid for by Departmental Representative. Cost incurred by late request will be Contractor's responsibility.
 - .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least twelve (12) hours before scheduled time of escort. Cost incurred by late request will be Contractor's responsibility.
 - .4 Calculation of costs will be based on average hourly rate of security officer for minimum of 8 hours per day for late service request and of 4 hours for late cancellations.

1.9 Environmental constraints

- .1 Environmental constraints are presented in Section 01 35 43 - Environmental procedures.

1.10 Building Smoking Environment

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

PART 2 - PRODUCTS

2.1 Not used

- .1 Not Used.

PART 3 - EXECUTION

3.1 Not used

- .1 Not Used.

END OF SECTION

PART 1 - GÉNÉRAL

- | | |
|-------------------------------------|---|
| 1.1 Section includes | .1 Not used. |
| 1.2 Administrative | <ul style="list-style-type: none">.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative..2 Project meetings will be held by the Departmental Representative..3 The agenda for the statutory meetings will be determined by Departmental Representative..4 The meeting minutes to be recorded by Departmental Representative. Departmental Representative will also reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and, affected parties not in attendance..5 Provide physical space and make arrangements for meetings..6 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents. |
| 1.3 Preconstruction meetings | <ul style="list-style-type: none">.1 Senior representatives of Departmental Representative, Contractor, major Subcontractors, field inspectors and will be in attendance..2 Without limitations, site meetings should address the following items;<ul style="list-style-type: none">.1 Appointment of official representative of participants in the Work..2 Schedule of submission of shop drawings, samples, and colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures..3 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00- Construction Facilities..4 Delivery schedule of specified equipment..5 Site security in accordance with Section 01 35 29.06 – Health and Security..6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements..7 Departmental Representative's provided products..8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures..9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals..10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals..11 Monthly progress claims, administrative procedures, photographs, hold backs..12 Appointment of inspection and testing agencies or firms..13 Insurances, transcript of policies. |

1.4 Progress meetings

- .1 A site meeting will be held every week or upon request of the Departmental Representative.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.
- .3 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Health and Security.
 - .3 Review of Work progress since previous meeting.
 - .4 Field observations, problems, conflicts.
 - .5 Problems which impede construction schedule.
 - .6 Review of off-site fabrication delivery schedules.
 - .7 Corrective measures and procedures to regain projected schedule.
 - .8 Revision to construction schedule.
 - .9 Progress schedule, during succeeding work period.
 - .10 Review submittal schedules: expedite as required.
 - .11 Maintenance of quality standards.
 - .12 Review proposed changes for affect on construction schedule and on completion date.
 - .13 Other business.

PART 2 - PRODUCTS

2.1 Not used

- .1 Not used.

PART 3 - EXÉCUTION

3.1 Not used

- .1 Not used.

END OF SECTION

PART 1 – GÉNÉRAL

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 may 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.
- .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. The term “day” indicated in this section means “**working days**”.
- .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 10 working days, to allow for progress reporting.

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 receiving the Master Plan acceptance.

1.4 Project Milestones

- .1 Project milestones form interim targets for project schedule. Contractor will have to include, without limitations, the following milestones :
 - .1 Transmission of administrative documents (security investigations, SST, etc.) by Contractor.
 - .2 Work-site mobilization and organization;
 - .3 Approval of workshop drawings;
 - .4 Demolition work according to the working schedule and phases;
 - .5 Demolition of existing systems;
 - .6 Electrical work to be carried out in the temporary intervention area (Coast Guard employees Parking) must be completed within a maximum of ten (10) consecutive working days.
 - .7 Exterior finishing, landscaping Works, and electrical and mechanical installations.
 - .8 Building envelope.
 - .9 Equipment Commissioning.
- .2 Project milestones should reflect the sequence of works to be completed on each floor according to each phase described in the documents.

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 Review 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 Award ;
 - .2 Permits ;
 - .3 Health and Safety Program ;
 - .4 Mobilization and organization of work-site ;
 - .5 Shop drawings, samples ;
 - .6 Demolition ;

- .7 Structures ;
- .8 Building envelope ;
- .9 Mechanical / Ventilation ;
- .10 Mechanical /Plumbing ;
- .11 Fire protection ;
- .12 Electricity ;
- .13 Security Systems ;
- .14 Commissioning;
- .15 Substantial completion of work.

1.7 Project Schedule Reporting

- .1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.
- .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, identify behind-schedule activities and provide measures to regain slippage. Behind-schedule activities are those with projected start or completion dates that occur later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

PART 2 - PRODUCTS

2.1 Not used

- .1 Not used.

PART 3 - EXÉCUTION

3.1 Not used

- .1 Not used.

END OF SECTION

PART 1 – GENERAL

- | | |
|---|---|
| 1.1 Related sections | .1 Not used. |
| 1.2 References | .1 Not used. |
| 1.3 Administrative | <ul style="list-style-type: none">.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 coordinated 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 coordinated..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. |
| 1.4 Shop drawings and product data | <ul style="list-style-type: none">.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work..2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Québec..3 All shop drawings and data sheets of the same specification section must be provided to Departmental Representative in one complete package including all required. If an item is missing, technical drawings and data sheets will not be reviewed and will be considered not provided. |

- .4 The Contractor shall submit Materials identification and information sheets (**Annex A**) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.
- .5 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .6 Allow ten (10) days for Departmental Representative's review of each submission.
- .7 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.
- .8 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.
- .9 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.
- .10 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.
- .11 After Departmental Representative's review, distribute copies.
- .12 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request, or printed copies: two (2) copies for Departmental Representative in addition to the required number of copies to the Contractor.
- .13 Submit 1 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.
- .14 Submit 1 electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Reports 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.
- .15 Submit 1 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.
- .16 Submit 1 electronic copy of manufacturer's 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.
- .17 Submit 1 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.
- .18 Submit 1 electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .19 Delete information not applicable to project.
- .20 Supplement standard information to provide details applicable to project.

- .21 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .22 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.

1.5 Samples

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's site office.
- .3 Notify the Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where color, 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.

1.6 Mock-ups

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

1.7 Certificates and transcripts

- .1 Submit the documents required by the Committee on Safety Code for the Construction Industry immediately after the awarding of the contract.
- .2 Submit transcription of insurance immediately after award of Contract.

PART 2 - PRODUCTS

2.1 Not used .1 Not used.

PART 3 - EXECUTION

3.1 Not used .1 Not used.

END OF SECTION

(See Annex A - Materials Identification and Information Sheets - 1 page attached)

ANNEX A - Materials identification and information sheets

		DATE YYYY-MM-DD	No : DA-00 00 00.00	R00
CONNTRACTOR Contractors' Name Project manager Address		PROJECT First title Second title If required		
SUB-CONTRACTOR Name of the sub-contractor	CONTACT Contact person	CONTACT INFORMATION Phone number and email of the contact person		
SPECIFICATIONS SECTION 00 00 00.00	ARTICLE 0.0.0.0.0	NAME AND DESCRIPTION Identify and briefly describe product or drawing provided Name, model, description, etc.		
MANUFACTURER Complete manufacturer name	CONTACT Contact person	CONTACT INFORMATION Phone number and email of the contact person		
SUPPLIER Complete manufacturer name	CONTACT Contact person	CONTACT INFORMATION Phone number and email of the contact person If required		
PRODUCT SUBMITTED <input type="checkbox"/> As specified <input type="checkbox"/> Equivalent product <input type="checkbox"/> Substituted product		REVIEW (reserved for professionals comments)		
NOTES If required				
SIGNATORY Name of the signatory				
SIGNATURE REQUIRED Declare that the information comply with the supplied products				
		NUMBER OF PAGES INCLUDING THIS ONE 0		

PART 1 - GENERAL

1.1 Related sections

- .1 Section 01 14 00 – Work Restrictions.
- .2 Section 01 33 00 – Submittal Procedures.
- .3 Section 01 35 43 – Environmental procedures.

1.2 References

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

1.3 Action and Informational Submittals

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative, the CNESST and the “Association paritaire en santé et sécurité du secteur de la construction” (ASP Construction) the site-specific **Health and Safety Plan**, as outlined in 1.8.2 at least ten (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 1.13.1.
- .4 Submit to Departmental Representative within twenty-four (24) hours a copy of any inspection report, correction notice or recommendation issued by federal or provincial inspectors.
- .5 Submit to Departmental Representative within twenty-four (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 (3) 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 Safe work procedures at height;
 - .8 Hot work procedures;
 - .9 Wearing and fitting of individual protective gear ;
 - .10 forklift truck ;
 - .11 Positioning platform;
 - .12 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.
- .1 The Contractor must provide the name and cell number of the person to contact in case of emergency. This person must be reachable at all times.
- .10 Notice of site opening: Ouverture de Chantier Notice shall be submitted to the *Commission des normes, de l'équité, de la santé et de la sécurité du travail* (CNESST) 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 CNESST, with copy to Departmental Representative.
- .11 Plans and certificates of compliance : Submit to the CNESST 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 CNESST: The certificate of compliance is a document delivered by the CNESST confirming that the contractor is in rule with the CNESST, 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 Safety 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. Safety belts shall not be used as protection against falling.

- .3 Equipment, tools and protective gear which cannot be installed, fitted or used without compromising the health or safety of workers or the public shall be deemed inadequate for the work to be executed.
- .4 All mechanical equipment shall be inspected before delivery to the site. Before using any mechanical equipment, submit to Departmental Representative a certificate of compliance signed by a qualified mechanic. Whenever he suspects a defect or accident risk, Departmental Representative may at any time order the immediate shut-down of equipment and require a new inspection by a specialist of his own choosing.
- .5 For use of equipment for lifting persons or materials, ensure that the inspections required by the standards are met and be able to provide a copy of certificates of inspection upon request of Departmental Representative.
- .6 Any use of equipment with an internal combustion engine must be subject to the approval of the Departmental Representative. In case of acceptance of the Departmental Representative, the contractor shall ensure that the catalyst of the equipment is functional, he must provide mechanical ventilation of the worksite and provide each equipment with a gas detector capable of measuring concentrations of carbon monoxide (CO) and nitrogen oxides (NOx) on a continuous basis.

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 Compliance requirements

- .1 Comply with the Act respecting occupational health and safety (RSQ, cS-2.1) and the Safety Code for the construction industry (S-2.1, r.4) in addition to present specification requirements.

1.8 Occupational health and safety 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 Health and 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 1.3. 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 Health and Safety responsibility.
 - .4 The physical and material layout of the site.
 - .5 First-aid and first-line treatment standards.
 - .6 Identification of site-specific hazards.
 - .7 Risk assessment for the tasks to be carried out, including preventive measures and the procedures for applying them.
 - .8 Training requirements.
 - .9 Procedures in case of accident/injury.
 - .10 Written commitment from all parties to comply with the prevention program.
 - .11 A site inspection schedule based on the preventive measures.
- .3 The Contractor must draw up an effective **emergency plan** based on the characteristics and constraints of the site and its surroundings. Submit the emergency plan to all parties concerned, pursuant to the provisions of 1.3. 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 Communication 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 CNESST.

**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 Health and Safety
Specialist**

- .1 As soon as work starts, hire a safety officer, pursuant to the provisions of sections 2.5.3 and 2.5.4 of the Construction Safety Code (S-2.1, r.6) and give him/her/them the necessary authority to carry out the duties of this position, including authority to stop work on safety and health grounds.
- .2 As soon as work starts, hire a qualified person whose duties will be to ensure compliance with and application of all legislation, regulations and standards and all contractual requirements pertaining to health and safety at work.
- .3 The person selected shall meet the following requirements :
 - .1 Hold a permanent attestation of safety officer delivered by the CNESST. The Contractor shall provide a copy of this attestation du the Departmental Representative;
 - .2 Have a minimum of two (2) years of experience as a safety officer for construction sites.
- .4 The person selected shall :
 - .1 Have in-depth knowledge of legislation and regulations applicable to the site pertaining to health and safety at work.
 - .2 Develop and provide a safety orientation program for all site workers.
 - .3 Ensure that no worker is admitted to the site without having taken the safety orientation program and met all the training requirements of the applicable legislation and the site-specific safety program.
 - .4 Inspect the work and ensure compliance with all regulatory requirements and those of the contract documents or the site-specific safety program.
 - .5 Keep a daily log of actions taken and submit a copy to Departmental Representative each week.

1.13 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.

1.14 Violence Prevention

- .1 Health and safety management on Public Works and Government Services Canada's construction sites includes implementation of measures to protect psychological health of all those who access the working site. In addition to physical violence, verbal abuse, bullying and harassment are not tolerated on the site. Anyone who demonstrates such actions or behaviors will receive a warning and / or may be permanently removed from the site by the Departmental Representative.

1.15 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.

1.16 Use of the public road

- .1 Where it is necessary to encroach on public roads for operational reasons or to ensure the safety of workers, occupants or the public (eg use of scaffolding, cranes, digging, etc.), the Contractor must, at its own expense, obtain all authorizations and permits required by competent authority.
- .2 Contractor shall install at its expense all signs, barricades and other devices required by regulations to ensure the public safety and its own facilities.

1.17 Lockout

- .1 For every work on energized equipment or equipment that may be started accidentally, the Contractor must forward a general lockout procedure to the Departmental Representative and implement it.
- .2 Supervisory personnel and all workers involved in work requiring lockout must have received lockout training from a recognized organization; the Contractor must send the training certificates to the Departmental Representative..
- .3 Before initiating the lockout procedures of equipment, the Contractor shall coordinate with the site representative if the interruption of energy sources may affect site operations or occupants.
- .4 The Contractor must identify a qualified person responsible for lockout procedures and must ensure that this person writes a lockout card for each equipment that is to be padlocked. The lockout sheet must be sent to Departmental Representative at least 48 hours before the start of the work. Lockout procedures to be checked by site representative if the work takes place in an existing building.
 - .1 The lockout sheet must include at least the following information:
 - .1 Work to be executed.
 - .2 Identification, description and location of circuit and / or equipment to be padlocked.
 - .3 Main building power feeders identifications.
 - .4 Cut-offs points identification.
 - .5 Lockout sequences and release of residual energy and resume sequence.
 - .6 Lockout equipment required.
 - .7 Reset energy procedures.
 - .8 Name and signature of the person who wrote the sheet.
 - .2 Upon Departmental Representative request, the Contractor shall record all information on the site representative form.
- .5 When lockout procedure occurs, the person in charge will have to date the sheet and make sure that each worker involved in the work on the padlocked circuit / equipment puts his / her name on form and sign.

1.18 Special Requirements - Scaffolding

- .1 **Foundation :**
 - .1 Scaffolding shall be installed on a solid foundation so that it does not slip or rock.
 - .2 Contractors wishing to install scaffolding on a roof, overhang, canopy or awning shall submit their calculations and loads to the Departmental Representative and shall obtain permission from the Departmental Representative before beginning installation.
- .2 **Assembly, bracing and mooring :**
 - .1 All scaffolding shall be assembled, braced and moored in accordance with the manufacturer's instructions and the provisions of the *Safety Code for the construction industry*.
 - .2 Where a situation requires the removal of part of the scaffolding (e.g., crosspieces), the Contractor shall submit an assembly procedure signed and sealed by an engineer certifying that the scaffolding assembled in that manner will allow the work to be done safely given the loads to which it will be subject.

- .3 For scaffolding where the span between two supports is greater than 3 m, the Contractor shall provide an assembly plan signed and sealed by an engineer.
- .3 **Protection against falls during assembly :**
 - .1 Workers working above the ground shall be protected against falls at all times during assembly.
 - .2 Before the work begins, the Contractor shall submit to the Departmental Representative a procedure stating the protective measures used and, if applicable, identifying the anchor points for the safety cables or moorings. This procedure shall be in accordance with sections 3.9.4.5, 2.9.1 and 2.10.12 of the *Safety Code for the construction industry* (amended on August 2, 2001).
- .4 **Platforms :**
 - .1 Scaffolding platforms shall be designed and installed in accordance with the provisions of the *Safety Code for the construction industry*.
 - .2 If planks are used, they shall be approved and stamped in accordance with section 3.9.8 of the *Safety Code for the construction industry* (in force January 1, 2002).
 - .3 The platforms shall cover the entire surface protected by the guardrails.
 - .4 The above notwithstanding, scaffolding 4 sections (or 6 metres) high or higher shall have a full platform covering the entire surface of the putlogs every 3 m or fraction thereof, and the components of that platform shall not be moved at any time to create an intermediate landing.
- .5 **Guardrails :**
 - .1 A guardrail shall be installed on every landing.
 - .2 Cross braces shall not be considered guardrails.
 - .3 Where scaffolding 4 sections (or 6 metres) high or higher requiring full platforms is used, guardrails shall be installed on each landing at the start of work and shall remain in place until the work is completed.
- .6 **Access :**
 - .1 The Contractor shall ensure that access to the scaffolding does not compromise worker safety.
 - .2 Where the platforms of the scaffolding are comprised of planks, ladders shall be installed in such a way that planks extending beyond the platform do not block the way up or down.
 - .3 Notwithstanding the provisions of the *Safety Code for the construction industry*, stairs shall be installed on all scaffolding that has 6 or more rows of uprights or is 6 sections (or 9 metres) high or higher.
- .7 **Protection of the public and occupants :**
 - .1 The Contractor shall identify the boundaries of and barricade the work area so as to limit access to authorized workers only.
 - .2 The Contractor shall install covered walkways, nets or other similar devices to protect the public or the occupants against falling objects.
- .8 **Use of public thoroughfares :**
 - .1 Where it is necessary to encroach on a public thoroughfare, the Contractor shall obtain at the Contractor's expense any authorizations and permits required by the competent authority.

- .2 The Contractor shall install at the Contractor's expense any signage, barricades or other devices needed to ensure the safety and security of the public and the Contractor's own facilities.

1.19 Hot work - PWGSC

- .1 Hot work means any work where a flame is used or a source of ignition may be produced, i.e., riveting, welding, cutting, grinding, burning and heating.
- .2 The Contractor must complete a hot work permit provided by Correctional Service Canada before starting any hot work.
- .3 Work on construction sites must be carried out in compliance with Fire Commissioner of Canada Standard CI 301, Standard for Construction Operations, June 1982. This standard is available at the following website :
http://www.rhdcc.gc.ca/fra/travail/protection_incendies/politiques_normes/commissaire/301/page00.shtml
- .4 A working portable fire extinguisher suitable to the fire risk shall be available and easily accessible within a 5 m radius from any flame, spark source or intense heat.
- .5 An individual shall be appointed to go on rounds (fire) for a period of 30 minutes after the end of the shift. This individual shall countersign the permit and give it to the person in charge of the work site (or the individual he/she appoints) after the 30 minutes period.
- .6 The storage of propane cylinders shall comply with the *CAN/CSA-B149.2-F00 Propane Storage and Handling Code* and meet the specific conditions outlined in this document. The cylinders shall be stored outdoors, in a safe place, away from any unauthorized handling, in a storage cabinet specially designed for this purpose. The cylinders shall be securely kept upright and locked at all times in a place where no vehicles are allowed, unless the cylinders are protected by bars or the equivalent.
- .7 All of the cylinders used or stored on the work site shall be equipped with a collar designed to protect the valve.
- .8 Filling the cylinders on the work site is forbidden, unless a procedure compliant with the *CAN/CSA B149.2* standard is approved and authorized by the Departmental Representative.
 - .1 Welding and cutting
 - .2 Note : For welding and cutting activities, make sure that the following conditions are met moreover that the ones mentioned above.
- .9 The works must be carried out in accordance with the articles "3.13 Compressed gas supply" and "3.14 Welding and cutting" of the *Safety Code for the construction industry, S-2.1, r. 6*.
- .10 Work on construction sites must be carried out in compliance with Fire Commissioner of Canada Standard CI 302, Standard for Welding and Cutting, June 1982. This standard is available at the following website :
http://www.rhdcc.gc.ca/fra/travail/protection_incendies/politiques_normes/commissaire/302/page00.shtml

- .11 The welding and cutting devices are excessively dangerous with regard to the fire risk on the building work place. The following precautions must be taken at the time of this type of work :
 - .1 Store all compressed gas cylinder on a fireproof fabrics and make sure that the room is well ventilated.
 - .2 Store all oxygen cylinders more than 6 metres from a flammable gas cylinder (ex: acetylene) or a combustible such as oil or grease, unless the oxygen cylinder is separated from it by a wall made of non-combustible material as mentioned in the article 3.13.4 of the *Safety Code for the construction industry, S-2.1, r. 6*.
 - .3 Set up fireproof fabrics when work of welding is done in superposition and that there is risk of spark fall.
 - .4 Store the bottles far from all heat sources.
 - .5 Not to store the bottles close to the staircases, exits, corridors and elevators.
 - .6 Not to put acetylene in contact with metals with metals such as silver, mercury, copper and alloys of brass having more than copper 65%, to avoid the risk of an explosive reaction.
 - .7 Check that welding equipments with electric arc has the necessary tension and are grounded.
 - .8 Ensure that the conducting wire of the electric welding equipment are not damaged.
 - .9 Place the welding equipment on a flat ground away from the bad weather.
 - .10 Move away or protect the combustible materials which can be near the welding equipment.
 - .11 Prohibition to weld or cut any closed container.
 - .12 Envisage protection measures when welding or cutting is carried out near drains, tanks or other containers containing inflammable materials.
 - .13 Do not perform any cutting, welding or work with naked flame on a container, a tank, a pipe or other container containing a flammable or explosive substance unless :
 - .1 Air Samples indicating that work can be made without danger has been taken; or
 - .2 Provisions to ensure the safety of the workers has been done.

1.20 Work in height

- .1 The Contractor must ensure that any person carrying out work that poses a risk of falling more than 2,4 m use fall protection equipment.
- .2 Plan and organize work so as to eliminate the danger at source or ensure collective protection, thereby minimizing the use of personal protective equipment. When personal fall protection is required, workers must use a safety harness that complies with CSA standard CAN/CSA Z-259.10 M90. A safety belt must not be used as fall protection.
- .3 Wearing of safety harness is obligatory in any elevating platform with telescopic, articulated or rotary boom.
- .4 Delimit a danger zone in any place where equipment for work in height is used.

1.21 Asbestos Work

- .1 Work covered by this specification do not involve the handling of materials containing asbestos; however, if the Contractor or Departmental Representative or his agent find materials that may contain asbestos, the Contractor shall immediately stop work and notify Departmental Representative. If it is subsequently demonstrated that these materials contain asbestos, the Contractor must comply with the following requirements.
- .2 Before undertaking work liable to emit asbestos dust, the contractor must, without limitation :
 - .1 Provide a written procedure considering all items specified in the Safety Code for the construction industry S-2.1, r-6.
 - .2 Show that the worker has been trained of the risks, prevention methods and safe working methods (ASP Construction) (art.3.23.7).
 - .3 Show that he has under the hand all the material and the equipment necessary to the respect of the procedure and of the execution of an safety work.

1.22 Silica

- .1 Preventive measures to apply to the work site
 - .1 Source reduction methods
 - .1 Work in wet environment or use tools with inflow of water in order to reduce dustiness, if not, collect dust at the source and retain it with a high efficiency filter not to propagate dust in the environment.
 - .2 Clean surfaces and tools with water, never with compressed air.
 - .3 Sand and pickle surfaces by using an abrasive containing less than 1 % of silica (also called amorphous silica).
 - .4 When required, install shields or other containment device to prevent silica dust from migrating toward other workers or the public.
 - .2 Individual protection equipments
 - .1 Wear individual respiratory protection equipments (mask) during all the operations that could generate silica dust. Select respiratory protection in accordance with the « *Guide des appareils de protection respiratoire utilisés au Québec* ».
http://www.prot.resp.csst.qc.ca/Guid_APR.pdf
 - .2 Wear an ocular protection (glasses or visors).
 - .3 Wear a coveralls to prevent contamination outside the worksite.
 - .3 Personal hygiene
 - .1 Do not eat, drink, or smoke in a dusty environment.
 - .2 Wash the hands and the face before drinking, eating or smoking.

1.23 Specific conditions for Roofing Work

- .1 Fall Protection :
 - .1 Guardrails :
 - .1 Installation of guardrails is mandatory. PWGSC may specify certain restrictions with regard to anchoring, in which case the Contractor must make sure that the guardrails meet all of the requirements in section 3.8 of the *Safety Code for the Construction Industry (L.R.Q., S-2.1, r. 6)*.
 - .2 The Contractor agrees not to remove the guardrails until the project is completed. The Departmental Representative will authorize their removal when he is able to attest that all of the work, inspections and corrections required have been carried out.
 - .2 Harnesses :
 - .1 Workers installing the guardrails shall wear safety harnesses.

- .2 Workers installing and modifying guardrails or flashing shall wear safety harnesses in the event guardrails must be moved temporarily.
- .3 Workers shall wear safety harnesses when receiving material and giving directions to the crane operator next to a drop.
- .4 Safety harnesses shall be worn when carrying out work next to a drop where collective protection is not sufficiently safe.
- .5 The Contractor shall provide a fastening method and safety cable system compliant with section 2.10.12 of the *Safety Code for the Construction Industry (L.R.Q., S-2.1, r. 6)* for each work site or location.
- .3 Ladders :
 - .1 All ladders must be at least three rungs taller than the access landing.
 - .2 All ladders must be attached at their summit so that they cannot slide sideways. The Contractor shall implement a system so that this regulation is abided by during finishing (flashing, etc).
- .4 Scaffolding :
 - .1 All scaffolding must be inspected and assembled as outlined in the *Safety Code for the Construction Industry (L.R.Q., S-2.1, r. 6)*.
 - .2 As needed, plans and compliance certifications must be provided to the Departmental Representative before work begins.
 - .3 The Contractor shall make sure that all workers are always protected from falls during scaffolding assembly, as provided in article 3.9.4.5 of the *Safety Code for the Construction Industry (L.R.Q., S-2.1, r. 6)*.
- .2 Protection against burns :
 - .1 Individuals assigned to the boilers shall wear long sleeves, safety glasses and a face shield when filling the boilers.
 - .2 Individuals working with asphalt or other hot liquids shall wear gloves, long sleeves and safety glasses.
- .3 Protection against fire :
 - .1 Work on construction sites must be carried out in compliance with *Fire Commissioner of Canada Standard CI 301, Standard for Construction Operations, June 1982*. This standard is available at the following website: http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/comm_issioneer/301/page00.shtml
 - .2 At the beginning of each shift on every site, the Contractor shall obtain a Hot Work Permit issued by the person in charge of the work location.
 - .3 A working portable fire extinguisher suitable to the fire risk shall be available and easily accessible within a 5 m radius from any flame, spark source or intense heat.
 - .4 An individual shall be appointed to go on rounds (fire) for a period of 30 minutes after the end of the shift. This individual shall countersign the permit and give it to the person in charge of the work site (or the individual he/she appoints) after the 30 minutes period.
 - .5 The storage of propane cylinders shall comply with the **CAN/CSA-B149.2-F00 Propane Storage and Handling Code** and meet the specific conditions outlined in this document. The cylinders shall be stored outdoors, in a safe place, away from any unauthorized handling, in a storage cabinet specially designed for this purpose. The cylinders shall be securely kept upright and locked at all times in a place where no vehicles are allowed, unless the cylinders are protected by bars or the equivalent.
 - .6 Compressed gas, fuel tanks or containers must be stored at least 10 m from any buildings.

- .7 The number of propane cylinders on the roof shall not exceed the number of cylinders necessary for a day's work, and cylinders shall at all times be secured upright or held in a cart designed for this purpose.
- .8 All of the cylinders used or stored on the work site shall be equipped with a collar designed to protect the valve.
- .9 Filling the cylinders on the work site is forbidden, unless a procedure compliant with the CAN/CSA B149.2 standard is approved and authorized by Departmental Representative.
- .4 Material and Waste Management :
 - .1 On the roof, light material and sheet material shall be kept in containers or be securely fastened. In the event this requirement is disregarded in the slightest way, Departmental Representative may disallow the storage of materials on the roof.
 - .2 The preceding paragraph also applies to waste.
 - .3 Waste shall be discarded as produced using a waste chute or appropriate containers.
 - .4 All waste must be removed from the roof at the end of shifts.
 - .5 Unless otherwise authorized by Departmental Representative, all waste bins must be placed at least 3 m from any structure or building.
- .5 General protection and Worksite 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.
 - .1 Covered passageways shall be set up to protect all entrances and exits.
 - .2 A safety perimeter on the ground must be placed under the work zone in order to protect the public and the occupants.
 - .3 The ground work site, material handling area and boiler area shall be clearly sealed off to prevent occupants or the public from accessing the site and areas.
 - .4 Before installing any device that may emit gas or fumes, the Contractor shall receive authorization from the person in charge of the work site, who shall make sure that there is no risk of gas or fumes infiltrating the building's ventilation system.
 - .2 The Contractor shall make sure that the work site is kept clean and tidy for the duration of the work.
 - .3 Copies of material safety data sheets of all controlled products shall be forwarded to Departmental Representative and to the person responsible of the work site before work begins.
- .6 The Contractor shall provide sanitary facilities and rest areas compliant with requirements of the *Safety Code for the Construction Industry*.

1.24 Lifting Material

- .1 Lifting devices shall be positioned in such a way that loads are not carried over workers, occupants or the public.
- .2 For lifting operations using a crane, the Contractor must submit to Departmental Representative a lifting plan which must include among others the following information: the capacity of the crane, load weights, the position of the crane, a sketch of the path of the load transported, the length of the mast, etc... Departmental Representative may, if it deems necessary, require the lifting plan is signed and sealed by an engineer and impose works evenings and weekends.

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

**1.25 Specific conditions for
CONFINED SPACES**

- .1 In addition of the requirements of health and safety general clause, the following measures shall be strictly applied for any work in confined spaces.
- .2 In case of discrepancy between the requirements of the provincial regulations and the requirements below, the most severe requirements apply.
- .3 The Contractor's prevention program shall include a written procedure which identifies :
 - .1 Necessary work tools;
 - .2 Instruments, installed or to be installed in the confined space, and measures to take for their installation, use, maintenance, protection and moving;
 - .3 Pipes and conduits entering the confined space;

- .4 Risks and security measures to be taken depending on the work to be carried out;
 - .5 Hazardous material that may be found in the confined space ;
 - .6 Appropriate rescue methods and equipment as well as emergency plan.
- .4 Whenever a person shall enter a confined space, the Contractor shall complete an access permit provided by Correctional Service Canada and comply with all the requirements of this permit (see example of permit in Annex). For work requiring the use of chemicals or any work likely to generate gas, vapor or dust , the content of the permit must be adjusted for risks related to the nature of the work. The permit is valid for the duration of a shift, and must take into account the information contained in the evaluation report and the specific conditions relating to the Work. A new work permit must be completed for each shift (8hres).
- .5 In addition to the confined space entry permit, the Contractor shall complete a Hot Work Permit provided by Correctional Service Canada when the work to be performed include welding, cutting or any other activity producing flames or sparks. A new work permit must be completed for each shift (8hres).
- .6 All persons having access to the confined space and the safety guard shall have the following training certificates issued by an organization it recognizes :
- .1 Safety for work in confined spaces, which shall include in particular the following :
 - .1 risks and safety measures related to confined spaces;
 - .2 entry procedures;
 - .3 use of ventilating equipment;
 - .4 use of safety harness;
 - .5 use and maintenance of respiratory protection equipment;
 - .6 gas detection equipment (ASP Construction or equivalent training).
 - .2 Workplace First Aid and CPR (organization recognized by the CNESST).
 - .3 When the use of air adduction adduction respirators or autonomous respirators is planned for, thorough training in the preparation, maintenance and use of such equipment (Manufacturer, supplier or recognized organization).
 - .4 In remote areas where no local rescue and emergency intervention unit is available, the Contractor shall designate persons who are capable of carrying out rescue operations in confined spaces. First-aid attendant designated by the Contractor shall have relevant training in the use of rescue equipment.
- .7 Employees who are required to work in sewage collection systems or other similar systems shall be immunized against infectious diseases, in compliance with the immunization program prescribed by Health Canada, which is, against diphtheria and tetanus and for work to be done at the Correctional Service Canada, against hepatitis « B ».
- .8 All persons who must use air adduction respirators or autonomous respirators shall present a medical certificate confirming that they are fit to use this kind of equipment. This certificate shall be valid for two years.
- .9 The antidiphtheria-tetanus vaccination is strongly recommended, though it is not mandatory.

- .10 The Contractor shall establish emergency and rescue procedures in co-operation with municipal and ambulance services. These procedures, together with the relevant phone numbers and the whereabouts of the nearest phone shall be conspicuously posted near the work station.
- .11 The Contractor shall, before entering the confined space and, thereafter, every 15 minutes to take readings of concentration and ensure that the measured concentrations are in accordance with the regulatory limits for the following gas : oxygen, flammable and toxic gases likely to be present, in particular, carbon monoxide and hydrogen sulfide. These readings shall be recorded in a register, unless the detecting devices are equipped with an alarm and operate on a continuous basis. Detecting devices that are used shall be calibrated and adjusted by a competent person according to the manufacturer's directives. NOTE : for welding and cutting tasks, readings of concentration must be done on a continuous basis.
- .12 The Contractor is responsible for the provision and maintenance of gas detecting devices. The Departmental Representative may at any time require the Contractor's equipment to be checked for accuracy by a qualified person. In the event of failure of a detecting device, work shall be suspended immediately and all workers shall leave the confined space. In these circumstances, no claim for time lost shall be accepted.
- .13 If a detecting device alarm is set off, all workers shall leave the confined space. The Contractor shall then find the source of contamination, neutralize it, ventilate the confined space to eliminate contaminant residues and authorize access to the confined space only when concentrations of oxygen and gas have returned to normal.
- .14 Compressed gas cylinders or welding equipment shall not be brought into confined spaces: this equipment shall remain outside and shall not block entrances or exits; all cylinders shall be properly secured.
- .15 Tools and electrical devices used to gain access to confined spaces shall be grounded and, when necessary, designed to be explosion-proof. All equipment must be connected to a ground fault interrupter outlet or to a step-down transformer. The Contractor shall, at his own cost, hire a qualified electrician to adjust power receptacles and/or circuit breakers that he intends to use which do not meet these criteria.
- .16 The Contractor shall provide a ventilation system to keep concentrations of contaminants below admissible limits.
- .17 The Contractor shall put up posters to prevent unauthorized persons from entering the confined space.
- .18 When it is impossible to maintain the noise level under 85 dB, the Contractor shall provide all workers with ear protection adapted to the desired level of attenuation and work to be carried out.
- .19 The Contractor shall ensure that all workers wear the required personal protection equipment.

- .20 The Contractor shall assign a competent person to assume the function of safety guard. The safety guard shall :
 - .1 Be properly informed of work procedures in a confined space.
 - .2 Ensure constant communication with all workers in the confined space. The instructions that are applied shall be adapted to confined spaces. The Contractor shall choose means of communication according to identified risks and other relevant factors, that is the protection equipment the workers must wear, noise levels in confined spaces and surrounding areas, remoteness, lighting conditions, etc...
 - .3 Be familiar with gas detecting devices and see to their proper functioning for the duration of the work.
 - .4 Be familiar with auxiliary ventilation systems and see to their proper functioning for the duration of the work.
 - .5 Be familiar with emergency procedures.
 - .6 Ensure that :
 - .1 All workers who enter the confined space respect the Contractor's work procedure.
 - .2 The working conditions and the environment inside the confined space are in no way detrimental to workers' health and safety.
- .21 The safety guard shall, at all times, be posted at the entrance of the confined space and shall not leave his station as long as there is a worker inside the confined space.
- .22 The Contractor shall designate a person to be in charge of the safety of the confined space. This person shall be present at all times on the job site.
- .23 The same person may act as a security guard and be responsible for the safety of confined spaces, provided all requirements of both functions are met.

- 1.26 Other special conditions**
- .1 The Contractor must consider in his scope of work that the base remains operational during the entire period of the work. This implies the circulation of machinery and the handling of heavy objects such as buoys and other marine objects around work area.

PART 2 - PRODUCTS

- 2.1 Not used**
- .1 Not used.

PART 3 - EXECUTION

- 3.1 Not used**
- .1 Not used.

END OF SECTION

PART 1 – GENERAL

1.1 Definitions

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.
- .3 References :
 - .1 Canadian Council of Ministers of the Environment (CCME)
 - .2 Canadian Environmental Protection Act.
 - .3 Environment Quality Act(Chapter Q-2).

1.2 Action and informational submittals

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.
- .3 Ensure Environmental Protection Plan includes comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental protection plan :
 - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names and qualifications of persons responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.
 - .6 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.
 - .7 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
 - .8 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

- .9 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
- .10 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .11 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

1.3 Fires

- .1 Fires and burning of rubbish on site not permitted.

1.4 Disposal of wastes

- .1 Do not bury rubbish and waste materials on site unless approved by Departmental Representative.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.5 Drainage

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.6 Pollution control

- .1 Control emissions from equipment and plant to local authorities' emission requirements.
- .2 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
 - .1 Provide temporary enclosures where indicated by Departmental Representative.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.7 Notification

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Do not take action until after reception of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 - PRODUCTS

2.1 Not used

- .1 Not used.

PART 3 - EXECUTION

3.1 Cleaning

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management : Separate waste material for reuse and recycling in accordance with section 01 74 21 – Construction/demolition Waste Management and Disposal.

END OF SECTION

PART 1 - GÉNÉRAL

- | | |
|--|---|
| 1.1 Related sections | <ul style="list-style-type: none">.1 Section 01 35 29.06 – Health and Safety..2 Section 01 35 43 – Environmental Protection. |
| 1.2 References and Codes | <ul style="list-style-type: none">.1 Perform Work in accordance with National Building Code of Canada (NBC) version 2005, including all 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 During works, when there is a conflict between the different regulations, the highest standards will be observed..3 Meet or exceed requirements of:<ul style="list-style-type: none">.1 Contract documents..2 Specified standards, codes and referenced documents. |
| 1.3 Laws, regulations and decrees | <ul style="list-style-type: none">.1 Contractor must respect the rights and privileges of others and comply with all federal, provincial and municipal laws, regulations and decrees. Contractor must ensure that his legal or de facto employees, including subcontractors, also comply with them..2 Contractor must obtain all applicable permits and approvals prior to the beginning of work. |
| 1.4 Hazardous material discovery | <ul style="list-style-type: none">.1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Representative. Demolition or removal of these materials is considered dangerous. If materials, other than those identified in the documents, having this aspect are found during demolition, stop immediately and notify Departmental Representative. Refer to related sections listed above..2 Stop work immediately when additional material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative..3 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative..4 Mould: stop work immediately when material, other than those identified in the documents, resembling mould is encountered during demolition work. Notify Departmental Representative. |
| 1.4 Building smoking environment | <ul style="list-style-type: none">.1 Comply with smoking restrictions and municipal by-laws..2 No smoking inside and outside of any federal building. |

PART 2 - PRODUCTS

2.1 Not used .1 Not used.

PART 3 - EXÉCUTION

3.1 Not used .1 Not used.

END OF SECTION

PART 1 - GÉNÉRAL

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|--|---|
| 1.1 Related sections | .1 Not used. |
| 1.2 References | .1 Not used. |
| 1.3 Inspection | <ul style="list-style-type: none">.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. |
| 1.4 independent inspection agencies | <ul style="list-style-type: none">.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative..2 Provide equipment required for executing inspection and testing by appointed agencies..3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents..4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection. |
| 1.5 Access to work | <ul style="list-style-type: none">.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants..2 Co-operate to provide reasonable facilities for such access. |
| 1.6 Procedure | <ul style="list-style-type: none">.1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made. |

- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.7 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, Departmental Representative 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.

1.8 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.

1.9 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.

1.10 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's 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 the Contractor in preparing schedule fixing dates for preparation.

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

1.11 Mill tests

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

1.12 Equipment and systems

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

PART 2 - PRODUCTS

2.1 Not used

- .1 Not used.

PARTIE 3 - EXÉCUTION

3.1 Not used

- .1 Not used.

END OF SECTION

PART 1 - GÉNÉRAL

- 1.1 Related sections**
- .1 Section 01 52 00 - Construction Facilities.
 - .2 Section 01 56 00 - Temporary Barriers and Enclosures.
- 1.2 References**
- .1 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- 1.3 Action and Informational Submittals**
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal procedures.
- 1.4 Installation and removal**
- .1 Provide temporary utilities controls in order to execute work expeditiously.
 - .2 Remove from site all such work after use.
- 1.5 Dewatering**
- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
- 1.6 Water Supply**
- .1 The Departmental Representative will provide continuous supply of potable water for construction use.
 - .2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.
- 1.7 Heating and Ventilation**
- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
 - .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
 - .3 Provide temporary heating and ventilation in enclosed areas as required to:
 - .1 Facilitate work progress;
 - .2 Protect work and products against dampness and cold;
 - .3 Prevent moisture condensation on surfaces;
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials;
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
 - .4 Maintain temperatures of minimum 10° degrees C in areas where construction is in progress.
 - .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities
- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building to be used when available. Be responsible for damage to heating system if use is permitted.
- .7 Upon completion of work requiring permanent heating systems, replace ventilation system filters.
- .8 Pay costs for temporary heat.
- .9 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes
 - .5 Vent direct-fired combustion units to outside.
- .10 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.8 Temporary Power and Light

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools, for the duration of the construction.
- .2 Arrange for connection with appropriate utility available on site. Connections and installation to meet Departmental Representative requirements and will include a meter approved by the Departmental Representative. The costs for installation, maintenance and removal will be assumed by the Contractor, including a transformer installation, if required.
- .3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lux.

1.9 Temporary Communication Facilities

- .1 Provide and pay for temporary telephone, fax, data hook up, lines and equipment necessary for own use and use of Departmental Representative.
- .2 Telecommunications must remain operational 24 hours a day for the duration of the work.

1.10 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.

PART 2 - PRODUCTS

2.1 Not Used .1 Not used.

PART 3 - EXÉCUTION

3.1 Temporary Erosion and sedimentation control .1 Refer to section 01 52 00 – Construction Facilities.

END OF SECTION

PART 1 - GÉNÉRAL

- 1.1 Related Sections** .1 Not used.
- 1.2 References**
- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59, Alkyd Exterior Gloss Enamel.
 - .3 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121, Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2, Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321, Signs and Symbols for the Occupational Environment.
 - .4 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- 1.3 Action and Informational Submittals** .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures
- 1.4 Installation and Removal**
- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
 - .2 Provide construction facilities in order to execute work expeditiously.
 - .3 Remove from site all such work after use.
- 1.5 Work at height**
- .1 For all exterior work at height, equipment used must minimize the movement of existing equipment currently stored near the exterior walls.
 - .2 Contractor **must use** mobile nacelles with articulated or telescopic arms for work at heights.
- 1.6 Hoisting**
- .1 Provide, operate and maintain hoists and or cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
 - .2 Bearing capacity limits of existing floors and surfaces and must be respected at all times. Contractor's structural engineer must validate the existing maximum capacities.
 - .3 Hoists and cranes to be operated by qualified operator.

- 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.
 - .3 Submit drawings, procedures and calculations demonstrating that the ability of existing structure is not compromised.
- 1.8 Trailers and parking**
- .1 Construction trailers and service vehicles, duly identified, will be allowed to park in the work areas approved by Departmental Representative, if this does not interfere with the execution of work.
 - .2 No parking area will be reserved for Contractor along Fort Street.
 - .3 If the use of existing roads to access site is permitted, ensure the maintenance to access site throughout the duration of the work and, if necessary, repair any damage that may be caused.
 - .4 Clean and remove snow from runways and exiting.
 - .5 Parking on the base is not permitted outside Contractor's identified area.
- 1.9 Security**
- .1 Throughout the duration of work, the Contractor shall provide security personnel to ensure reliable daily surveillance, during holidays and vacation periods, of site installations and materials / equipment contained therein, and assume all related cost.
- 1.10 Work site Offices**
- .1 Provide office heated to 22° degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing lay down table.
 - .2 Provide marked and fully stocked first-aid case in a readily available location.
 - .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.
- 1.11 Equipment, tool and materials storage**
- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
 - .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities. Equipment or Material storage will not be tolerated outside the building.

1.12 Sanitary facilities

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Existing facilities within the work area can be used by Contractor's staff. Keep area and premises in sanitary condition.

1.13 Protection and maintenance of traffic

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect public and occupants from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic, including trucks serving the Richardson International Grain Terminal
- .6 Verify adequacy of existing roads and allowable load limit on these roads.
Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .8 Dust control: adequate to ensure safe operation at all times.
- .9 Provide snow removal from the construction site and off site transportation during Construction period.

1.14 Clean-up

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material away from construction facilities.

PART 2 - PRODUCTS

2.1 Not used .1 Not used.

PART 3 - EXÉCUTION

3.1 Not used .1 Not used.

END OF SECTION

PART 1 - GÉNÉRAL

- 1.1 Related Sections**
- .1 Section 01 35 29.06 – Health and Safety.
 - .2 Section 01 52 00 – Construction Facilities.
 - .3 Section 02 41 16 – Demolition.
- 1.2 References**
- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.59, Alkyd Exterior Gloss Enamel.
 - .2 CAN/CGSB 1.189, Exterior Alkyd Base Coat Paint for Wood.
 - .3 CAN/CGSB-138.1, Fabric for Chain Link Fence.
 - .4 CAN/CGSB-138.2, Steel Framework for Chain Link Fence.
 - .5 CAN/CGSB-138.3, Installation of Chain Link Fence.
 - .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CSA-O121, Douglas Fir Plywood.
- 1.3 Installation and Removal**
- .1 Provide temporary controls in order to execute Work expeditiously.
 - .2 Contractor shall limit access of unauthorized personnel to worksite. Appropriate security measures should be taken during works to limit public access.
 - .3 Remove from site all such work after use.
- 1.4 Guard Rails and Barricades**
- .1 Provide secure, rigid guard rails and barricades around open shafts, open stair wells, open edges of floors and roofs and other sectors of potential risk of falls.
 - .2 Provide and install these elements according to requirements of competent authorities and in coordination with the Departmental Representative.
- 1.5 Shelters and weather closures**
- .1 During the roofing works, install all necessary protections to ensure at all times the complete sealing of roofs and adequately protect buildings from water infiltration.
 - .2 Design enclosures to withstand wind pressure and snow loading.
- 1.6 Protective measures and temporary enclosures**
- .1 Before beginning of work the Contractor must meet Departmental Representative to agree on all protective measures and temporary enclosures.
 - .2 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

- .3 Maintain and relocate protection until such work is complete.

1.7 Access to site

- .1 Provide and maintain access, ramps, construction runways and pedestrian crossings as may be required for access to Work.
- .2 Maintain access to property including overhead clearances for use by emergency response vehicles.
- .3 Erect temporary 1.2 m high mesh fence around site, attached with wire to T-shaped posts at 2.4 m spacing. This enclosure to be accepted by CNESST. Provide lockable access barriers to storage and work areas for Contractor equipment and trucks.
- .4 During the entire construction period, remove snow for the entire worksite. Access to facilities must be free of snow accumulation during the work period.
- .5 Removal and disposal of snow shall be in accordance with applicable federal, provincial and municipal laws and regulations.

1.8 Protection for off-site and public property

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

1.9 Protection of building finishes

- .1 Provide protections 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.

1.10 Waste management and disposal

- .1 Work is governed by a **waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal. Works of this section to be realized in accordance to this plan's requirements.

PART 2 – PRODUCTS

2.1 Materials

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Plywood : Softwood, exterior category in accordance with CSA O121 and CAN/CSA-O325.0, construction classification, standard quality, 20mm thickness, moisture content of 8% at time of fabrication, class G1S;
- .3 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W or 350W.

.4 Heavy gauge steel plate: to CAN/CSA-G40.20/G40.21, Grade 260W.

.5 Welding materials: to CSA W59.

.6 Welding electrodes: to CSA W48 Series.

.7 Security equipment :

.1 Safety cones.

.2 Laminated tape (yellow).

.8 Post and rails, in accordance with CAN/CGSB-138.2 :

.9 Bolts and anchor bolts: to ASTM A307 and A325.

2.2 Fences

.1 Provide construction fences around all exterior work areas according to work sequences, and phasing shown in the drawings.

2.3 Temporary partitions / enclosures

.1 Provide construction partitions, dust screens to enclose areas where dust generating works are executed in order to protect workers and areas where work is completed.

2.2 Dust tight screens / Protection enclosures

.1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished work areas.

.2 Temporary enclosure partitions must form watertight compartments made of 8 mils thickness polyethylene, with 100mm overlapped and sealed joints (acoustical sealant, at stud junctions and stapled). These divisions to be from floor to ceiling, watertight, and assembled to form 1000mm deep vestibules.

PART 3 - EXÉCUTION

3.1 Not Used

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

- .1 Not used

1.2 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.
- .5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids.

1.3 Quality

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 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.

1.4 Availability

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify 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.
- .3 Within (10) days of written request by Departmental Representative, submit following information for materials and equipment proposed for supply :
 - .1 Name and address of manufacturer;
 - .2 Trade name, model and catalogue number;
 - .3 Performance, descriptive and test data;
 - .4 Manufacturer's installation or application instructions;
 - .5 evidence of arrangements to procure.

1.5 Storage, handling and protection

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials lumber and 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.

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| 1.6 Transportation | <ul style="list-style-type: none">.1 Pay costs of transportation of products required in performance of Work. |
| 1.7 Manufacturer's instructions | <ul style="list-style-type: none">.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. |
| 1.8 Quality of work | <ul style="list-style-type: none">.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. |
| 1.9 Co-ordination | <ul style="list-style-type: none">.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision..2 Be responsible for coordination and placement of openings, sleeves and accessories. |
| 1.10 Concealment | <ul style="list-style-type: none">.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. |
| 1.11 Remedial work | <ul style="list-style-type: none">.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. |

1.12 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.

1.13 Fastenings

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

1.14 Fastenings - equipment

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 316 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.15 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.

PART 2 - PRODUCTS

2.1 Not used .1 Not used.

PART 3 - EXECUTION

3.1 Not used .1 Not used.

END OF SECTION

PART 1 - GENERAL

- 1.1 Related sections**
- .1 Section 02 41 16 – Demolition.
 - .2 Section 07 52 00 – Modified bituminous membrane roofing.
 - .3 Section 07 92 10 – Joint Sealing.
- 1.2 Action and informational 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 Departmental Representative 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 Departmental Representative or separate contractor;
 - .7 Written permission of affected separate contractor;
 - .8 Date and time work will be executed.
- 1.3 Materials**
- .1 Required for original installation.
 - .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures
- 1.4 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.
- 1.5 Execution**
- .1 Execute cutting, fitting, and patching, including excavation and fill, to complete Work.

- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .12 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.6 Repair and patching work

- .1 Repair and seal all existing openings left by the demolition of electromechanical components and removal of equipment, furniture, accessories and other fixed elements.
- .2 Openings in floor slabs, refer to the documents and indications in structure.

1.7 Waste management and disposal

- .1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The works of this section shall be made in accordance with the requirements of this plan.

PART 2 - PRODUCTS

2.1 Not used .1 Not used.

PART 3 - EXECUTION

3.1 Not used .1 Not used.

END OF SECTION

PART 1 - GENERAL

- | | |
|--------------------------------|---|
| 1.1 Related sections | .1 Section 01 77 00 – Closeout Procedures. |
| 1.2 Project cleanliness | <ul style="list-style-type: none">.1 Maintain Work in tidy condition, free from accumulation of waste products and debris..2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site..3 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. These containers will be kept locked on site..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 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations..8 Store volatile waste in covered metal containers, and remove from premises at end of each working day..9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose..10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer..11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems..12 Maintain interior spaces of the site clean, clean access soiled by the work. |
| 1.3 Final cleaning | <ul style="list-style-type: none">.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work..2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy..3 Prior to final review remove surplus products, tools, construction machinery and equipment..4 Remove waste products and debris. |

- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Inspect finishes fitments and equipment and ensure specified workmanship and operation.
- .8 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .9 Remove dirt and other disfiguration from exterior surfaces.
- .10 Sweep and wash clean paved areas.
- .11 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .12 Clean roofs, downspouts, and drainage systems.
- .13 Remove snow and ice from access to building.

1.4 Waste management and disposal

- .1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The works of this section shall be made in accordance with the requirements of this plan.

PART 2 - PRODUCTS

2.1 Not used

- .1 Not used.

PART 3 - EXECUTION

3.1 Not used

- .1 Not used.

END OF SECTION

PARTIE 1 - GÉNÉRALITÉS

1.1 Waste Management Goals

- .1 Prior to start of work, conduct meeting with the Departmental Representative to review and discuss waste management goals and Plan.
- .2 Waste Management Goal is to reduce total construction/renovation/demolition (CRD) residual materials sent to landfill sites by 75%. Provide Departmental Representative with documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3 Accomplish maximum control of solid construction waste.
- .4 Preserve environment and prevent pollution and environment damage.

1.2 Related Sections

- .1 All sections referring to this section.

1.3 References

- .1 RECYC-QUÉBEC, Ministère du développement durable, de l'environnement et des parcs (MDDEP).
- .2 Canadian Environmental Protection Act, 1999
- .3 Quebec Environment Quality Act and rules.
- .4 Quebec's Waste Management Action Plan (2011-2015).
- .5 The Environmentally Responsible Construction and Renovation Handbook, Public Works and Government Services Canada

1.4 Definitions

- .1 Class III: non-hazardous waste - construction renovation and demolition waste.
- .2 Inert Fill: inert waste - exclusively asphalt and concrete.
- .3 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .4 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .5 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.
- .6 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.

- .7 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .8 Separate Condition: refers to waste sorted into individual types.
- .9 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
- .10 Residual materials Reduction Workplan (RRW): written report which addresses opportunities for reuse or recycling of residual materials. Refer to Schedule A in order to reduce the final amount of waste generated by work.
- .11 Residual Material Management Co-ordinator (RMMC): Contractor representative responsible for supervising residual material management activities as well as co-ordinating related required submittal and reporting requirements.

1.5 Documents

- .1 Keep one copy of each of the following documents at the job site:
 - .1 Residual materials Reduction Workplan (RRW, including Schedule A).
 - .2 Residual materials tracking forms (Schedule B).
 - .3 Waybills (Schedule C).

1.6 Action and informational submittals

- .1 Prior to the start of the work, prepare and submit to Departmental Representative:
 - .1 Two (2) copies of the Residual materials Reduction Workplan (RRW, including Schedule A).
- .2 On completion of the work, submit one copy of the residual materials tracking forms (Schedule B) to the Departmental Representative.
- .3 Before the final payment, submit to Departmental Representative the residual materials tracking forms (Schedule B) and waybills (Schedule C).
 - .1 Failure to submit the residual materials tracking forms and waybills could result in holdback of the final payment.
 - .2 Provide to Departmental Representative receipts, scale tickets, waybills, and show quantities (in t) and types of residual materials being reused on-site, sold, recycled or separated off-site, or disposed of.
 - .3 For each residual material generated by the project that is reused, sold, recycled or separated off-site, indicate the quantity (in t), type and final destination.
 - .4 For each residual materials material generated by the project that is landfilled or incinerated, indicate the quantity (in t), the type and the name of the landfill, incinerator or transfer station.

1.7 Residual materials Reduction Workplan (RRW)

- .1 The General Contractor is responsible for implementing, co-ordinating and overseeing the Residual materials Reduction Workplan RRW.
- .2 The General Contractor is responsible for the construction signage related to the implementation of Residual materials Reduction Workplan.
- .3 The General Contractor must designate a **residual materials management co-ordinator** before the start of the work.

- .4 The RRW must include but not be limited to:
 - .1 Destination of the residual materials listed
 - .2 Techniques and sequencing for dismantling / disassembly.
 - .3 Dismantling / disassembly schedules.
 - .4 Location of the residual materials management and separation sites
 - .5 Security aspects
 - .6 Protection
 - .7 Locations of storage areas
 - .8 Details for handling and removal of waste materials.
 - .9 Estimated quantities of residual materials to be salvaged for reuse, recycled and those to be landfilled (Schedule A)
- .5 Structure the RRW to prioritize actions and follow the "3 R's" hierarchy, with Reduce as the first priority, followed by Reuse, then Recycle.
- .6 Describe management of residual materials.
- .7 Monitor residual materials reduction.
- .8 Collect, handle and store on-site, and transport off-site, salvaged materials in separate condition.
 - .1 Salvaged residual materials must be shipped to an approved and authorized recycling facility.
 - .2 Residual materials that cannot be salvaged or recycled must be shipped to an appropriate disposal site.

1.8 Residual materials disposal site

- .1 The Contractor is responsible for selecting the residual materials treatment sites in accordance with the requirements of this section.

1.9 Residual materials management co-ordinator

- .1 The residual materials management co-ordinator is responsible for:
 - .1 Planning and preparing the residual materials separation program prior to the start of the work, as described in the RRW;
 - .2 Supervising the implementation of the RRW for construction/demolition residual materials and ensuring its follow-up and supervision;
 - .3 Being on-site at all times to supervise the parties on the job site, track trucks transporting construction/demolition residual materials, and collect the data required to prepare the final summary;
 - .4 Taking all appropriate measures to prevent any residual materials contamination (recycling and recovery facilities either refuse to accept residual materials that has been contaminated by materials other than those specified, or charge additional fees);
 - .5 Regularly encouraging the subcontractors and workers working on the site to meet the objectives and ensuring that the construction residual materials management conditions are met;
 - .6 Regularly reminding the subcontractors and workers of the importance of preventing the site from being contaminated by fuels, oils or other hazardous chemicals;
 - .7 Ensuring that the construction/demolition residual materials is collected, handled and stored on-site and transported off-site in separate condition;

- .8 Using and properly completing the residual materials reduction documents (schedules) in order to follow up and collect of data for the purpose of preparing the residual materials management report.

1.10 Residual materials tracking

- .1 The residual materials tracking form (Schedule B) is essentially a residual materials logbook. Before the start of the work, the residual materials management co-ordinator must retranscribe the residual materials tracking table onto legal-size paper in order to enter all the necessary data.
- .2 On-site, the residual materials management co-ordinator must:
 - .1 Track residual materials shipments to ensure that CRD residual materials is shipped to the appropriate facilities;
 - .2 Ensure that each residual materials collection truck transports its load to the appropriate facilities ;
 - .3 Compile all data required by the residual materials tracking form (Schedule B) before the residual materials collection trucks leave the job site;
 - .4 Forward copies of the residual materials tracking forms to the Departmental Representative at the end of the project.

1.11 Waybill

- .1 To confirm and document that the residual materials is accepted by the appropriate disposal system, the residual materials management co-ordinator must:
 - .1 Have drivers **sign** a waybill (Schedule C) as they are leaving the job site with a load of residual materials. The waybill must be signed on-site by each driver **before** the residual materials leaves the job site.
 - .2 Give a copy of the waybill to the driver and have each driver request confirmation of receipt when unloading the residual materials. The facility receiving the load **must confirm** the receipt and acceptance of the residual materials and must return a signed copy of the waybill to the residual materials management co-ordinator. The waybill must be returned by E-mail or fax from the facilities to the residual materials management co-ordinator.
 - .3 Include the contact information for the job site at the bottom of the document so that the receiving system can return the waybill.
 - .4 Compile a waybill book with **a system of instant copies** (carbon paper or other) to streamline waybill circulation.
 - .5 Keep the original copies of the waybills on the job site.
 - .6 If the residual materials disposal facility is a company that collects all construction/demolition residual materials from the site for separation, the company is required to transmit a residual materials tracking document to the residual materials management co-ordinator. In this document, the company must clearly indicate the weight (in kg) of each type of residual materials, the addresses and contact information of the companies that accepted each load of residual materials from the job site, and an indication of whether the residual materials was reused, recovered, recycled, incinerated, composted, landfilled or other. If this is the case, the contract with the facility should include this task and the tracking requirement should be clearly indicated.

- 1.12 Storage, handling and protection of materials**
- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
 - .2 Unless specified otherwise, residual materials for disposal become the property of the Contractor.
 - .3 Protect, stockpile, store and catalogue salvaged items.
 - .4 Separate non-salvageable items from salvageable items. Transport and deliver non-salvageable items to the licensed disposal facility.
 - .5 Protect surface drainage and electrical and mechanical facilities from damage or blockage.
 - .6 Separate and store residual materials produced during the dismantling of structures.
 - .7 Prevent contamination of residual materials to be salvaged and recycled, in accordance with the requirements for acceptance by the designated facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled residual materials to an off-site treatment facility for separation.
 - .3 Provide waybills for residual materials that are separated and transported off-site.
- 1.13 Disposal of wastes**
- .1 Do not bury rubbish, waste or residual materials materials.
 - .2 Do not dispose of volatile materials, mineral spirits, hydrocarbons, paint thinner or any other type of residual materials in waterways or storm or sanitary sewers. These types of residual materials must be disposed of in accordance with the *Canadian Environmental Protection Act, 1999* and the *1998–2008 Quebec Residual Materials Management Policy*.
 - .3 Closely monitor construction/demolition residual materials to control the destination and quantities of each type of material leaving the job site (schedules A, B and C).
- 1.14 Use of site and facilities**
- .1 Execute the work with the least possible interference with or disturbance to the normal use of the premises.
 - .2 Provide temporary security measures approved by the Departmental Representative.

PART 2 - PRODUCTS

- 2.1 Not used**
- .1 Not used.

PART 3 - EXECUTION

3.1 General

- .1 Carry out the work in accordance with the RRW.
- .2 Follow the applicable codes and regulations for handling residual materials that is not reused, recycled or salvaged.

3.2 Cleaning

- .1 On completion of the work, remove the tools and residual materials. Leave the work area in a clean and orderly condition.
- .2 Clean up the work area as the work progresses.
- .3 Separate reusable or recyclable residual materials at the source and put them in the locations indicated.

3.3 Residual materials reclamation

- .1 Using the following list, separate residual materials from the general residual materials stream and stockpile them in separate piles or containers, as authorized by the Departmental Representative and in accordance with the applicable fire regulations.
 - .1 Provide instructions on disposal practices.

- .2 The on-site sale of residual materials salvaged for recycling is prohibited.

- .3 Demolition residual materials

Residual materials Type	Material Reclaimed	Recommended % Reclaimed
Steel	100	_____
Wood (uncontaminated)	100	_____
Rubbles	100	_____
Other		_____

- .4 Construction residual materials

Residual materials Type	Material Reclaimed	Recommended % Reclaimed
Cardboard	100	_____
Plastic packaging	100	_____
Asphalt	100	_____
Steel	100	_____
Wood (uncontaminated)	100	_____
Gypsum (uncontaminated)	100	_____
Bottles and cans	100	_____
Other		_____

END DE SECTION

Material Category (or product)	Quantity (kg)	% estimated waste generated	Total quantity of waste (kg)	% reusable waste	% recyclable waste	% estimated waste to bury
Rubbish/Waste						
Concrete						
Asphalt						
Wood pallet						
Plastic wrapping						
Metals						
Total		N/A		N/A	N/A	N/A

Identification of treatment facilities				
Material	Company	Contact name	Telephone	Address
Wood				
Metal				
Cardboard				
Plastics				
Etc.				

Instructions :	
Category of materials (or products)	Identify all materials and products which will be used on-site during works. Indicate category and nature of materials or products.
Quantity	Estimate quantity (in kg) of materials or products used on-site during works.
Estimated percentage of waste to manage	Estimate percentage of waste which will be generated from materials or products.
Total quantity of waste	Determine quantity of waste generated (in kg).
Percentage of reusable waste	Estimate percentage of waste generated that will be reused during works.
Percentage of recyclable waste	Estimate percentage of waste generated that shall be redirected to recycling facilities.
Percentage estimated to bury	Estimate percentage of generated waste that shall be redirected to landfill sites.
Total	Calculate totals for each column
IDENTIFICATION OF TREATMENT FACILITIES	
Identify opportunities to divert each type of waste to manage from landfill. (wood, metal, paper, glass, etc...)	
Identify at least 2 treatment facilities except for landfill for each type of waste.	

Waste follow-up Waybill

Load number	
Transport company	
Trucker name	
Date and hour of departure	
Load description (category of materials)	
Weight (kg)	
Destination	

I certify that information described is exact. I accept to transmit this waybill, signed, by fax or by hand to the following address.

SIGNATURE**

** //By signing this present form, you are certifying that the load of materials described above shall be unloaded at the treatment facility mentioned above and shall be received by a representative of the treatment facility..

TREATMENT FACILITY REPRESENTATIVE'S SIGNATURE***

*** By signing this form, you are certifying that the load of material described above has been delivered to the treatment facility that you represent. You hereby promise to transmit the present signed document by fax or in person to the correspondent listed below.

Return this receipt to :

Indicate name and address

PART 1 - GÉNÉRAL

1.1 Related sections

- .1 Not used.

1.2 Administrative requirements

- .1 Acceptance of Work Procedures :
 - .1 Contractor's Inspection: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Departmental Representative inspection.
 - .2 Departmental Representative Inspection:
 - .1 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 subjected to a trial period during which no abnormality has occurred for 30 consecutive days Equipment and systems have been adjusted and balanced and are fully operational.
 - .4 Owner's personnel has received the necessary training, with operations manuals approved by the Departmental Representative, for the operation of equipment, materials and systems.
 - .5 Work is complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.
 - .2 When Work incomplete according to Departmental Representative, complete outstanding items and request re-inspection.
 - .5 The Contractor will assume all inspection fees related to a second general inspection if it is required for the Departmental Representative to issue the document "Final approval of the work."

1.3 Cleaning

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

PART 2 - PRODUCTS

2.1 Not Used .1 Not used.

PART 3 - EXÉCUTION

3.1 Not Used .1 Not used.

END OF SECTION

PART 1 - GENERAL

- 1.1 Related sections**
- .1 Section 01 45 00 – Quality Control.
 - .2 Section 01 77 00 – Closeout Procedures.
- 1.2 Administrative requirements**
- .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.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.
- 1.3 Actions and informational submittals**
- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
 - .3 Copy will be returned after final inspection, with Departmental Representative's comments.
 - .4 Revise content of documents as required prior to final submittal.
 - .5 Two (2) weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in English and French.
 - .1 The Departmental Representative will issue the Certificate of Completion only after approval of the manuals. The Departmental Representative will hold a sum as a guarantee against the complete submission of documents.
 - .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.
- 1.4 Format**
- .1 Organize data as instructional manual.
 - .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

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

1.5 Contents – Project record document

- .1 Table of Contents for Each Volume: 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.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.6 As-built documents and samples

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

- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative

1.7 Recording information on project record documents

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications and field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.8 Equipment and systems

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics, and limiting conditions.
 - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

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

1.9 Materials and finishes

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

- 1.10 Maintenance materials**
- .1 Spare Parts :
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
 - .2 Extra Stock Materials :
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
 - .3 Special Tools :
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
- 1.11 Delivery, storage and handling**
- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
 - .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
 - .3 Store components subject to damage from weather in weatherproof enclosures.
 - .4 Store paints and freezable materials in a heated and ventilated room.
 - .5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- 1.12 Warranties**
- .1 Develop warranty management plan to contain information relevant to Warranties.
 - .2 Submit warranty management plan, (30) thirty days before planned pre-warranty conference, to Departmental Representative approval.
 - .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder and submit upon acceptance of work and organize binder as follows :
 - .1 Separate each warranty 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 executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (10) days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties until time specified for submittal.
- .7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows :
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems and lightning protection systems.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating :
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.

- .12 Typical response time and repair time expected for various warranted equipment.
- .4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
- .5 Procedures and status of tagging of equipment covered by extended warranties.
- .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification will follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

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 signature.

PART 2 - PRODUCTS

2.1 Not used

- .1 Not used.

PARTIE 3 - EXECUTION

3.1 Not used

- .1 Not used.

END OFSECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 Work covered by this section includes the provision of expertise, materials, labour, equipment, and all that is required for the safe, partial or complete demolition of parts of the structure identified in the structural drawings.
- .2 The work includes removing all debris, transporting and disposing of them off site.
- .3 Unless otherwise specified by the Departmental Representative, the demolition materials become the Contractor's property upon authorization to start work. In this document, the word "remove" means to take the demolition materials away from the site in compliance with the relevant laws, at the Contractor's expense.

1.2 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specifications sections.

1.3 REFERENCES

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

1.4 DOCUMENTS TO BE SUBMITTED

- .1 If required by the Departmental Representative, submit for information purposes, drawings and schematics that provide clear, detailed indications regarding the order in which the structures are to be dismantled, or that indicate the support structures and the underpinning work. All documents shall be submitted in triplicate. A single (1) annotated copy shall be returned to the Contractor. The Contractor shall be responsible for making additional copies and distributing them.
- .2 Drawings of support structures must bear the signature and seal of a qualified Engineer who is a member in good standing of the Ordre des Ingénieurs du Québec.

1.5 SAFEGUARDS

- .1 Take all the necessary measures to prevent any movement or collapse of the various parts of the buildings and other structures to be retained, and to prevent them from sustaining any damage. Provide and install the parts required for reinforcement and support, perform the underpinning work as needed. Repair damaged structures and assume responsibility for injuries that could arise from the demolition work.
- .2 If any danger arises during the demolition work involving the parts of the structure to be demolished or the adjacent structures and services, stop the work and notify the Departmental Representative. Firmly support the structures and only resume work after having obtained the Departmental Representative's authorization.
- .3 If the Departmental Representative deems it necessary, install reinforcement and support materials, and perform the underpinning work required to prevent any movement or breakdown of the structures.
- .4 All parts of the structure under demolition must be solidly braced or supported to prevent any danger of collapse.
- .5 The private supply mains for water, gas and electricity and the other services shall be cut off at the place and in the way specified by the appropriate authorities. These service mains shall be relocated to avoid any damage and shall not constitute a hazard for workers and the public.
- .6 It is forbidden to work on top of any wall, pier or any structural part unless scaffolding is provided on every side at a distance not exceeding 10 feet (3.05 m) from the level at which the work is taking place.
- .7 It is forbidden to leave without taking the necessary protection measure, any wall or other structural part which might collapse under the effect of internal pressure differentials or vibrations.
- .8 The Contractor shall direct the operations while obstructing the streets, alleys and passages as little as possible and never obstructing the accesses. The Contractor shall comply with directives received in this connection from the Departmental Representative and the City.
- .9 Install, in compliance with laws, codes and by-laws, and the directives issued by the Departmental Representative, fences, safety shelters, guard rails, railings, lighting, adequate warning signs, etc., during the execution of the work to completely protect the public and the Departmental Representative against material losses or damage, loss of life or injuries attributable to the Contractor's negligence, carelessness or incompetence or that of his employees.

- .10 The Contractor shall take strict measures to ensure that no materials, products, debris or other objects cause any damage to the environment or to persons and shall keep and hold the City harmless in this regard from all legal proceedings, claims, losses or damage incidental to and resulting from his failure.
- .11 Ensure that the demolition work does not have any negative impact on wildlife, the water table, and adjacent watercourses, and that it does not generate excessive levels of atmospheric or noise pollution.
- .12 Do not dump volatile waste or materials such as mineral spirits, oils, petroleum-based lubricants or toxic cleaning solutions, in watercourses, storm drains or sanitary sewers.
- .13 Ensure that appropriate methods are used to dispose of this type of waste for the duration of the project.
- .14 Do not dump, pump or otherwise dispose of any water containing suspended materials in watercourses, storm drains or sanitary sewers or on adjacent lots.
- .15 Ensure that the evacuation of water and confinement of surface runoff containing suspended materials or other harmful substances, in compliance with the requirements of the appropriate authorities.
- .16 Protect vegetation (trees, plants, shrubs and their foliage) located on the site and adjacent sites, according to indications.
- .17 During the execution of the demolition work, erect temporary protective enclosures to prevent foreign substance or materials from contaminating the air outside the worksite.
- .18 Cover dry materials and waste or dampen as a dust and debris abatement measure. Apply sweeping compound on all temporary access lanes.
- .19 The Contractor is responsible for ensuring worksite safety at all times, including outside working hours.
- .20 Demolition work shall be performed while taking the necessary precautions to prevent any damage to the parts of the structure to be retained.
- .21 Where required, the Contractor shall erect protective panels to preserve the existing facilities or equipment from flying debris.
- .22 If, due to lack of precaution, the frame to be retained is damaged and cannot be reused, the Contractor shall replace it adequately at his expense.

1.6 CONDITION OF THE STRUCTURES TO BE DEMOLISHED

- .1 Perform the demolition of the structures in the condition in which they will be on the day the contract is awarded, regardless of the condition in which they were when the site was inspected prior to submission of the tender.

PART 2 - PRODUCTS

DOES NOT APPLY

PART 3 - PERFORMANCE

3.1 DEMOLITION METHODS

- .1 The Contractor is solely in charge of the means and methods of demolition and assumes sole responsibility for them. However, the Contractor shall provide the Departmental Representative and the proper authorities with demolition plans describing the methods the Contractor intends to use. These means and methods must be prepared by an Engineer who is a member in good standing of the Ordre des Ingénieurs du Québec and bear the Engineer's seal.
- .2 If, in the Departmental Representative's opinion or that of the representatives of the safety organizations, the demolition methods recommended by the Contractor might cause damage or inconveniences to persons, property or the environment, the Departmental Representative or the representatives of the safety organizations may require that these methods be modified or adapted at the Contractor's sole expense.
- .3 The Departmental Representative's involvement shall not release the Contractor from his responsibilities; conversely, the Departmental Representative's lack of involvement does not necessarily constitute approval of these means or methods.
- .4 The demolition methods used by the Contractor must be controllable. The steel members and framework shall be removed and lowered with care, using appropriate equipment with sufficient capacity. Reinforced concrete members shall be demolished progressively. The Contractor shall maintain complete control of all phases of demolition and be able to foresee the effect of his actions on the element under demolition and on the remaining parts. In particular, the Contractor shall avoid overloading parts of the structure with debris in order to prevent them from being damaged.
- .5 Demolish masonry and concrete walls, as well as slabs in small sections. Carefully remove and place on the ground frame structures and other heavy or sizable objects.
- .6 Selling or burning demolition materials on the site is prohibited.

- .7 Gather all contaminated or hazardous materials and remove them from the site while taking all necessary safety measures and complying with the requirements of the authorities involved.
- .8 Delineate the zone to be demolished using saw cuts in the concrete sections. Saw cuts shall not exceed the layer of concrete covering the rebar where the rebar needs to be retained.
- .9 In concrete areas to be demolished, if a saw cut crosses more than a third of the entire concrete section and if patching concrete or mortar needs to be poured against this section, the surface shall be bushhammered or coarse-grit sandblasted before applying a binding agent or pouring.
- .10 Ensure that the demolition does not obstruct the runoff water evacuation system, elevators or electrical and mechanical systems that must remain operational.
- .11 Do not cut the power to utility lines in service or under tension if they do not have to be relocated.

3.2 SEQUENCE OF DEMOLITION WORK

- .1 In choosing the order in which the various parts of the structure are to be demolished, the Contractor shall ensure that the sequence he has selected is such that the removal of a member does not affect the stability of a part still standing, in order to avoid a cascading collapse in this work area.
- .2 The demolition and clearing of part of the work shall be terminated before the supports are removed.
- .3 No beam, column or other member of the frame shall be cut or detached from the others without having been detached beforehand from all its supports.

3.3 ALLOWABLE FLOOR LOADS

- .1 Do not exceed the following floor loads: 4.8 kPa (100 lb/pi²)
- .2 Place solid supports at locations where shear legs, derricks and other lifting equipment, which are needed to perform demolition work, are installed.

3.4 DEMOLITION

- .1 Completely and partially demolish structures according to the indications and specifications contained in the structural drawings.

- .2 At the end of each work day, make sure that no structure can break down or collapse. Close off the parts of the structure not scheduled for demolition to protect them against any damage.
- .3 Perform the demolition so as to generate as little dust as possible and dampen dusty materials.
- .4 Perform the demolition work required to enable the indicated work.
- .5 Remove any equipment, supply lines and other elements that hinder the restoration or repair of existing surfaces, and reinstall them as work progresses.

3.5 BRACING

- .1 If required, install shoring during masonry and concrete demolition work. The Contractor is solely responsible for the building's structural integrity and the stability of masonry or concrete walls during the work.
- .2 If demolition of part of the structure results in the need to install temporary shoring or bracing in an adjacent part of the building scheduled for later demolition, the Contractor shall install this shoring or bracing at his expense.
- .3 Provide the bracing, scaffolding, ladders, chutes and means of transportation required for the work.
- .4 Construct and maintain these structures in compliance with the laws, codes, by-laws and directives of the appropriate authorities.

3.6 DRILLING HOLES IN STRUCTURAL MEMBERS

- .1 When sawing to delineate the opening to be drilled, the Contractor shall take every precaution required to avoid sawing the reinforcement outside the perimeter of the opening.
- .2 Overcuts are not allowed. As a result, delineation drill holes must not be used in the corners of the opening to be drilled in order to ensure saw cuts do not extend beyond the edges of the opening.

3.7 SITE CLEAN UP

- .1 The Contractor shall dispose of all demolition materials and waste in a safe, orderly manner while complying with the requirements of the authorities involved. Clean the site as the work progresses.
- .2 The Contractor shall remove from the site all temporary material and structures no longer required for performance of the contract, as soon as they are no longer needed.

- .3 Clean the adjacent areas to restore them to the condition that existed before the work began, to the Departmental Representative's satisfaction.
- .4 All temporary obstructions installed for the duration of the work shall be removed from sidewalks, streets or public thoroughfares and the latter shall be restored to their original condition.
- .5 The demolished construction site shall be cleaned and cleared of anything that may cause accidents, fires, or harm public health.

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with sections and drawings depicting complementary works, prior or related to the work described.
- .3 The Contractor / Subcontractor shall provide all materials, equipment, labor and services required for the complete execution of demolition so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General Requirements.
- .2 Requirements for structural demolition works.
- .3 Requirements for mechanical and electrical demolition works.
- .4 Demolition specialist has to review all sections of the contract documents even though they are not directly related to his specialty, in default of which he will be deemed to have accepted all conditions therein. Consult Index for a list of all specifications related to his contract.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA S350, Code of Practice for Safety in Demolition of Structures.
- .3 Conform to the requirements of the *National Building Code, Part 8, Construction site Safety Measures* and to Provincial regulations.
- .4 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Assessment Act (CEAA), c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), c. 33.
 - .3 Transportation of Dangerous Goods Act (TDGA), c. 34.
- .5 Construction safety code, last edition in use.
- .6 National Fire Code of Canada

1.4 Designated Hazardous materials

- .1 Remove all materials designated as hazardous or contaminated by environmental protection authorities and evacuate from the site using all safety measures required in order to minimize danger of contamination during their removal and evacuation.

1.5 Drawings

- .1 Submit, for approval, all drawings, details and diagrams indicating the order of demolition work, showing temporary protection works.
- .2 Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
- .3 Drawing shall bear the seal and signature of a professional Engineer licensed in Quebec.

1.6 Protection

- .1 Take all necessary precautions to prevent the displacement, collapse or any other damage to adjacent work, conduits, sidewalks, paving, landscaping and other building parts to be conserved.
- .2 Supply and install all shoring and bracing elements required to execute work as indicated by Departmental Representative.
- .3 Support affected structures and, if safety of structure being demolished or adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
- .4 Execute demolition work in a manner that generates dust as little as possible. Keep materials moist.
- .5 Provide required temporary protection in order to prevent all infiltration of water, dust or debris inside the existing buildings.
- .6 Use soundproof mats to minimize demolition work noise.
 - .1 Coordinate authorized periods of "noisy work" with the Departmental Representative.
- .7 Lower demolition materials to the ground by means of approved mechanical apparatus.
- .8 Protect all building apparatus, mechanical and electrical installations as well as adjacent work.
- .9 Erect screens, railings supporting elements and other required protective devices, according to section 01 56 00 - Temporary barriers and enclosures. Ensure their maintenance, displacement and removal when work is complete.
- .10 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on temporary roads.
- .11 Use reinforced canvases and ballast to withhold all materials that can be moved by the wind.

- 1.7 Waste management and disposal** .1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The works of this section shall be made in accordance with the requirements of this plan.

PART 2 - PRODUCTS

- 2.1 Not used** .1 Not used.

PART 3 - EXÉCUTION

- 3.1 Demolition works**
- .1 Demolition works include for each building, without limitation, exterior demolition work as described and indicated on the drawings.
 - .2 At the completion of the work, the removal of temporary walls and any other temporary elements, on all floors affected by the work, unless otherwise indicated.
 - .3 The coordination of work on building elements and equipment to be conserved, removed, stored and reinstalled.
 - .4 Coordinate architectural demolition work with electromechanical and structure demolition as outlined in structural, mechanical and electrical documents.
 - .5 The disposal of materials and demolition waste must conform to section 01 74 21 - Construction / Demolition Waste management and disposal.
- 3.2 Preparation**
- .1 Carry out site inspection and verify with the Departmental Representative the work to be removed and evacuated, the work to be salvaged and the work to remain in place.
 - .2 Ensure that all temporary protections are in place.
 - .3 Locate and protect public services and building networks. As required, protect networks that remain on the site in a manner that keeps them in functioning order.
 - .4 Disconnect the electrical, communications and mechanical conduits or other electrical or mechanical apparatus that may hinder the execution of work of the present section in accordance with regulations and norms of the appropriate authorities. Install warning panels on electrical conduits and equipment that shall remain live for the duration of the work. Provide required temporary support.

- .5 When work can disturb users in adjacent areas take all necessary measure before beginning work to ensure that they will not be affected by the work.

3.3 Roofs removal

- .1 Take all necessary precautions when removing membranes and existing roof elements to avoid damaging existing facade materials.

3.4 Safety

- .1 Execution of work in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Observe and respect the safety requirements of National Building Code (NBC) 2005, Part 8, or given by provincial government authority, of the Workplace health and safety commission (CNESST) or municipal authorities, concerning construction work. Where regulations are contradictory or diverge, the more stringent requirements shall apply.
- .3 Ensure that no part of the work is put under a load that may compromise its solidity or that may cause permanent deformity.
- .4 Design and erect temporary structures in accordance with CSA S269.1.
- .5 Design and erect scaffolding in accordance with CSA S269.2.

3.5 Demolition and salvage

- .1 Dismantle roofs elements of existing buildings required to enable the realization of new works.
- .2 Demolish structural elements upon approval from the Departmental Representative.
- .3 Demolished in order to raise as little dust as possible and wet materials.
- .4 Demolish parapets, walls and concrete work in small parts. Prior to the demolition work, make vertical cut with a saw on the full height and thickness of the wall at each end of the section of wall to be demolished. Carefully remove and lower to the ground masonry work, concrete and other heavy or large sized objects.
- .5 At the end of each work day, make sure that no work may sag or collapse. If required, temporarily close exterior wall openings in order to protect the inside against inclement weather at all times.
- .6 During the demolition, the Contractor shall ensure that no debris can fall into the lower floor ceilings. The Contractor will be responsible for any related damages.
- .7 Remove materials, conduits and other elements that may hinder the reconditioning or reparation of existing surfaces, and replace such elements as work progresses.
- .8 Refer to specifications and demolition drawings to learn which materials to salvage for re-use. See also Section 01 11 01 - Work related general information.

- .9 Remove elements to be salvaged and store them in accordance with the Departmental Representative indications.
- .10 All existing elements to be deconstructed and/or dismantled shall be stored in a dry shelter and protected from damage. All elements damaged by improper storage during the work shall be replaced by the Contractor.
- .11 Retool edges of building components partially demolished in order to facilitate the placement of new elements.
- .12 Where required, repair work damaged through the execution of demolition work in accordance with the directions of the Departmental Representative.
- .13 Collect contaminated or hazardous materials as defined by the competent authorities for environmental protection and dispose of site according all necessary safety measures.
- .14 At all times, protect the bridging surfaces and openings of the existing open-air parapets until weatherproofing works are carried out.
 - .1 Do not proceed with deconstruction / dismantling of a section of the envelope if the installation of the new sections of exterior walls or roof cannot be carried out on the same day.

3.6 Demolition features

- .1 The Contractor shall take note of the work of partial demolition from available documents in the tender. In addition, the Contractor shall realize by visiting the site, the extent of the work and its characteristics.
- .2 Perform demolition work by sawing and drilling. Jackhammer demolition work is prohibited.
- .3 The Contractor shall consider at any time that the work is carried out in occupied buildings. Perform work to minimize inconvenience for staff and users.

3.7 Make good patching and repair

- .1 Following the demolition works, repair and make good existing surfaces and structures outside the demolition areas as they were in prior to the commencement of work or in the condition of adjacent undisturbed surfaces.

3.8 Cleaning

- .1 Remove materials, conduits and other elements that hinder the restoration or reparation of existing surfaces, restore as work progresses.
- .2 At the end of each workday, ensure Work is stable and secure. At all times, ensure protection from exterior elements, water and dust of parts that are not to be demolished.
- .3 Keep grounds clean and in order at all times.. See Section 01 74 11 – Cleaning.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 Work covered by this section includes the provision of all materials, equipment supplies and services, labour and transportation to fully carry out the following:
 - .1 Design, construct, provide, assemble, dismantle and maintain all formwork, scaffolding and falsework required for the construction of all structures specified or shown on the drawings.
 - .2 Install sleeves, anchor bolts, anchoring components, anchor plates, embedded components, grooves, sockets, angle irons, accessory parts, drains and all parts embedded in concrete shown on the plans of all disciplines or described in the invitation to tender document.

1.2 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specifications sections.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-O86.1-01 (supplement CAN/CSA –08651-05), Engineering Design in Wood (Limit States Design).
 - .3 CSA O121-M1978, Douglas Fir Plywood.
 - .4 CSA O151, Canadian Softwood Plywood.
 - .5 CSA O153-M1980, Poplar Plywood.
 - .6 CSA 437.0-93, Standards on OSB and Waferboard.
 - .7 CSA S269.1-1975, Falsework for Construction Purposes.
 - .8 CAN/CSA-S269.3-M92, Concrete Formwork.

- .9 CAN/CSA-S269.2-M87, Access Scaffolding for Construction Purposes.
- .2 Council of Forest Industries of British Columbia (COFI)
 - .1 COFI, Exterior Plywood for Concrete Formwork.
- .3 Quebec Official Publisher
 - .1 S-2.1, r.6; Safety Code for the construction industry.

1.4 CONTRACTOR'S RESPONSIBILITIES

- .1 Assume responsibility of concrete formwork and falsework. The Departmental Representative's review of the formwork and falsework shall not release the specialized Contractor from his responsibility regarding the provision of structures that fully comply with the drawings and specifications.
- .2 The Contractor shall be aware of all laws and regulations that apply to the design and construction of formwork and falsework and shall comply with these requirements. Comply with regulations including the Quebec Safety Code, S-2.1, r.6, regarding shoring of concrete formwork.
- .3 Before using the formwork and falsework, give the Departmental Representative a signed statement written by an Engineer who is a member in good standing of the Ordre des Ingénieurs du Québec, and which bears the Engineer's seal. The statement should certify that the formwork and falsework comply with the signed and sealed drawings, and that they may be used for their intended purposes.

1.5 ARCHITECTURAL CONCRETE

- .1 The concrete used to build the following components shall be considered architectural concrete.

COMPONENTS	DESCRIPTION
<ul style="list-style-type: none">▪ Staircase▪ Shear walls▪ Beams / columns	All surfaces of these components above the main floor level.

1.6 SHOP DRAWINGS

- .1 Produce shop drawings of formwork and falsework, which describe all the necessary components required to perform the work in compliance with the drawings and specifications.

- .2 Have an Engineer who is a member in good standing of the Ordre des Ingénieurs du Québec sign these shop drawings and affix his seal.
- .3 Before performing concrete formwork or falsework, submit these drawings to the Departmental Representative for review and comments. All documents shall be submitted in triplicate. A single (1) annotated copy shall be returned to the Contractor. The Contractor shall be responsible for making additional copies and distributing them.
- .4 The shop drawings shall indicate, show or include the construction method and work schedule, procedures relating to shoring, the removal of forms, and the reinstallation of supports, the materials, the specific architectural characteristics of visible surface finishes, the location of joints, fasteners, ties and interior coatings, and the location of embedded falsework components. Comply with CSA S269.1 falsework drawing requirements. Comply with CAN/CSA-S269.3 formwork drawing requirements.
- .5 Shop drawings shall indicate, show or include formwork data such as the allowable speed and temperature at which concrete may be placed into the forms.
- .6 In addition to the details requested in 1.6.4., indicate on the shop drawings, at each location where the falsework is connected or leaning on an existing structure or a structure under construction, or already completed, the intensity and direction of maximum loads exerted on the load-bearing structure, taking into account construction site loads.
- .7 Specify the order in which the concrete formwork and falsework are to be assembled and dismantled, according to the Departmental Representative's directives.

1.7 FORMWORK AND FALSEWORK DESIGN

- .1 Design the falsework according to trade practices making sure not to exert abnormal stress on the structure under construction.
- .2 Take construction sequences into account when designing the falsework. Describe on the shop drawings or in an explanatory note how and in what order to use the formworks, the position of specified construction joints and the falsework and formwork reuse principle. Submit the explanatory note and the relevant shop drawings to the Departmental Representative for review.
- .3 For vertical components, vertical construction joints shall be a maximum of 18 m apart. Submit the location of construction joints to the Departmental Representative.
- .4 The specialized Contractor is entirely responsible for engineering, locating and building the formworks.

- .5 The formworks are engineered to sustain the loads and lateral pressures described in Section 102 of the American publication "Recommended Practice for Concrete Formwork" (ACI 347). Wind loads are those recommended by the latest edition of the National Building Code.
- .6 Engineering considerations and the allowable loads shall comply with Section 103 of the above-mentioned U.S. publication.
- .7 Every aspect of construction shall at all times comply with various government standards (municipal, provincial and federal standards) that govern the specialized Contractor's duties regarding worker safety on construction worksites.

1.8 CONFORMITY CERTIFICATE

- .1 When required by CNESST, the conformity certificate of the anchor bolts must be prepared by an engineer member of the "Ordre des ingénieurs du Québec" hired by the specialized contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Submit all formwork material in direct contact with fresh concrete to the Departmental Representative for review.
- .2 Construction Lumber:
 - .1 in contact with concrete: form plywood.
 - .2 other: structural timber not warped and sawed straight
- .3 Formwork Materials
 - .1 To pour concrete with no particular architectural characteristics, use forms made of wood and wood products that comply with the CSA O121 CAN/CSA-O86 CSA 0437 CSA O153-M1980 standards.
- .4 In the case of exposed formwork surfaces (architectural concrete), use new formwork materials. The forms shall be made of 20 mm thick 1200 x 2400 plywood, sanded and covered with a coat of high quality form release oil. For lining only, use 7 mm thick three-ply plywood. Exposed formwork surfaces are those indicated in Section 1.5 of these specifications and those shown on the architectural drawings.

- .5 Interior formwork liners
 - .1 Plywood: Douglas fir in compliance with the CSA O121-M1978 standard.
 - .2 Waferboard: that complies with the CSA O437.0-93 standard.
- .6 Form release agent: non-toxic, biodegradable, and with low VOC content.
- .7 Form release oil: Colourless, non-toxic, biodegradable, low VOC content, mineral oil free from kerosene, whose viscosity is 15 to 24 mm²/s at 40°C and whose flashpoint in an open crucible is at least 150°C.
- .8 Falsework Materials: in compliance with the CSA S269-1-1975, Table 1 standard. Identify the materials using a quality index or provide certificates, trial data or other attestations of compliance.
- .9 Form release oil with chemical properties, containing compounds that react with the free lime in the concrete to form insoluble soaps in the water and prevent the concrete from adhering to the form.
- .10 Form ties can be:
 - .1 metal ties embedded in concrete, designed to be broken at least 25 mm under the surface of the hardened concrete after the forms have been removed;
 - .2 fixed or variable length metal ties whose ends are moveable bolts. The part of the tie embedded in the concrete is embedded at least 25 mm under the surface of the hardened concrete;
 - .3 Spacety and Acrow-Richmond brand ties equipped with moulded water barriers at each end, for all the work. Both ends of these formwork ties shall be equipped with plastic cones at least 25 mm in diameter, which provide a minimum 25 mm of coverage on the broken end of the tie embedded in the concrete.
- .11 In the case of an exposed formed surface (architectural concrete), type 1) or 2) ties shall be equipped with plastic cones a maximum 38 mm in diameter, which provide a minimum 25 mm of coverage.
- .12 In the case of concrete that requires architectural features, use ties equipped with plastic cones and pale grey concrete plugs.
- .13 Sleeves, fasteners, anchors and other parts embedded in concrete meet the requirements of the drawings and specifications, and comply with Sections 6.2 and 6.7 of the CAN/CSA-A23.1-04/A23.2-04 standard. Sleeves embedded in concrete shall be equipped with a steel water barrier able to withstand a minimum of 60 kPa of hydrostatic pressure or the pressure in the line if it is greater.

PART 3 - PERFORMANCE

3.1 CONSTRUCTION AND ASSEMBLY

- .1 Unless otherwise specified, build and use the formwork in compliance with the CAN/CSA-A23.1/A23.2 standard.
- .2 Before using the forms, clean and treat the form surfaces with form release oil in compliance with Section 6.5.3.3 of the CAN/CSA-A23.1/A23.2 standard.
- .3 Before starting formwork and falsework construction, check the alignments, levels and centrelines, and make sure the dimensions match those indicated on the drawings.
- .4 Build and assemble the formwork in compliance with the CAN/CSA-S269.3-M92 standard to obtain finished concrete structures whose shape, dimensions and levels comply with the indications and are situated in the locations indicated on the drawings and specifications. Properly truss the forms and join them so as to keep the desired position and shape while the concrete is being poured and keep them trussed until the concrete has set.
- .5 Location tolerances and tolerances regarding the geometric configuration of components embedded in concrete after removal of the forms according to indications in the drawings shall comply with Section 6.4 of the CAN/CSA-A23.1/A23.2 standard.
- .6 Manufacture and build the falsework and assemble it in compliance with the CSA S269.1-1975 standard and the COFI "Exterior Plywood for Concrete Formwork" guide.
- .7 Obtain the Departmental Representative's written approval before pouring concrete directly on the ground or making openings in a form component, which are not indicated on the drawings, but which may be required for construction purposes.
- .8 Align the formwork joints and seal them to prevent any loss of cement. The formwork shall contain as few joints as possible. Adequate reinforcements shall be installed behind the joints between the plywood panels to ensure that the plywood panels form a smooth, continuous surface capable of withstanding all phases of the pour without losing their shape or shifting.
- .9 Before pouring concrete directly on the ground, level the walls and the bottom of the excavated area, then remove the loose soil.
- .10 Refer to the architectural drawings regarding concrete components with visible architectural finishes.
- .11 The footings and supports installed on the ground shall not be assembled on a frozen surface.

- .12 Design lot drainage to prevent the ground from being washed away from under the footings and the supports installed at ground level.
- .13 Arrange all formwork joints and ties symmetrically on all concrete surfaces that will be visible (architectural concrete) after the forms are removed. Submit for inspection by the Departmental Representative.
- .14 Build the grooves, dovetail joints, mouldings, mortises and tenons, openings, drips, recesses, expansion and construction joints according to the indications of the drawings and specifications. See Section 03 25 00 for isolation or expansion joint requirements.
- .15 Place the formwork, trusses and supports so workers are able to remove them without causing any shocks or damage to the concrete.
- .16 Forms may be reused except in the case of exposed formed surfaces. They may be reused after sufficient cleaning, providing their surfaces are not cracked or rough; cracked or rough forms must be trimmed and patched to the Departmental Representative's satisfaction.
- .17 Install openings in the forms or other devices to enable workers to inspect and clean the forms, and to enable concrete placement and consolidation.
- .18 Unless otherwise indicated, provide and install in the forms the sleeves, fasteners, anchors and other embedded components required in the drawings and/or specifications of all disciplines, in compliance with Section 6.7 of the CAN/CSA-A23.1/A23.2 standard. Immediately before pouring the concrete, use surveyor's equipment to check the dimensions required in the drawings and specifications and make sure that these parts meet specified tolerances.
- .19 Before closing the forms, notify the Departmental Representative beforehand to allow him to perform the required inspections. The pouring of the concrete into the forms shall not take place before the Departmental Representative's written authorization has been received.
- .20 Use 25 mm bevelled moulding for exterior corners and/or 25 mm corner guards for the inside corners of beams, walls, slabs, joints and columns, unless otherwise indicated.
- .21 Slab and beam formwork shall have a camber of 6 mm per 3,000 mm of length, unless otherwise indicated. Keep the height of the beam and the thickness of the slab even throughout the length of the cambered surface.
- .22 Build forms for the architectural concrete components and install the ties according to the indications or directives provided. At times, the location of the joints may preclude the use of standard-sized panels or reduce the maximum allowable space between ties.

3.2 ANCHORS, SLEEVES AND EMBEDDED PARTS

- .1 Provide and install in the forms, the sleeves, fasteners, anchor plates and other embedded components required in the drawings and/or specifications, in compliance with Section 6.7 of the CAN/CSA-A23.1/A23.2 standard. The work shall comply with Section 03 25 00.
- .2 Provide and install in the forms, the anchor bolts for fasteners and machinery as shown and detailed in the drawings, in compliance with Section 6.7 of the CAN/CSA-A23.1/A23.2 standard.
- .3 Install in the forms, the sleeves, conduits and ducts provided by others at the levels and locations shown on the mechanical, electrical, procedural and architectural drawings.
- .4 In all cases, comply with the installation tolerances specified in Article 6.7.3 of the CAN/CSA A23.1/A23.2 standard.
- .5 In slabs, place conduits between the upper and lower rows of reinforcement.
- .6 Install sleeves, conduits and ducts in compliance with the following requirements:
 - .1 The exterior diameter of the sleeves, conduits or ducts shall not exceed one third of the thickness of the beams, slabs or walls in which they are embedded;
 - .2 The centreline between adjacent components must be greater than or equal to three diameters;
 - .3 These parts shall not be positioned in a manner that reduces the strength of the structure;
 - .4 These parts shall not be embedded in ground slabs exposed to the weather;
- .7 If the requirements of Article 3.2.6 cannot be met, notify the Departmental Representative and await his instructions on how to proceed.
- .8 Make sure aluminium sleeves, conduits or ducts embedded in concrete are covered or adequately coated to protect them against aluminum corrosion.
- .9 Submit a sleeve location plan for approval by the Structural Departmental Representative.
- .10 Coordinate with subcontractors responsible for their supply the delivery (to the construction site) and the installation in the formwork of accessory parts.
- .11 It is forbidden to place in the formwork any accessory parts which are not indicated in the drawings, or required in the specifications or the drawings referred to in Sub-article .2 above, unless the Departmental Representative so authorizes.

3.3 REMOVAL OF THE FORMS AND REINSTALLATION OF THE SUPPORTS

- .1 Remove the formwork and dismantle the falsework in compliance with Article 6.5.3.5 of the CAN/CSA-A23.1/A23.2 standard, unless otherwise indicated.
- .2 Do not disturb or remove the formwork or falsework as long as the concrete has not become strong enough to support its own weight and the load it supports.
- .3 Have the Departmental Representative authorize the removal of the formwork and falsework.
- .4 Leave the formwork in place after the concrete has been poured for the following lengths of time:
 - .1 Walls and sides of beams: 3 days;
 - .2 Slabs and beam soffits: 28 days or 3 days if all the supports removed to enable the removal of each of the form panels are immediately reinstalled within 30 minutes or less, and remain in place until expiry of the aforementioned 28-day period;
 - .3 Columns: 7 days;
 - .4 The periods of time specified above represent a cumulative number of hours, days, or fractions of days, not necessarily consecutive, during which the ambient temperature is maintained above 10°C.
- .5 Reinstall all the supports required when frame components might be subject to additional loads during construction of the structure.
- .6 Notwithstanding the provisions of Sub-article .4 above, do not remove the forms unless the Departmental Representative authorizes their removal because he is satisfied with the measures taken to ensure the concrete cures properly and the concrete is protected against cold or heat and the weather.
- .7 However, the Departmental Representative may cancel the provisions of Sub-article .4 above if the non-destructive trials on the concrete placed in beam and slab forms indicate that the concrete has achieved 80% of the compression strength specified in Section 03 30 00 of these specifications. The non-destructive trials mentioned above shall have a recognized value and be approved by the Departmental Representative; he will determine beforehand the locations where they are to be performed. The costs of all these trials shall be borne by the specialized Contractor.
- .8 Even when the Departmental Representative has authorized him to remove the forms, the specialized Contractor remains solely responsible for all damage caused to concrete components if action is taken prematurely.

- .9 Depending on weather conditions, the placement of the concrete and curing conditions, the Departmental Representative may specify a minimum period of time that must elapse before the forms are removed from the various pours.
- .10 Reuse the formwork and falsework, notwithstanding the requirements of the CAN/CSA-A23.1/A23.2 standard.
- .11 The maximum spacing between the supports reinstalled at each of the main load inflection points is 2400 mm.

3.4 FILLING OF FORM TIE HOLES

- .1 Use Sikatop 122 mortar to fill all cone-shaped cavities left after removal of the plastic cones at the ends of the form ties. Moisten beforehand as required by the manufacturer. Carefully smooth the surface after applying the mortar so that it blends in with the adjacent concrete surfaces. Allow to cure.
- .2 In the case of exposed surfaces (architectural concrete), check with the Departmental Representative whether the cone-shaped cavities need to be filled. Have the Departmental Representative approve the filling products used. The products used shall be of the same texture and colour as the concrete utilized.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 Provide all the expertise, labour, materials, products, equipment and services needed to supply, detail, manufacture and install all the reinforcement steel shear heads, dowels, metallic wires that must be incorporated in the concrete components indicated in the structural drawings.

1.2 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specifications sections.

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 315-99, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
- .2 American National Standards Institute/American Concrete Institute (ANSI/ACI)
 - .1 ANSI/ACI 315-99, Details and Detailing of Concrete Reinforcement.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 775/A 775M-07b, Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction / Methods for Test and Standard Practices for Concrete.
 - .2 CSA-A23.3-04, Design of Concrete Structures for Buildings.
 - .3 CSA G30.3-M1983 (R1998), Cold-Drawn Steel Wire for Concrete Reinforcement.
 - .4 CSA G30.5-M1983 (R1998), Welded Steel Wire Fabric for Concrete Reinforcement.

- .5 CSA G30.14-M1983 (R1998), Deformed Steel Wire for Concrete Reinforcement.
- .6 CSA G30.15-M1983 (R1998), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- .7 CAN/CSA-G30.18-M92 (R1998), Billet-Steel Bars for Concrete Reinforcement.
- .8 CAN/CSA-G40.21-04, Structural Quality Steels.
- .9 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .10 CSA W186-M1990 (R1998), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .5 Institut d'acier d'armature du Québec
 - .1 Manuel des normes recommandées, most recent edition.
- .6 Quebec Construction Code - Chapter I, Building and National Building Code of Canada (amended)
 - .1 Code de Construction du Québec - Chapter I, Building, and National Building Code - Canada 2010 (amended) as well as the User's Guide - NBC 2010: Comments on the calculation of structures (Part 4 of Division B).

1.4 SAMPLING, TRIALS, AND INSPECTION

- .1 Provide the Departmental Representative with free access to the plant and the construction site at all times to enable him to verify, examine and supervise the quality of materials and their manufacture, and if required, take samples for testing, trial and analytical purposes.
- .2 Pouring of the concrete is not authorized before the Departmental Representative has inspected and approved the reinforcement in place.
- .3 At his request, send the Departmental Representative one (1) copy of the certificates issued by the steel mill attesting to the chemical composition and physical properties of the steel used to manufacture the reinforcement.
- .4 Upon request, inform the Departmental Representative regarding the proposed source of supply for the materials to be provided.

1.5 SHOP DRAWINGS

- .1 Submit for review and comments by the Departmental Representative, all shop drawings for all steel reinforcement for the work in compliance with the following requirements.
- .2 The format of the reinforcement drawings shall be the same as that of the drawings upon which they are based. The full project title and the name Departmental Representative, Professionals and the specialized Contractors shall appear on each drawing.
- .3 The drawings submitted shall include three (3) copies of each reinforcement drawing. The drawings shall be accompanied by three (3) photocopies of each purchase order. One (1) corrected copy of the shop drawings shall be returned to the Contractor. The Contractor shall be responsible for making any additional copies he requires.
- .4 The reinforcement drawing shall clearly indicate:
 - .1 The number, nominal diameter, length, position, spacing and bending details of each type of bar shown on the drawings.
 - .2 The bar-supports, separators, additional bars and other accessories required to support and fasten the reinforcements while the concrete is being poured.
- .5 When not specified in the plans:
 - .1 Reinforcement overlap and sealing lengths shall comply with the requirements of Articles 7 and 12 of the CAN/CSA-A23.3 standard. Unless otherwise indicated on the drawings, all overlaps shall be Class B (1.3 Lc), in compliance with Table 17b: pre-stressed overlapping requirements for upper reinforcement in the Reinforcing Steel Institute of Canada's manual of standard practice.
 - .2 Overall dimensions of hangers, ties and coils shall comply with the minimum concrete cover thicknesses stipulated in Article 6.6.2 of the CSA-CSA A23.1/A23.2 standard.
- .6 Unless otherwise indicated in the drawings, the hooks required at the end of certain bars, including hangers, ties and spirals are all "standard hooks", which shall comply with the description provided in Articles 6.6.2 of the CSA A23.1/A23.2 standard.
- .7 The reinforcement shall be marked so that it is quick and easy to find on the purchase orders.
- .8 The Contractor shall provide shop drawings so the Departmental Representative has at least ten (10) working days to examine and comment on the shop drawings, which are submitted at each phase of the concrete work.

- .9 The reviewed shop drawings, which may or may not be annotated by the Departmental Representative, shall be returned to the specialized Contractor, who shall revise these drawings and resubmit them to the Departmental Representative for review and comment, if required. However, if the Departmental Representative finds that too many revisions are required, he shall return the drawings without annotating them; in addition, if the drawings need to be submitted more than twice, the Departmental Representative shall withhold funds from the specialized Contractor to pay for the cost of the Departmental Representative's additional reviews.
- .10 The specialized Contractor is solely responsible for the accuracy of his drawings; he cannot claim any supplement for delays caused by the discovery, on site, of errors or omissions on his own drawings, even if they have been reviewed by the Departmental Representative.
- .11 Unless otherwise indicated, use steel reinforcement details that comply with the most recent edition of the "Manuel des normes recommandées" published by the Institut d'acier d'armature du Québec.
- .12 Wait for final approval of the shop drawings before cutting and bending the rebar.
- .13 Submit the steel schedules that match the various shop drawings at the same time as the shop drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

Description	Standards
▪ High adherence billet-steel reinforcement bars, regular category (R).	CAN/CSA G30.18 Grade 400
▪ Weldable high adherence steel reinforcement bars made of low alloy weldable steel, weldable category (W).	CAN/CSA G30.18 Grade 400
▪ Tie wire, annealed cold-drawn steel wire	CSA G30.3
▪ High adherence steel wire for concrete reinforcement, 16 gauge	CSA G30.14
▪ Welded steel wire fabric provided in flat sheets only	CSA G30.5
▪ High adherence welded steel wire fabric in flat sheets only	CSA G30.15
▪ Non-prestressed galvanized reinforcement	CAN/CSA G164

Description	Standards
▪ Chairs, bar chairs, bar supports, spacers (rustproof)	CSA A23.1/A23.2
▪ Metal coupling	Reinforcement steel, "recommended standards manual" subject to the Departmental Representative's approval
▪ Steel fibres	ASTM A820/A820M, C-1116 NOVOCON 1050 (FE) type of SI Concrete Systems

2.2 SUBSTITUTES

- .1 Obtain the Departmental Representative's written approval to substitute specified bars with bars of different dimensions, and to change spacing, overlapping or bending specified on the drawings.

2.3 FORMING

- .1 Form the bars at the factory, in compliance with requirements of the CAN/CSA-A23.1/A23.2 standard.
- .2 Unless otherwise indicated, forming tolerances are those indicated in Chapter 6 of the "Manuel des normes recommandées" published by the Institut d'acier d'armature du Québec. Bars that do not comply with these tolerances shall be rejected.

2.4 IDENTIFICATION

- .1 Clearly identify bar and wire fabric lots to conform to the shop drawings and steel schedules before shipping them to the construction site.
- .2 Use factory-labelled reinforcement bars. The label identifies the size, quality and manufacturer of the bar. All unlabelled bars shall be rejected.

PART 3 - PERFORMANCE

3.1 ON-SITE BENDING

- .1 Unless otherwise expressly indicated or authorized by the Departmental Representative, do not bend steel reinforcement bars on the construction site.
- .2 It is forbidden to bend rebar partially embedded in hardened concrete on site unless the Departmental Representative has authorized this procedure.

3.2 MANUFACTURE OF REINFORCEMENT

- .1 The manufacture of the reinforcement shall not start until the Departmental Representative has reviewed the drawings of this reinforcement.
- .2 Cut and bend the bar in strict compliance with the details shown on the drawings and in accordance with the requirements of the CAN/CSA-A23.1/A23.2 standard.
- .3 No substitution of the bars shown on the reinforcement drawing shall be allowed without the Departmental Representative's authorization.
- .4 Take every precaution to avoid deforming or dirtying the reinforcement during transportation, handling and storage.

3.3 REINFORCEMENT INSTALLATION

- .1 Assemble and install the rebar with care and tie them with black annealed drawn steel wire. Use a pattern and number of supports that comply with Section 6.6.8 of the CAN/CSA-A23.1/A23.2 standard.
- .2 Install the rebar and keep them in place during the pouring of the concrete in compliance with the tolerances stipulated in Section 6.6.8 of the CAN/CSA-A23.1/A23.2 standard.
- .3 Unless otherwise indicated on the drawings or in Section 3.6 of these specifications, the minimum concrete cover thickness around reinforcement bars is that stipulated for each of the various structural components in Article 6.6.6 of the CAN/CSA A23.1/A23.2 standard.
- .4 If required, before placing the rebar in the formwork, remove all excess rust, scale, mud, oil and any other dirt likely to reduce the concrete's adherence.
- .5 Use an adequate number of support bars of the height and rigidity required to ensure all concrete coverage of the rebar complies with the thicknesses stipulated on the drawings and in the standards.
- .6 Have the Departmental Representative approve the rebar and its installation, before pouring the concrete. The Departmental Representative shall have 48 hours to approve the steel reinforcement before the concrete is poured.

3.4 OVERLAPS

- .1 Overlap the reinforcement as indicated on the drawings and typical details.

- .2 Overlapping lengths and extension lengths of bars beyond critical points shall comply with the CSA-A23.3 standard. Unless otherwise indicated on the drawings, all overlaps shall be Class B (1.3 Lc), in compliance with Table 17b: tension overlapping requirements for upper reinforcement in the Reinforcing Steel Institute of Canada's manual of standard practice.
- .3 Obtain the Departmental Representative's approval for the locations of reinforcement overlaps other than those shown on the drawings.
- .4 Overlap at least 10% of the surface of the wire fabric sheets, but never less than one mesh width.

3.5 WELDING

- .1 Do not weld steel rebar unless authorized in writing by the Departmental Representative.
- .2 Where permitted by the Departmental Representative, perform the rebar welding work in compliance with Section 6.6.10. of the CAN/CSA-A23.1/A23.2 standard and the requirements of the CSA W186 standard. When welding is performed, the use of category W weldable bars is mandatory.
- .3 All welding work shall be assigned to a company accredited by the Canadian Welding Bureau and shall be performed in compliance with the requirements of the most recent version of the CSA W186 standard. Prior to starting any welding work, submit to the Departmental Representative for verification, all details regarding the welds to be performed. In this case, the steel reinforcement to be welded shall comply with the requirements of the most recent version of the CSA G30.16 standard. Pre-heat all steel reinforcement as required by these standards.

3.6 REINFORCEMENT COVERAGE

- .1 Unless otherwise indicated on the drawings, the reinforcement bars shall be installed at the following specific distances from the surface of the concrete:

	Coverage
A) Concrete poured directly on the ground	75 mm
B) Concrete exposed to the ground or the weather	50 mm
a) Bars larger than 15 M in walls and slabs or main bars in beams and columns	
b) Bars 15 M or smaller	40 mm
c) Ties, hangers and spiral reinforcement	40 mm

	Coverage
<p>C) Concrete not exposed to the weather Class N</p> <p>a) Slabs (other):</p> <ul style="list-style-type: none"> - top steel rebar - bottom steel rebar <p>b) Curbs and coping</p> <p>c) Beams (main steel rebar)</p> <p>d) Columns (main steel rebar)</p> <p>e) Walls</p> <p>f) Ties, hangers and spiral reinforcement</p>	<p>25 mm</p> <p>25 mm</p> <p>50 mm</p> <p>40 mm</p> <p>50 mm</p> <p>25 mm</p> <p>30 mm</p>
<p>D) Concrete exposed to chlorine (exposure classes C-1, C-XL, C-3 and C-4)</p>	<p>The reinforcement coverage shall not be less than any of the following values;</p> <ul style="list-style-type: none"> - 60 mm - twice the nominal diameter of the reinforcement - twice the maximum nominal diameter of aggregate

- .2 For conditions A-B-C of the preceding table, the ratio between coverage and the maximum size of the aggregate as well as the ratio between the coverage and the nominal diameter of the bars shall be at least 1.5 for concrete exposed to the ground and weather, and 1.0 for concrete not exposed to the ground and weather.

3.7 STORAGE AND DELIVERY

- .1 Deliver the reinforcement and wire fabric to the construction site in clearly identified lots.
- .2 Handle the reinforcement and wire fabric with care to avoid deforming them.
- .3 As soon as they are delivered on site, properly stack the steel reinforcement and wire fabric on wood skids to protect them against rust and keep them off the ground.
- .4 When there is snow, cover all stored steel with a woven tarp to protect it from the weather.
- .5 During transportation and handling, use a covering to protect the parts of the bars coated with epoxy and paint.

3.8 CLEANING

- .1 In order for the pouring of the concrete to take place, the condition of the reinforcement bars shall comply with Section 6.1.5 of the CAN/CSA A23.1/A23.2 standard.
- .2 If required, clean the reinforcement immediately before the concrete is poured.

3.9 REINFORCEMENT DOWELLING

- .1 The installation of reinforcement dowels in concrete that has already been poured shall be performed using a Hilti HIT, HY-150 epoxy-based system.
- .2 The sealing length of the dowels is that indicated in the sealing lengths table provided on the drawings.
- .3 Certain types of dowels shall have conical threads designed to work with "Terminator" type anchors by Lenton equipped with conical threads.

3.10 ON-SITE TOUCH-UPS

- .1 Using a compatible finishing product, touch up damaged or cut ends of galvanized or epoxy-coated reinforcement to provide a continuous coat.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 Provide all the expertise, labour, materials, products, equipment and services needed to supply and deploy all the accessories specified and detailed on the drawings for all the disciplines, regardless of whether or not they are described in this section of the Specifications.

1.2 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specifications sections.
- .2 Comply with the general requirements and the requirements of all documents to which reference is made.

1.3 MANUFACTURED PRODUCTS

- .1 The brand of each of the manufactured products described in this section of the specifications shall be approved by the Departmental Representative. At the Departmental Representative's request, provide him with the technical description and/or samples of these products as well as certified copies of the results of analyses and trials conducted by independent laboratories attesting that these products comply with the manufacturing standards that apply to them. All documents shall be submitted in triplicate. A single (1) annotated copy shall be returned to the Contractor. The Contractor shall be responsible for making additional copies and distributing them.

1.4 FASTENERS

- .1 In all cases where fasteners not indicated on the drawings are required in concrete components to provide vertical and/or lateral support for architectural elements, pre-fabricated concrete components, parts for mechanical, electrical, or other equipment, the structural design and engineering of these fasteners are the full and sole responsibility of the manufacturer who shall provide them, and shall in no way confer liability on the Departmental Representative or his representatives.
- .2 The fasteners to which Sub-article .1 above refers to includes plates, angle irons and all other hardware in direct contact with the concrete of components identified on the drawings, including rods, bolts, dowels, and various anchoring devices wholly or partially embedded in this concrete.

- .3 The specialized Contractor shall nevertheless provide the Departmental Representative with a reproducible copy and a copy of the shop drawings, for information purposes, clearly indicating the location of all fasteners required as well as the intensity and direction of the stresses that each of the fasteners exert on the concrete components. These drawings shall have been approved for construction beforehand by an Engineer in good standing with the Ordre des Ingénieurs du Québec.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 **Pre-moulded joint fillers:** pre-moulded resilient bitumen impregnated fibreboards in compliance with the ASTM D1751 standard. The dimensions required match the joints to be put in place on the drawings.
- .2 **Vapour barrier membrane under slabs-on-grade:** 0.15 mm thick polyethylene sheets in compliance with the CAN/CGSB-51.33 standard.
- .3 **Auxiliary backer rod for joints:** closed cell polyethylene foam, diameters required based on the dimensions shown on the drawings.
- .4 **Sealant for horizontal joints:** two-component, polyurethane-based product with a chemical cure, in compliance with the CAN/CGSB-19.24 standard, such as the "Sikaflex 2C SL" sealer. Distributed by Sika Canada or an equivalent approved by the Departmental Representative
- .5 **Sealant for vertical joints:** two-component, polyurethane-based product with a chemical cure, in compliance with the CAN/CGSB-19.24 standard, such as the "Sikaflex 2C NFEZ" sealer. Distributed by Sika Canada or an equivalent approved by the Departmental Representative.
- .6 **Primer for use with joint sealer:** "Sikaflex Primer 202" distributed by Sika Canada or an equivalent approved by the Departmental Representative. The primer and sealer must be compatible.
- .7 **Reinforcing steel:** according to Section 03 20 00.
- .8 **Embedded steel components:** in compliance with the requirements of the CSA-G40.21 standard, 300 MPa grade.
- .9 **Bonding agent:** three-component cement based and water-based modified epoxy product in compliance with the CAN/CSA-A23.1/A23.2 standard such as "SikaTop Armatec 110 EpoCem" from Sika Canada or an equivalent approved by the Departmental Representative.

- .10 **Rustproof coating:** three-component cement based and water-based modified epoxy product in compliance with the CAN/CSA A23.1/A23.2 standard such as "SikaTop Armatec 110 EpoCem" from Sika Canada or an equivalent approved by the Departmental Representative.
- .11 **Sealant for pressure injection of cracks:** two-component (2) epoxy resin, 100% solid, moisture tolerant. Use "Flexocrete Gel" from KRYTEX or "Sikadur 31 Hi-Mod Gel" distributed by Sika Canada or an equivalent approved by the Departmental Representative.
- .12 **Epoxy for pressure injection of cracks:** two-component (2) structural epoxy resin, 100% solids, moisture tolerant, low viscosity. Use "EPOXY-SCEL-80" from KRYTEX or "Sikadur 52" from Sika Canada or an equivalent approved by the Departmental Representative.
- .13 **Chemical anchoring system:** high-performance two-component (2) structural epoxy adhesive. Use an adhesive such as "HIT HY 150" from HILTI or "Sika Anchor Fix-3ca" from Sika Canada or an equivalent approved by the Departmental Representative.
- .14 **Mechanical rebar splicing system:** Lenton type mechanical splicing system or approved equivalent. Mechanical splices must develop 120% of the steel rebar's tension.
- .15 **Textile form liner:** Use one of the following products or an equivalent approved by the Departmental Representative at the locations indicated on the plans:
 - Drainaform R from SolmaxTexel
 - Hydroform 2000 from Hydro
 - Zemdren from Dupont
- .16 **Waterstop:**
 - .1 Ribbed extruded polyvinyl chloride PVC waterstops with the following properties:
 - .1 Minimal tensile strength: 11.4 MPa
 - .2 Elongation to failure: 275%
 - .3 Minimum tear resistance: 50 kN/m (ASTM D624-00 standard, Die "B" Method).
 - .2 The waterstops shall be of the width and thickness specified on the drawings. If no other dimension is provided, the waterstops shall be at least 150 mm wide and 10 mm thick.
 - .3 At T, L or X intersections use factory pre-cut and pre-assembled components.

- .17 **Sealer for concrete surfaces:** Silane based sealer such as "Sikagard SN40" from Sika Canada or approved equivalent.
- .18 **Beam support pad:** made of 50 duro neoprene measured with a durometer according to the ASTM D2240-05 standard and with a tensile strength of at least 15.5 MPa according to the ASTM D412-06a standard; the pads shall be moulded to the appropriate dimensions or cut out of moulded sheets.
- .19 **Repair grout:** Non-shrink cementitious grout such as Sika Grout 212 from Sika mixed with 1.1 litres of Sikacem 810 and 3.5 litres of water per bag of grout, or an equivalent approved by the Departmental Representative.
- .20 **Caulking mortar:** Once the injection is completed, caulk the cracks with an epoxy mortar such as "Sikadur 31 Hi-Mod Gel" from Sika or an equivalent approved by the Departmental Representative.
- .21 **Epoxy repair grout:** Three-component (3) epoxy resin such as "Sikadur 42 Grout Pak Multi-Flo" from Sika Canada at a 6:1 ratio or an equivalent approved by the Departmental Representative.

PART 3 - PERFORMANCE

3.1 JOINT FILLER:

- .1 Locate and form isolation and / or expansion joints according to the indications provided. Install the joint filler.
- .2 Unless otherwise indicated on the drawings, use a 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces, and a 25 mm joint filler to separate slabs-on-grade from one another at the required locations.

3.2 VAPOUR BARRIER MEMBRANE

- .1 Install a vapour barrier membrane under concrete slabs-on-grade located inside buildings.
- .2 At locations where there are joints, overlap the sides of the polyethylene sheets by at least 150 mm.
- .3 Repair any perforations in the vapour barrier membrane before pouring the concrete. Use pieces that extend at least 150 mm beyond all the edges of the perforations.

3.3 JOINT CAULKING:

- .1 Remove dust, loose mortar and other foreign material and dry the surfaces of the joint.

- .2 Prepare the surfaces in compliance with the caulking manufacturer's instructions.
- .3 Clear the joint to the required depth to install a backer rod. This will allow the application of a layer of caulking that complies with the manufacturer's recommendations for the width of the joint involved.
- .4 Apply the primer on the contact surfaces, and then apply the caulking following the manufacturer's recommendations. Clean adjacent surfaces immediately after application.

3.4 WATERPROOFING THE JOINTS

- .1 Refer to the drawings to determine which construction joints need to be sealed with waterstops. Even if there are no indications on the drawings, all joints below the grade shall be sealed with waterstops.
- .2 Take care not to deform or damage the waterstops when fastening them to the form. Avoid moving adjacent reinforcements and ensure the waterstops cannot shift or bend during the pour.
- .3 Butt weld the waterstops together, following the manufacturer's recommendations. Each weld shall be perfectly watertight. Butting waterstops together on the construction site is only permitted in the case of waterstop segments that are an extension of one another.

3.5 EMBEDDED COMPONENTS

- .1 All embedded component manufacturing work shall be performed in compliance with the requirements of the CAN/CSA-S16-01 standard.

3.6 IMPLEMENTATION – CHEMICAL ANCHORING SYSTEM:

- .1 Drill a hole 4 mm wider than the bar to be anchored.
- .2 Make sure the drill hole is clean, dry, free of clay, debris and cement dust. The holes shall be drilled with a hammer drill and cleaned with compressed air.
- .3 Prepare and apply epoxy resin according to the recommendations provided on the manufacturer's data sheet.
- .4 Where possible, partially fill the hole with epoxy and insert the bar. If not, introduce the rod and inject epoxy resin.
- .5 Anchor the rod in the concrete to a depth at least 15 times the diameter of the bar unless otherwise indicated.

3.7 IMPLEMENTATION – RUSTPROOF COATING

- .1 Dry or wet sandblast the rebar to clean it and remove all grease, oil, or rust. It may be necessary to clean the steel rebar using a mechanical steel brush to remove the rust.
- .2 Following the manufacturer's recommendations, use a stiff brush or a roller to apply a 0.5 to 1 mm thick coat on the steel rebar.
- .3 Allow to dry for 2 to 3 hours before applying a second coat of the same thickness.
- .4 Allow to dry for 2 to 3 hours before placing the repair concrete.

3.8 IMPLEMENTATION – BINDING AGENT

- .1 Dry or wet sandblast the surfaces to clean them and remove all traces of grease, oil or rust, as well as loose aggregate.
- .2 Moisten the surface of the concrete to obtain a saturated, superficially dry substrate.
- .3 Following the manufacturer's recommendations, use a stiff brush or a roller to apply a 0.5 mm coat over the entire area to be bound.
- .4 Place the repair concrete within the maximum time limits prescribed by the manufacturer.

3.9 INJECTING THE CRACKS

- .1 Roughen the cracks and clean the surfaces with compressed air jet.
- .2 Install injection points and seal them and the surfaces of the cracks to be injected to prevent resin loss. The distance between injection points shall not exceed the thickness of the part to be injected.
- .3 When the sealer has hardened, inject epoxy at the injection points. Inject the filler until the filler begins to come out of the next injection point.
- .4 Then plug the first injection point before going on to the next one.
- .5 When the epoxy resin has hardened, grind the top of the concrete surfaces at the sealing location to remove the sealer and the excess epoxy from the surface. The repaired crack surfaces shall have a quality finish.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 This section specifies the requirements regarding the providing, placement, finishing, protection and curing of the cast-in-place concrete.

1.2 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specifications sections.

1.3 REFERENCES

- .1 The following standards and publications are mentioned in this section of the specifications. They form an integral part of the specifications and their provisions apply, but are not limited by the other provisions of this section.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C109/C109M-02, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens).
 - .2 ASTM C260-01, Specification for Air-Entraining Admixtures for Concrete.
 - .3 ASTM C309-03, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .4 ASTM C332-87 (1991), Specification for Lightweight Aggregates for Insulating Concrete.
 - .5 ASTM C494/C494M-04, Specification for Chemical Admixtures for Concrete.
 - .6 ASTM C827-95a, Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
 - .7 ASTM C939-97, Test Method for Flow of Grout for Preplaced-Aggregate Concrete.
 - .8 ASTM D412-92, Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.

- .9 ASTM D624-91, Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .10 ASTM D1751-83 (1991), Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- .11 ASTM D1752-84 (1992), Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral-Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
 - .2 CAN/CGSB-51.34-M86 Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .3 CGSB 81-GP-1M-77, Flooring, Conductive and Spark Resistant.
- .4 Canadian Standards Association (CSA)
 - .1 CAN/SA-A3000-03, Cementitious Materials Compendium:
 - A3001-03
Cementitious Materials for use in Concrete
 - A3004-03
Test Methods and Standard Practices for Cementitious Materials
 - A3005-03
Test Equipment and Materials for Cementitious Materials for use in Concrete and Masonry
 - .2 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.
 - .3 CSA-A23.3-04, Design of Concrete Structures.
 - .4 CSA-A23.5-03, Supplementary Cementing Materials.
- .5 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2010, Volumes 1 and 2, as well as the user's guide – NBC 2010: Structural Commentaries (Part 4 of Division B)

1.4 SAMPLES

- .1 At least four (4) weeks before beginning the work, advise the Departmental Representative regarding the proposed source of supply for the aggregates, and allow him to access the source for sampling purposes.

1.5 CERTIFICATES

- .1 At least 4 weeks prior to starting concrete work, provide the Departmental Representative with copies of the manufacturer's trial reports, as well as a certificate issued by a qualified independent testing and inspection laboratory attesting that the materials listed hereinafter will comply with the specified requirements.
 - .1 Portland Cement
 - .2 Blended Hydraulic Cement
 - .3 Supplementary Cementing Materials
 - .4 Grout
 - .5 Admixtures
 - .6 Aggregates
 - .7 Water
 - .8 Waterstops
 - .9 Waterstop Joints
 - .10 Joint Filler
- .2 Provide the mix formulas for approval by the Departmental Representative and a certificate attesting that the selected mix will produce concrete of the required quality, strength and performance, and that it complies with the requirements of the CSA-A23.1-00 standard.
- .3 Provide a certificate attesting that the batching plant, equipment and materials that will be used to produce the concrete comply with the requirements of the CSA-A23.1-00 standard.
- .4 The Departmental Representative's acceptance of the cement mix or mixes shall in no way release the specialized Contractor from his responsibility to provide concrete whose properties, in both its elastic and hardened states, meet the requirements of these specifications.

- .5 All documents shall be submitted in triplicate. A single (1) annotated copy shall be returned to the Contractor. The Contractor shall be responsible for making additional copies and distributing them.

1.6 QUALITY ASSURANCE

- .1 At least four (4) weeks prior to starting concrete work, submit proposed quality control methods for approval by the Departmental Representative, regarding the following items:
 - .1 Hot weather concreting
 - .2 Cold weather concreting
 - .3 Curing
 - .4 Finishes
 - .5 Joints

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Cement: Type GU and/or Gub-SF Portland cement that complies with the CSA-A23.5-03 or the CSA-A5/A8/A362-03 standard. Only use one recognized brand of cement per type of concrete for the entire contract.
- .2 Fine aggregate: of normal density, complying with Article 4.2.3 of the CSA-A23.1 standard. The aggregate may be natural sand or manufactured sand containing at least 20% natural sand.
- .3 Coarse aggregate: of normal density, complying with Article 4.2.3 of the CSA-A23.1 standard. The particles shall be clean, durable and free from dust and harmful material and shall contain less than 10% flat or elongated particles. Loss shall be less than 12% after 5 cycles of the magnesium sulphate soundness test. The Los Angeles abrasion test loss shall be less than 50%. The aggregates shall not contain fine-grained limestone and crystalline limestone. The maximum aggregate size shall be 20 mm, unless otherwise indicated. Subject to the Departmental Representative's approval, a 13 mm maximum aggregate size may be used in certain areas where concrete flow is restricted.
- .4 Mixing water: complies with Section 4.2.2 of the CSA-A23.1 standard.
- .5 Air-entraining admixture: complies with the ASTM C260 standard.

- .6 Chemical and pozzolanic mineral admixtures: comply respectively with the requirements of the ASTM C494/C494M and ASTM C1017/C1017M standards. The use of calcium chloride or admixtures that contain calcium chloride is not allowed. The Departmental Representative must approve accelerators or retarders during hot and cold weather concrete work.
- .7 Non-shrink mortar for concrete repairs: pre-mixed Portland cement-based product containing a non-metal aggregate and a plasticizer, capable of achieving at least 35 MPa of compression strength at seven (7) days.
- .8 Superplasticizer: complies with requirements of the ASTM C494/C949M standard.
- .9 Supplementary Cementing Materials: comply with the CSA-A23.5 standard.
- .10 Cementitious hydraulic slag: complies with the CAN/CSA-A362 standard.
- .11 Set retarders: comply with the ASTM C494/C494M [water-based], [low VOC content], [solvent-free] standard. The set retarder film shall never be exposed to humidity.

2.2 MIX DESIGN

- .1 Assume responsibility for the mix of each type of concrete required, while taking into account the requirements described in Section 2.1 of these specifications and the following criteria in compliance with possibility No. 1 presented in Table 5 of the CSA-A23.1 standard.
 - a) Concrete for sidewalks, curbs, slabs and exterior footings and enclosures
 - tested compression strength: 35 MPa at 28 days
 - cement type: GU
 - exposure category (Table No. 1, CSA-A23.1/A23.2): C2
 - maximum nominal size of coarse aggregate: 20 mm
 - air content: 5 to 8%
 - maximum water/cement mass ratio: 0.45
 - desired on-site slump: 80 mm (± 30 mm)
 - Chemical admixtures: type air-entrainers that comply with the ASTM C494/C494M standard.
 - normal density concrete

- b) Lean concrete blinding slab:
 - minimum tested compression strength at 28 days: 15 Mpa
 - cement type : GU
 - exposure category (Table No. 11, CSA-A23.1/A23.2): F-2
 - air content: 4 to 7%
 - maximum water/cement mass ratio: 0.55
 - desired on-site slump: 80 mm (± 20 mm)
 - normal density concrete
- .2 Obtain the Departmental Representative's approval for all admixtures used in concrete mixes (superplasticizers and required air-entrainers or other admixtures needed for any specific purpose, designated by the specialized Contractor). The use of calcium chloride is prohibited.
- .3 Provide a sample of the admixture(s) used, at the Departmental Representative's request.
- .4 Follow the manufacturer's instructions when using admixtures.
- .5 The specialized Contractor is responsible for ensuring the admixtures are compatible with one another and with the materials included in the mix.
- .6 Enter the type and quantity of the admixture(s) used on the concrete shipping slip.
- .7 The use of an admixture shall never reduce the soundness of the concrete or its ability to withstand freezing and thawing.

2.3 CONCRETE CONTROL

- .1 Concrete quality control performed in compliance with the CSA-A23.2 standard by a designated laboratory at the Main Contractor's expense.
- .2 Submit to the laboratory for approval, proposed formulas for batching the mixes for each class of concrete; specify the type and brand of all admixtures used.
- .3 Provide the laboratory with samples of the fine and coarse aggregates that will be incorporated into the concrete blends and identify the quarry they come from.

Unless otherwise directed in writing by the Departmental Representative, also provide the laboratory with a document signed by a recognized petrographer certifying that none of the harmful alkali-aggregate and cement-aggregate reactions described in Appendix B of the CSA-A23.1/A23.2 standard are likely to occur in the concrete after it has been poured.

- .4 Notify the laboratory at least 24 hours before each concrete pour, whatever the volume involved.
- .5 Cooperate with sampling and facilitate testing. Provide free access to the structures. Provide the required concrete at no cost. If applicable, protect and provide a storage area for the samples taken.
- .6 The concrete's compression strength shall be checked during construction by taking 3 core samples per 75 m³ poured or at least 3 core samples per pour. The Departmental Representative may ask the laboratory to produce a fourth core sample and let it cure on the construction site as a control sample. A sample shall be crushed on the 7th day; the two other samples shall be crushed on the 28th day.
- .7 The cylinders shall be numbered consecutively and the laboratory report shall indicate the exact location of the concrete they represent in the framework, as well as the number of the truck that delivered the concrete.
- .8 The laboratory shall measure the concrete slump and air content every time it samples the concrete for strength tests and as often as necessary depending on the type of structure to be built.
- .9 Provide a sheltered location on site where the concrete core samples can be stored at an ambient temperature ranging from a minimum of 10°C to a maximum of 25°C before they are shipped to the trial laboratory.
- .10 If the core sample test results do not comply with Article 4.4.6.7 of the CSA A23.1 standard, the Departmental Representative may require that Section 4.4.6.8 of the standard be applied.
- .11 The specialized Contractor is solely responsible for the all concrete work required to complete the structures as indicated on the drawings or stipulated in the Specifications. All work that does not meet the requirements of the Specifications, for any reason whatsoever (quality of materials, batching, placement, strength, impermeability, etc.), shall be modified in compliance with the Departmental Representative's requirements, or it shall be completely demolished and rebuilt in compliance with the provisions of the Specifications and drawings, at the specialized Contractor's expense.

PART 3 - PERFORMANCE

3.1 PREPARATION

- .1 Ensure that the forms are erected and that they are clean and free of ice, snow and water, and that form reinforcement and hardware are installed in compliance with the requirements of Sections 03 10 00, 03 20 00 and 03 25 00 of the specifications.
- .2 Before starting the work, obtain the Departmental Representative's approval of the concrete placement methods, which shall comply with Section 7.2 of the CAN/CSA-A23.1-04/A23.2-04 standard.
- .3 Obtain the Departmental Representative's written authorization before performing the concrete work and notify him 24 hours before beginning the work. To notify the Departmental Representative, the "Avis de bétonnage" form from Dessau must be used and duly completed by the Contractor.
- .4 Pumping concrete is [forbidden] [shall only be permitted once the equipment and the mix are approved].
- .5 Ensure that the reinforcement and embedded components are not moved while the concrete is being poured.
- .6 Before performing the concrete work, obtain the Departmental Representative's written authorization regarding the proposed method for protecting the concrete during the pour and the subsequent cure.
- .7 No concrete shall be poured without the Departmental Representative's written authorization.
- .8 Authorization to pour concrete shall only be provided once the Departmental Representative has completed his own inspection of the formwork and determined that the requirements of Article 3.1 appear to have been met.
- .9 It is forbidden to pour concrete when it is raining or snowing, unless the Departmental Representative provides the required authorization, being satisfied with the measures taken to shelter the concrete while it is being transported and placed.
- .10 The Departmental Representative's authorization to pour concrete when the outside temperature is below 5°C or above 25°C shall in no way release the specialized Contractor from his full responsibility regarding the strength and soundness of the concrete to be poured.
- .11 Keep a concrete placement log, which indicates the date and location of each placement, the concrete's characteristics, the truck numbers, the ambient temperature, samples taken and other relevant information.

- .12 Immediately before placing the concrete, carefully clean and remove all waste and debris of any kind from the space the concrete will occupy.
- .13 In areas where new concrete is bonded to an existing structure, drill holes in the existing concrete and install steel dowels made of high adherence steel rebar in it and thoroughly embed the dowels with non-shrink epoxy grout to anchor and maintain them in the positions indicated.
- .14 No load shall be exerted on the new concrete components until the Departmental Representative has provided the required authorization.

3.2 MANUFACTURE AND DELIVERY OF THE CONCRETE

- .1 Provide ready-to-use concrete manufactured in a concrete plant, transported and discharged at the site in compliance with Section 5.2 of the CAN/CSA-A23.1/A23.2 standard, or provide concrete manufactured on site, in compliance with all the requirements of that same section. If the second alternative is chosen, submit the entire procedure to the Departmental Representative for approval.
- .2 The manufacturer of the ready-to-use concrete is solely responsible for batching the concrete, and he shall personally, at his expense, take all necessary measures to ensure the quality and uniformity of his product.
- .3 Require that the concrete supplier provide a delivery slip for each load of concrete and provide the Departmental Representative with a copy of these slips. The slips shall contain the following information: name and address of the supplier's company, truck number, specialized Contractor's name, project name and location, class of concrete, cumulative quantity, start of discharge, end of discharge, maximum size of aggregate, slump and air-entrainment required, types of admixtures used, quantity and type of cement and quantity of water.
- .4 The addition of water to the mix after the initial batching shall only be carried out in strict adherence with Article 5.2.4.3.2 of the CAN/CSA-A23.1/A23.2 standard, but the maximum quantity used shall be 6 l/m³. Submit all anticipated additions to the Departmental Representative for approval and control. Indicate on the delivery slip the quantity of all water added at discharge.
- .5 Plan the manufacture of the concrete and schedule the deliveries to the site so that each pour can be performed without any interruptions. Each batch of concrete shall be completely discharged into the forms within two (2) hours of beginning of batching.
- .6 Never remix concrete or mortar that has started to set.
- .7 The temperature of the concrete at discharge shall be within the range presented in Table 1 of the CAN/CSA-A23.1/A23.2 standard and shall be controlled according to

Article 5.2.4.4 of the same standard. Use all protective measures required for this purpose.

- .8 No aluminum component shall be used to batch, transport or place the concrete.

3.3 IMPLEMENTATION

- .1 Place the concrete in compliance with the requirements of the CAN/CSA-A23.1/A23.2 standard.
- .2 Carry out the consolidation of the concrete using models and sizes of mechanical vibrators approved by the Departmental Representative.
- .3 Select an appropriate type and number of vibrators and use them in accordance with Section 7.2.5 of the CAN/CSA-A23.1/A23.2 standard.
- .4 Bind the fresh concrete with rock or hardened concrete in accordance with Section 19.2 of the CSA-A23.1/A23.2 standard.
- .5 Saturate hardened concrete surfaces with water immediately before pouring concrete on these surfaces.
- .6 Lay the concrete without interruption or in layers thick enough that each new layer will bind with the underlying layers before they have hardened enough to form cold joints.
- .7 If difficulties arise during pouring, change the concrete formula following the laboratory's directives and use the admixture(s) prescribed by the laboratory, and assume all expenses for this procedure.
- .8 Adding a superplasticizer to the concrete before it has been poured into the forms is mandatory when pouring walls (including retaining walls) and columns.

3.4 CONCRETE CURING

- .1 The concrete shall be cured according to the requirements of section 7.4 of the CSA-A23.1/A23.2 standard. Walls and slabs 500 mm thick or thicker are considered mass concrete.
- .2 The use of curing compounds is prohibited.
- .3 The concrete of walls and other vertical elements shall be cured using two layers of jute kept moist at all times.
- .4 The concrete of slabs shall be cured using a using a cover kept moist at all times,
- .5 Slabs and other unformed surfaces shall be kept moist for a period of at least 7 days.

- .6 Walls, beams, columns and other formed surfaces shall undergo the following 7-day curing schedule:
 - .1 forms left in place: 3 days;
 - .2 moist curing after removal of the forms: 4 days.
- .7 When the outside temperature exceeds 20°C for mass concrete or otherwise 27°C, keep the forms moist before pouring the concrete and throughout the entire time they remain in place.
- .8 In cold weather, water curing ends 12 hours before the end of protection.
- .9 Throughout the entire cure, the concrete shall never be under any load and shall be adequately protected against violent shocks, excessive vibration, weather and other disturbances.
- .10 The provision, installation and maintenance of all falsework and devices required for the curing and protection of the concrete in hot or cold weather, as well powering the equipment, are part of the contract work, for which all costs are to be assumed.

3.5 CONCRETE PROTECTION

- .1 In hot weather, the concrete shall be protected according to Article 7.4.2.4 of the CSA-A23.1/A23.2 standard.
- .2 Concrete components containing silica fume shall be protected from drying according to Article 7.4.2.2 of the CSA-A23.1/A23.2 standard.
- .3 Other concrete components shall be protected from dryout based on Appendix D of the CSA-A23.1/A23.2 standard.
- .4 In cold weather, the concrete shall be protected according to Article 7.4.2.5 of the CSA-A23.1/A23.2 standard.
- .5 Methods for protecting concrete in cold weather are detailed in Chapter 15.4.3.13 of the "Cahier des charges et devis généraux (CCDG)", 2003 edition. Payment methods described in this chapter of the CCDG shall not apply to this contract.

3.6 FINISHING OF FORMED SURFACES

- .1 Clean and finish the formed surfaces in compliance with Section 7.7.3 of the CSA-A23.1/A23.2 standard. Visible surfaces in completed buildings require smooth formed surfaces in accordance with Article 7.7.3.6 of the CSA-A23.1/A23.2 standard. All other surfaces require a rough formed surface in accordance with Article 7.7.3.5 of the CSA-A23.1/A23.2 standard.

- .2 Fill the holes left by the form ties in compliance with Section 03 10 00 of these specifications.

3.7 CONCRETE PREPARATION

- .1 Remove and replace all damaged or defective concrete with concrete that meets the specifications and requirements of the drawings.
- .2 After the forms have been removed, the Departmental Representative shall examine all voids, honeycombs and other defects. If applicable, submit the methods for repairing the voids, honeycombs and other defects to the Departmental Representative for approval. Do not repair any of the surfaces before having received the Departmental Representative's authorization.
- .3 Wherever possible, repair formed surfaces as soon as possible after the forms have been removed.
- .4 Cover the concrete surfaces with a cement-latex slurry or an epoxy-based glue before performing concrete or mortar repairs.
- .5 The product used shall comply with Section 2.1.7 of this section.

3.8 CUTS, DRILL HOLES AND CUT-OUTS IN HARDENED CONCRETE

- .1 Components that have already been poured shall never be cut, drilled or cut-out for any reason whatsoever, unless the Departmental Representative has authorized these procedures.
- .2 Any cut, drill hole or cut-out in hardened concrete authorized by the Departmental Representative shall be performed at the specific location, using the exact dimensions he has approved. Use rotary tools that prevent the concrete from shattering.

3.9 TOLERANCES

- .1 If the tolerances specified in Article 6.4 of the CSA-A23.1/A23.2 standard have not been met during the construction of any component of a structure shown on the drawings, the Departmental Representative may require that this component be demolished and rebuilt according to the tolerances of said article, at no additional expense to the Departmental Representative.

3.10 CONSTRUCTION JOINTS

- .1 Follow the indications of Section 7.3 of the CSA-A23.1/A23.2 standard for construction joints.
- .2 The Departmental Representative shall approve the location of the construction joints that demarcate each concrete pour. If the Departmental Representative deems it appropriate, he may require that these joints be brought closer together or relocated.
- .3 None of the construction joints already indicated on the drawings shall be moved or eliminated without prior authorization from the Departmental Representative.
- .4 Immediately before resuming pouring against a construction joint or above it, clean and score the surface of the hardened concrete to eliminate all loose fragments and any trace of bleeding, moisten the surface and allow to dry to obtain saturated, dry surface conditions.
- .5 Install 80 mm thick shear keys on construction joints along the entire length/height of the component, of a width equal to one-third the thickness of the component. Slightly bevel the sides of the shear keys.
- .6 For vertical components (walls, strip footings) construction joints shall be a maximum of 20 m apart. For structural raft foundation and slabs install construction joints with maximum 20 m x 20 m spacing. Submit the location of the construction joints to the Departmental Representative.
- .7 Allow a section to cure for a minimum of 7 days before pouring a new section next to it.

3.11 WATERSTOPS

- .1 Where indicated on the drawings, install waterstops to provide continuous watertightness. Do not bend or puncture the waterstops in order to avoid hindering their performance. Do not move the reinforcement when installing waterstops. Splice waterstops on site using equipment that complies with the manufacturer's requirements. Firmly secure the waterstops before the concrete is poured.
- .2 Joints butt-welded on site are only allowed between the points of intersection of the straight lengths. Weld the intersecting parts on site.

3.12 WATER STOPS FOR COLD JOINTS

- .1 Where indicated on the drawings, install weather-stripping and waterstops for cold joints to provide continuous watertightness. Strictly follow manufacturer recommendations regarding the installation, handling and materials required for each type to be used. Submit for the Departmental Representative's approval the installation method for each type used, in keeping with the manufacturer's recommendations.

3.13 ON-SITE QUALITY CONTROL

- .1 A testing laboratory designated by the Departmental Representative shall inspect and test the concrete and its constituents in accordance with the CSA-A23.1/A23.2 standard.
- .2 The Departmental Representative shall assume all costs for the trials.
- .3 The Laboratory shall take additional core samples during cold weather concrete work. These core samples shall be cured on site, under the same conditions as the concrete pours they represent.
- .4 Non-destructive concrete trials shall be performed according to the methods described in the CSA-A23.1/A23.2 standard.
- .5 The inspection and trials performed by the Laboratory shall not replace or finalize the quality control performed by the Contractor, nor shall they release the Contractor from his contractual obligations in this respect.

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with sections and drawings depicting complementary works, prior or related to the work described.
- .3 The Contractor / Subcontractor shall provide all materials, equipment, labor and services required for the complete execution of exterior masonry work so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General Requirements.
- .2 Section 02 41 16 – Demolition.
- .3 Section 04 05 00 – Common Work Results for Masonry.
- .4 Section 07 92 10 – Joint Sealing.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 Canadian Standards Association (CSA International) :
 - .1 CAN/CSA A23.1/A23.2, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.
 - .2 CAN/CSA A371, Masonry Construction for Buildings.
 - .3 CAN/CSA A179, Mortar and Grout for Unit Masonry.
 - .4 CAN/CSA-A3000, Cementitious Materials Compendium.
- .2 American Society for Testing and Materials International, (ASTM) :
 - .1 ASTM C270 – Standards Specifications for Mortar for Units Masonry.
 - .2 ASTM C207-06 – Hydrated Lime for Masonry Purposes.
 - .3 ASTM C979-05 – Pigments for Integrally Colored.
- .3 Documents from Masonry Institute of Quebec (IMQ) :
 - .1 Masonry work for buildings, Technical Bulletins.

1.4 Definitions

- .1 Raking: the removal of loose/deteriorated mortar until sound mortar or to a minimum depth of 13mm.
- .2 Repointing: filling and finishing of masonry joints from which mortar has been raked out.
- .3 Tooling: finishing of masonry joints using tool to provide final contour.
- .4 Repair: using adhesives to rebond sections of fractured masonry.

- .5 Consolidation: strengthening masonry units to prevent deterioration (spalling).
- .6 Stripping: Removal of loose masonry units (usually chips) by hammering or using appropriate tool.

1.5 Action and informational submittals

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Provide labelled samples of materials used on project for approval before work commences.
- .4 Test and Evaluation Reports:
 - .1 Provide certified test reports showing compliance with specified performance characteristics and physical properties.
 - .2 Provide laboratory test reports certifying compliance of mortar ingredients with specifications requirements.

1.6 Quality assurance

- .1 Masonry Contractor:
 - .1 Use Masonry Contractor for masonry work.
 - .2 Masonry contractor to be experienced in masonry work on projects of similar size and complexity to Work of this Contract and hold a general contractor's license.
 - .3 Masonry contractor to have good level of understanding of structural behaviour of masonry walls when masonry work involves replacing or repairing brick which are part of structural masonry work.
- .2 Masons:
 - .1 Masons must have experience in brick masonry works.
 - .2 Masons to have proof of license certification for propriety restoration mortars.
- .3 Cement grouting: grouting activities should be undertaken by experienced workers in manipulation and cement grouting methods.
- .4 Obtain approval from Departmental Representative for changes to qualified personnel.
- .5 Mock-ups:
 - .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct mock-up for each type of intervention planned:
 - .1 Stripping and cleaning joint.
 - .2 Repointing brick masonry.
 - .3 Repointing of concrete block facing masonry
 - .4 Plastering of the foundation wall.
 - .3 Construct mock-up 1000mm x 1000mm to demonstrate raking and repointing procedures for each type of masonry material specified in locations designated by Departmental Representative.

- .4 Notify Departmental Representative minimum of 24 hours prior to construction of the mock-up.
- .5 Perform mock-up of masonry cleaning with low pressure 1 to 3 bar clean water and soft natural bristle brush.
- .6 Construct mock-up under supervision of Departmental Representative to demonstrate a full understanding of specified procedures, techniques and formulations is achieved before work commences.
- .7 Construct mock-up where directed by Departmental Representative.
- .8 Work not to proceed prior to approval of mock-up. Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with masonry repointing work.
- .9 Accepted mock-up will demonstrate minimum standard for this work. Mock-up will not remain as part of finished work.

1.7 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .2 Store cementitious materials and aggregates in accordance with CAN/CSA A23.1.
 - .3 Store lime putty in plastic lined sealed drums.
 - .4 Keep material dry. Protect from weather, freezing and contamination.
 - .5 Ensure that manufacturer's labels and seals are intact upon delivery.
 - .6 Remove rejected or contaminated material from site.

1.8 Existing Conditions

- .1 Identify areas of masonry deterioration that are not identified in the drawings and inform in writing the Departmental Representative. Wait for instructions before proceeding to the replacement or repair of masonry involved.
- .2 Report to Departmental Representative conditions of deteriorated masonry or pointing found during cleaning.
- .3 Do not clean areas of deteriorated masonry without prior written approval of Departmental Representative.

1.9 Ambient Conditions

- .1 Maintain masonry temperature between 10 degrees C and 25 degrees C for duration of work.
- .2 When ambient temperature is 10 degrees C :
 - .1 Store cements and sands for immediate use within heated enclosure. Allow cement and sands to reach minimum temperature of 10 degrees C.
 - .2 Heat and maintain water to minimum of 20 degrees C and maximum of 27 degrees C.
 - .1 At time of use temperature of mortar to be minimum of 15 degrees C and maximum of 27 degrees C.
 - .2 Do not mix cement with water or with aggregate or with water-aggregate mixtures having higher temperature than 25 degrees C.
 - .3 Maintain aggregate temperature between 10 degrees C and 27 degrees.

.4 Maintain mortar mix between 10 degrees and 35 degrees.

.3 Enclosures and protection methods to be approved by Departmental Representative

.4 Departmental Representative and repair products manufacturer to approve the masonry surfaces to be repaired.

1.10 Work Sequence

.1 Perform cleaning following completion of replacement of stone and backpointing, and prior to carrying out stone refacing treatments, surface consolidates treatments and mortar refacing treatments. Sequence subsequent applications to approval of Departmental Representative.

.2 Allow period of curing as specified in applicable sections prior to all cleaning operations.

1.11 Protection

.1 At end of each working day, cover unprotected work with waterproof membranes. Membranes should extend to 0.5 m over surface area of work and be tightly installed to prevent finished work from drying out too rapidly.

.2 Protect adjacent finished work against damage which may be caused by on-going work.

1.12 Waste Management and Disposal

.1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The works of this section shall be made in accordance with the requirements of this plan.

PART 2 - PRODUCTS

2.1 Materials

.1 General: use one and same manufacturer and supplier for sources of each mortar material for entire project.

.2 Aggregate: to CAN/CSA 179-04.

.3 Water : potable, clean and free of ice, oils, acids, alkalis, organic matter, sediment or other harmful substances, to CAN/CSA A179-04.

.4 Portland Cement: type 10 normal, to CAN/CSA A-3000, white, non-staining.

.5 Hydrated Lime: To ASTM C207-06, Type SA, containing air entraining agent.

.6 Sand: fine-grained aggregates, particle size in accordance with Table 1 of the A179 standard, when specified joints are 6mm thick, the aggregate used must pass through a sieve of 1.18 mm.

.7 Colour additives: inorganic pigment, dry powder, mineral oxide type to ASTM C979-05.

- .8 Dowels: threaded nylon or stainless steel type 304, of a minimum diameter of 6mm, length to suit application.

2.2 Mortars

- .1 Repointing mortar: mortar specifically designed for repointing masonry, type O, to CSA A179-04 or ASTM C270, pre-mixed, pre-packaged, made from Portland cement, hydrated lime type "SA", controlled sand grading and colored according to the approved samples.

2.3 Plasterwork

- .1 Plaster Mortar: A mortar specifically formulated for roughing of concrete exterior walls, type N, compliant with CSA A179, Portland cement based, hydrated lime, sand with controlled particle size and colorants according to approved samples.

2.4 Masonry cleaning

- .1 To wall sections identified on elevation drawings, clean masonry surfaces using appropriate products for stains and surfaces.
- .2 Water: potable, clean. Treat water having high metal content before use.
- .3 Sand blasting and water vapour cleaning is strictly prohibited.
- .4 Air: free from oil or other contaminants.
- .5 Masking materials: type to approval of Departmental Representative.
- .6 Surfactant (detergent): non-ionic, type suitable for use on masonry.
- .7 Petroleum based solvents: xylene, toluene, benzene and proprietary asphalt and tar removers.
- .8 Organic solvents: methylene chloride.
- .9 Chemicals:
 - .1 EDTA (Ethylene Diamine Tetraacetic Acid).
 - .2 Proprietary alkali masonry prewash cleaner.
 - .3 Proprietary ferrous stain remover.
 - .4 Proprietary ammonia-based copper stain remover.
 - .5 Biocide: proprietary quaternary ammonia-based biocide.
- .10 Prior to the beginning of the required works, all cleaning products used must be approved by the Departmental Representative and tested on samples located in the work area.

PART 3 - EXECUTION

3.1 Generals

- .1 Perform work in accordance with CSA-A371.
- .2 At all times, protect adjacent masonry works and any other part of the building
- .3 Repointing and repair works must present a uniformity of color and texture.

- .4 All stages of the work shall be inspected by the Departmental Representative before the next begins.
- .5 Work schedule to provide all necessary measures to ensure proper curing of the works.
- .6 An inadequate curing within 72 hours of setting up mortars will be a sufficient reason to refuse the works.
- .7 Repointing :
 - .1 Perform stripping of masonry joints and repointing according to surfaces shown in the drawings.
- .8 Repair of existing facing concrete masonry block :
 - .1 Remove, clean and reinstall (repoint) concrete facing blocks according to surfaces indicated on the drawings
- .9 Foundation walls plastering :
 - .1 On walls surfaces shown in drawings completely remove all existing plaster and apply a new coat of plaster of the same thicknesses.
 - .2 Where required, install alkali-resistant plastic reinforcement mesh as prescribed by the plaster manufacturer.

3.2 Raking joints

- .1 Rake joints free of deteriorated and loose mortar, dirt and other undesirable material.
- .2 Rake joints to the full depth the deteriorated mortar, but never less than 15 mm deep for joints 6 mm wide and 25 mm depth for joints over 6 mm wide. Clean out voids and cavities encountered.
- .3 In all cases, the joint must be stripped to the sound mortar.
- .4 Unless otherwise indicated by Departmental Representative, Rake joints with a chisels and hammer. Any other method must first be approved by the Departmental Representative. In all cases, the method used should be the same as the one used for the approved sample. Pneumatic tools or power tools are not permitted.
- .5 Unless otherwise indicated in the drawings, remove and redo sealing around openings so as to reach as much of the surface as possible.
- .6 Clean by compressed air and with non-ferrous brush surfaces of joints without damaging texture of exposed joints or masonry units.
- .7 Ensure that no masonry units are chipped, altered or damaged by work to remove mortar.
- .8 Flush open joints and voids; clean open joints and voids with low pressure water and if not free draining blow clean with compressed air.
- .9 Leave no standing water.

- .10 Departmental Representative to inspect and approved clean joints before repointing works begin.

3.3 Dosage and mixing

- .1 Prepare masonry mortar in accordance with CSA A179, and in accordance with Section 04 05 00 - Common Work Results for Masonry.
- .2 Mortar to match the existing mortar. Each type of prepared mortar must be submitted for Departmental Representative approval, based on the sample of work completed and approved.
- .3 The mixing shall be done in accordance with mortar manufacturer recommendations, using a clean mechanical mixer free of dried mortar, rust and other contaminants.

3.4 Repointing

- .1 Dampen joints without causing accumulation of water set up the mortar mix until the joints are completely filled with mortar. Never fill the joints at once but in successive layers as described below.
- .2 If surface of masonry units has worn rounded edges keep pointing back from surface to keep same width of joint. Avoid feather edges. Pack mortar solidly into voids and joints.
- .3 Keep masonry damp while pointing is being performed.
- .4 It is forbidden to do the repointing during freezing weather. Make sure the surfaces and products are between 5 ° C and 35 ° C throughout the period of application and for a minimum of 72 hours after completion of works.
- .5 Build-up pointing in layers not exceeding 8mm in depth. Allow each layer to set before applying subsequent layers. Maintain joint width.
- .6 Apply a first coat of mortar to obtain a uniform depth. Allow to cure.
- .7 Lightly dampen the surface and apply the second coat. Tool and compact using jointing tool to force mortar into joint. Apply a third layer to the final finishing of the joint.
- .8 Tool joints to match existing, texture and color as directed by Departmental Representative. Consider that the joint is to be slightly recessed into the cavity with a concave appearance and not leaving any stone edge visible.
- .9 Remove excess mortar from masonry face before it sets. Finir le jointoiment proprement, selon les prescriptions.
- .10 Follow the manufacturer's recommendations regarding the useful life of mortar mix.

3.5 Obturation of the existing opening

- .1 To the existing opening in the exterior wall, where indicated on the drawings, obturate the openings by using stones of the same thickness, profiles and textures that the existing adjacent stone.
- .2 Provide all elements required for the completion of the works.

3.6 Protection and curing

- .1 Protect works from elements such as direct sunlight, rain, strong winds and frost. The curing of the mortar must be done in a controlled and stable environment for a minimum of 72 hours.
- .2 Keep dampen for a minimum of 72 hours after installation, without exception.
- .3 Spray three times a day, morning, noon and night, including holidays, all surfaces affected by the work. If required, protect the work with a wet burlap and / or polyethylene sheet installed to not to stick to the joints. Keep wet for a period of 72 hours.
- .4 Cover with waterproof tarps to prevent weather from eroding recently repointed material.
- .5 Wet mist burlap only - ensure no direct spray reaches surface of curing mortar.
- .6 Shade areas of work from direct sunlight during periods over 25 degrees C, and maintain constant dampness of burlap.

3.7 Cleaning

- .1 Clean surfaces of mortar droppings, stains and other blemishes resulting from work of this contract as work progresses.
- .2 Take great care to prevent damage to the newly installed grout.
- .3 Remove droppings and splashings using clean sponge and water.
- .4 Do further cleaning using stiff natural bristle brushes after mortar has attained its initial set and has not fully cured.
- .5 Clean masonry with stiff natural bristle brushes and plain water only if mortar has fully cured.
- .6 Obtain approval of Departmental Representative prior to using other cleaning methods for persistent stains.

END OF SECTION

PART 1 - GENERAL

- 1.1 Conditions**
- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
 - .2 This section and related drawings must be read and reviewed in conjunction with sections and drawings depicting complementary works, prior or related to the work described.
 - .3 The Contractor / subcontractor shall provide all materials, equipment, labour and services required for the masonry works, so that works perfectly fulfill the purposes for which they are intended.
- 1.2 Related sections**
- .1 Division 1 – General Requirements.
 - .2 Section 04 03 07 – Common Work Results for Masonry.
 - .3 Section 07 92 10 – Joint Sealing.
- 1.3 References**
- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
 - .2 Canadian Standards Association (CSA International).
 - .1 CSA-A165, Standards on Concrete Masonry Units.
 - .2 CSA A179, Mortar and Grout for Unit Masonry.
 - .3 CSA-A371, Masonry Construction for Buildings.
 - .4 CSA S304.1, Design of Masonry Structures (Limit States Design).
 - .3 International Masonry Industry All-Weather Council (IMIAC).
 - .1 Recommended Practices and Guide Specification for Hot and Cold Weather Masonry Construction.
 - .4 Institut de Maçonnerie du Québec
 - .1 Masonry work for buildings and technical bulletin.
- 1.4 Design criteria**
- .1 Perform masonry load-bearing and non-load-bearing works in order to meet reinforcement requirements prescribed in National Building Code and CSA-S304.1.
- 1.5 Action and informational Submittals**
- .1 Product Data.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Samples.
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit samples.
 - .1 One (1) of each type of masonry unit specified.

- .2 A minimum of one (1) sample used for testing and when accepted becomes standard for material used.
- .3 Submit samples tested to laboratories employing technicians certified/trained in procedures for testing masonry units.
- .3 Manufacturer's Instructions.
 - .1 Provide manufacturer's installation instructions, including storage, handling, safety and cleaning.
- .4 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (**Annex A**) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.

1.6 Quality assurance

- .1 Test Reports.
 - .1 Test reports to certify compliance of masonry units and mortar ingredients with specified performance characteristics and physical properties.
 - .2 Provide data for masonry units, in addition to requirements set out in referenced CSA and ASTM Standards, indicating initial rates of absorption.
- .2 Certificates: provide manufacturer's product certificates certifying materials comply with specified requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01 31 19 - Project Meetings and Section 01 33 00 - Submittal Procedures.

1.7 Waste management and disposal

- .1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The works of this section shall be made in accordance with the requirements of this plan.

1.8 Delivery, storage, and handling

- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Storage and Handling Protection:
 - .1 Keep materials dry until use.
 - .2 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
 - .3 Storage and location as indicated by Departmental Representative.

1.9 Site conditions

- .1 Ambient Conditions: assemble and erect components when temperatures are above 4 degrees C.
- .2 Weather Requirements: to CSA-A371.
- .3 Cold weather requirements.
 - .1 To CSA-A371 with following requirements.
 - .1 Supplement Clause 5.15.2 of CSA-A371 with following requirements.
 - .1 Maintain temperature of mortar between 5 degrees C and 50 degrees C until batch is used or becomes stable.
 - .2 Maintain ambient temperature of masonry work and its constituent materials between 5 degrees C and 50 degrees C and protect site from windchill.
 - .3 Maintain temperature of masonry above 0 degrees C for minimum of 28 days, after mortar is installed.
 - .4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10 degrees C, before applying mortar.
- .4 Hot weather requirements.
 - .1 To Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings
 - .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction
- .5 Spray mortar surface at intervals and keep moist for maximum of three days after installation.

PART 2 - PRODUCTS

2.1 Materials

- .1 Masonry materials and accessories are specified in sections referred to Related Sections.
 - .1 Mortars and masonry grouts, prescribed and described in Section 04 03 07;
 - .2 Joint sealer works prescribed and described in Section 07 92 10.
- .2 The work of this section include all accessories and others works necessary for the full implementation of the works of this section.

PART 3 - EXECUTION

3.1 Manufacturer's instructions

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

3.2 Examination

- .1 Examine conditions, substrates and work to receive work of this Section.
- .2 Examine openings to receive masonry units. Verify opening size, location, and that opening is square and plumb, and ready to receive work of this Section.
- .3 Verification of Conditions:
 - .1 Verify that:
 - .1 Substrate conditions which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of brick or concrete block.
 - .2 Field conditions are acceptable and are ready to receive work.
 - .3 Built-in items are in proper location, and ready for roughing into masonry work.
 - .2 Commencing installation means acceptance of existing substrates.

3.3 Preparation

- .1 Establish and protect lines, levels, and coursing.
- .2 Protect adjacent materials from damage and disfiguration.
- .3 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
- .4 Bracing to be approved by Departmental Representative.

3.4 Generals

- .1 Do masonry work in accordance with CSA-A371 except where specified otherwise.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment, respecting construction tolerances permitted by CSA-A371.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.5 Construction

- .1 Exposed masonry.
 - .1 Remove chipped, cracked, and otherwise damaged units, in accordance with CSA A-165, in exposed masonry and replace with undamaged units.
- .2 Jointing.
 - .1 Concave joints (half round) are required, allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.
- .3 Cutting.
 - .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
 - .2 Make cuts straight, clean, and free from uneven edges.

- .4 Building-In.
 - .1 Build in items required to be built into masonry.
 - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .5 Provision for movement.
 - .1 Leave 3mm space below shelf angles.
 - .2 Built masonry to tie in with stabilizers, with provision for vertical movement.
- .6 Loose steel lintels:
 - .1 Install loose steel lintels. Centre over opening width.
- .7 Interface with other work.
 - .1 Cut openings in existing work as indicated.
 - .2 Openings in walls: approved by Departmental Representative.
 - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
 - .4 Dismantle, clean and carefully store masonry elements to be reused. Masonry components chipped, cracked or otherwise damaged should not be reused.
 - .5 Repair and make good all openings, grooves and cut-out indicated.
 - .6 Make good existing work. Use materials to match existing.
- .8 Patching and repair to masonry work:
 - .1 Perform all work patching, repair and make good of existing masonry surfaces according to the instructions and indications to Section 01 73 00 – Execution.

3.6 Site tolerances

- .1 Tolerances in notes to Clause 5.3 of CSA-A371 apply.

3.7 Field quality control

- .1 Inspection and testing will be carried out by Testing Laboratory designated by Departmental Representative.

3.8 Cleaning

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.9 Protection

- .1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 The specialized Contractor shall provide all the materials, equipment and labour required to perform the detailing, joint design, manufacturing, fitting-up, factory painting, transportation, and installation of the steel framework.
- .2 The specialized Contractor shall also provide all parts to be embedded in concrete as well as the anchor bolts.

1.2 RELATED SECTIONS

The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specifications sections.

1.3 REFERENCES

- .1 The following standards and publications are mentioned in this section of the specifications. When reference is made to them, they must be consulted:
 - .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164-M92 (C2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16-01 CONSOLIDATION, Limit States Design of Steel Structures as well as CAN/CSA S16S1-05, Supplement no 1.
 - .4 CAN/CSA-S136-01 (C2007), North American Specification for the Design of Cold-Formed Steel Structural Members as well as CAN/CSA-S136S1-04, Supplement.
 - .5 CAN/CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.
 - .6 CAN/CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding.

- .7 CAN/CSA W55.3-1965 (R2003), Certification of Companies for Resistance Welding of Steel and Aluminium.
- .8 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A36/A36M-00, Standard Specification for Carbon Structural Steel.
 - .2 ASTM A193/A193M-08b, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
 - .3 ASTM A307-04, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .4 ASTM A325-02, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - .5 ASTM A325M-00, Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric).
 - .6 ASTM A490M-00, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .4 Canadian Institute of Steel Construction (CISC)/Canadian Paint and Coatings Association – CPCA (formerly the Canadian Paint Manufacturers Association - CPMA).
 - .1 CISC/CPMA 1-73A (1975), A Quick-drying One-coat Paint for Use on Structural Steel.
 - .2 CISC/CPMA 2-75, A Quick-drying Primer for Use on Structural Steel.
- .5 Master Painters Institute
 - .1 MPI-INT 5.1-04, Structural Steel and Metal Fabrications.
 - .2 MPI-EXT 5.1-04, Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC)
 - .1 SSPC-SP 3 (1995), Power Tool Cleaning.

- .7 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2010 and Supplement
- .8 Code de Construction du Québec - Chapter I, Building, and National Building Code - Canada 2010 (amended) as well as the User's Guide - NBC 2010: Comments on the calculation of structures (Part 4 of Division B).
- .2 Unless otherwise specified, perform structural steel work and welding work in compliance with the CAN/CSA-S16-01 and CAN/CSA S136S1-04 Standards.
- .3 The framework welding shall only be performed by a duly approved member of the Canadian Welding Bureau (CWB), in accordance with the requirements of the CAN/CSA W47.1 standard, Division 1 or Division 2.1. Check whether the subcontractor is a certified member of the CWB in the Division concerned, because the Departmental Representative will reject any specialized contractor that does not meet this requirement.

1.4 DESIGN CRITERIA

- .1 Structural and jointing details shall be designed in accordance with the requirements of the CAN/CSA-S16, CAN/CSA-S136 and CAN/CSA S136S1-04 standards, so that they can withstand the indicated forces, moments and shear stresses, and accommodate anticipated thermal movements.
- .2 Factory connections shall be welded.
- .3 Unless otherwise indicated on the drawings, the types of bolted joints are as follows:

Components	Types of Connections
Beams, columns	Bearing type
Bracing	Slip critical connections
Trusses	Slip critical connections

- .4 Unless otherwise indicated on the drawings, the stresses to be used in the design of connections are as follows:

Components	Stresses
Beams, columns	The more stringent of two (2) criteria: <ul style="list-style-type: none">▪ Reaction of the uniform load producing the section's ultimate

	resisting moment ▪ Or 50% of the beam's shear strength
Columns	▪ The section's ultimate compressive strength and shear strength
Trusses	▪ The section's ultimate tensile strength

- .5 Additional stresses induced on components to be connected:
- .1 All joints shall be designed so that no additional stresses are induced on the components to be connected.
 - .2 The Departmental Representative shall reject all details that create torque, bending moment or other stresses.
 - .3 The Departmental Representative shall be the only one to decide whether the details submitted are accepted or rejected.
 - .4 All modifications relating to changes required by the Departmental Representative shall be at the specialized Contractor's expense.
- .6 For non-standard joints, submit sketches and design notes bearing the seal and signature of a qualified Engineer recognized in the Province of Quebec, Canada.
- .7 Use at least two bolts per bolted joint (including those where anchors are used).
- .8 The depth of a beam joint shall never be less than 50% of the beam.

1.5 SHOP DRAWINGS

- .1 Submit the shop drawings to the Departmental Representative.
- .2 Each shop drawing must bear the seal and signature of an Engineer who is a member in good standing of the Ordre des Ingénieurs du Québec.
- .3 Clearly indicate on the shop drawings all forming and assembly details, including cuts, cut-outs, joints, drill holes, threaded anchors, bolts, shear connectors and welds. Use the symbols indicated in the CAN/CSA W59 Standard to represent welds.
- .4 Submit to the Departmental Representative the description of the work methods, the order in which the components are to be assembled, and the type of material intended for use. Even if this formality has been fulfilled and the document submitted, the specialized Contractor remains solely responsible regarding the use of the methods, equipment, delivery mode and safety measures.

- .5 Provide the Departmental Representative with three (3) copies of each complete and detailed shop and erection drawings of the steel framework to be built. The drawings shall be provided in metric units (SI).
- .6 The shop and erection drawings shall contain all the information mentioned in Articles 4.2 and 4.3 of the CAN/CSA-S16 Standard and bear the signature of the person who verified them before their submission to the Departmental Representative.
- .7 The project title as well as the names of the Departmental Representative, Expert framework consultant and of the Contractor shall appear on each shop and erection drawing.
- .8 The shop and erection drawings shall be sent soon enough to ensure that the Departmental Representative has at least ten (10) working days to examine them.
- .9 A copy of each drawing shall be returned to the specialized Contractor who, if required, shall revise the annotated drawing(s) and resubmit it (them). If the Departmental Representative determines that the revisions are too numerous or complex, he shall return the drawing(s) without annotating it (them). The Contractor shall be responsible for making any additional copies he requires.
- .10 The specialized Contractor shall only manufacture the framework components after the Departmental Representative has returned the shop and erection drawings.

1.6 ASSEMBLY VIDEO

- .1 The steel framework Contractor, in conjunction with the manufacturer of the pre-stressed concrete components, shall make an assembly video that shows in details the components installation sequences.
- .2 The sequences shall be ordered as to balance the various loads exerted on the main trusses to avoid any twisting.

1.7 VERIFICATION OF DIMENSIONS, MEASUREMENTS AND LEVELS

- .1 Before manufacturing the components of the framework, take and check all the dimensions, measurements and levels on site to compare them with the ones on the drawings or to complete the information shown on the drawings.

Notify the Departmental Representative of any errors on the construction site or of any incompatibility between the dimensions taken and the instructions provided on the drawings. Await the Departmental Representative's instructions on how to correct the errors and/or make the required adjustments.

- .2 If connecting to an existing framework, check all the dimensions, measurements, and levels of the existing framework before producing shop drawings of the new frame that will be connected to it. Adjust the dimensions of the parts to be built to the situation and submit the modifications to the Departmental Representative.

1.8 QUALITY ASSURANCE

- .1 Submit 3 copies of shop trial reports 4 weeks prior to assembly of the structural steel work.
 - .1 The shop trial reports shall indicate the steel's chemical and physical properties, as well as other relevant details before it is used for this work,
 - .2 The trial reports shall be certified by qualified metallurgists authorized to work in the Province of Quebec, Canada.
- .2 Also provide an affidavit from the manufacturer of the structural steel work certifying that the products, equipment and materials used for this work comply with the relevant standards that apply to the required or indicated products, equipments and materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Use materials free of dirt, rust, scale, pinholes, leafing or any other defect. No used materials shall be accepted.
- .2 General structural steel: in compliance with the CAN/CSA-G40.20/G40.21 Standard of grade 350W
- .3 Hollow Structural Sections (HSS): in compliance with the CAN/CSA-G40.21 and CAN/CSA-S16 Standards, of grade 350W, class H, as indicated on the drawings.
- .4 High-strength bolts, nuts and washers: in compliance with the ASTM A325M or A490M Standard.
- .5 Anchor bolts:
 - .1 Lower strength: in compliance with the CAN/CSA G40.21 Standard, grade 300W and the ASTM A307 Standard, grade A.
 - .2 High-strength: in compliance with the ASTM-A-449 standard with a minimum yield strength of 500 MPa.

- .6 Welding materials: in compliance with the CAN/CSA W59 Standard and the CAN/CSA W48 series Standards and approved by the Canadian Welding Bureau.
- .7 Shear connectors (if required on the drawings): in compliance with the CAN/CSA W59 Standard, Clause 5.5.6 and its Appendix H.
- .8 Non-shrink grout: non-metallic pre-mixed Portland cement-based product, of a consistence appropriate for pouring and capable of achieving at least 50 MPa compression strength at 28 days, subject to the Departmental Representative's approval.
- .9 Paint:
 - .1 1-73A CISC/CPMA: "Quick-drying one-coat paint for use on structural steel", grey colour.
 - .2 2-75 CISC/CPMA: "Quick-drying primer for use on structural steel", grey colour.
- .10 Mechanical anchor bolts (when specified on the drawings) approved by the Departmental Representative. The type required, the diameter and total length are specified on the drawings.
- .11 Hot dip galvanizing: apply a minimum 600 g/m² coat of zinc on the indicated areas, in compliance with the CAN/CSA-G164 Standard.
- .12 Touch up paint for galvanized steel: Complies with CAN / CGSB-1.181 with a metal zinc content higher than 87% (% in mass of the non-volatile part) such as the "ZRC Cold Galvanizing Compound" of ZRC Worldwide. Aerosol coatings are not permitted and the dry coating film must contain 95% zinc metal.

2.2 FACTORY PAINTING

- .1 Structural steel components shall be cleaned, prepared and coated with a layer of primer at the workshop in compliance with the CAN/CSA-S16 Standard, with the exception of components to be embedded in concrete.
- .2 The components shall be cleaned and freed of millscale, rust, oil, dust and all other foreign material. The surfaces shall be prepared according to the SSPC-SP 3 method.
- .3 A layer of primer shall be applied at the workshop so as to produce a dry film of at least 4 mils thick, on all steel surfaces, with the exception of the following surfaces:
 - .1 surfaces embedded in concrete;
 - .2 surfaces to which shear dowels will be fastened at the construction site;
 - .3 surfaces and edges that are to be welded on site;

- .4 friction joint contact surfaces;
- .5 surfaces located below grade and in direct contact with the ground.
- .4 In cases where frame components are not visible in the finished building (structural steel components covered by other construction materials), at the shop, apply on the structural steel a quick-drying one-coat paint for use on structural steel, in compliance with the 1-73A CISC/CPMA Standard. Follow the requirements of this standard regarding the methods to be used, atmospheric conditions to maintain and temperatures to respect when applying the paint.
- .5 In cases where frame components are visible in the finished building (exposed structural steel components later covered with one or two coats of finish paint on site, such as a gymnasium), at the shop, apply on the structural steel a quick-drying primer for use on structural steel, which complies with the 2-75 CISC/CPMA Standard. Follow the requirements of this standard regarding the methods to be used, atmospheric conditions to maintain and temperatures to respect when applying the paint.
- .6 Paint on nuts, bolts, straight edges and angles shall be removed before it is dry.

PART 3 - PERFORMANCE

3.1 FORMING

- .1 Form the steel components in compliance with the CAN/CSA-S16 Standard and according to the shop drawings submitted.
- .2 Structural members formed of welded sections shall be rejected if they are not shown as such on the shop drawings.
- .3 The use of members whose quality and/or dimensions differ from those shown is strictly forbidden without the Departmental Representative's written permission.
- .4 Drill or punch the bolt holes. All burning or cutting with a torch is forbidden.
- .5 The manufacturing and assembly tolerances are respectively those described in Sections 28.9 and 30.7 of the CAN/CSA-S16 Standard.
- .6 If required, reinforce the openings to maintain the design strength.
- .7 Where indicated on the drawings, continuously seal all steel members with a continuous weld bead and grind the welds.
- .8 Reinforce the girder web with stiffening plates at each girder-column intersection and at each concentrated load location.

- .9 Grind visible welds where required.
- .10 Provide the qualified trades persons with the templates and the parts to be embedded in the concrete or masonry.
- .11 Once the assembly is completed, touch-up the rivets, on-site welds, and bolts as well as burned or scratched surfaces.
- .12 Apply a zinc primer on galvanized surfaces in areas burned as a result of on-site welding work.
- .13 The welding companies shall be certified under the terms of Division 1 of these specifications or Article 2.1 of the CAN/CSA W47.1 Standard regarding fusion welding of steel structures, and/or the CAN/CSA W55.3 Standard regarding resistance welding of structural members.

3.2 MARKING

- .1 Mark the materials in compliance with the CAN/CSA-G40.21 Standard. Do not use die-stamping. When the steel part must not be painted, stamp the mark in locations that will not be visible after assembly.
- .2 Joint markings: at the factory, mark load-bearing assemblies, assembly joints and adjustment joints.

3.3 ASSEMBLY

- .1 The proposed technique, as well as the equipment used to erect the frame are subject to the Departmental Representative's approval. However, this approval shall in no way release the specialized Contractor from his full responsibility regarding the choice of technique and the handling of the equipment that will enable him to perform his work quickly and in complete safety.
- .2 Assemble the steel components in compliance with the CAN/CSA-S16 Standard and according to the shop drawings.
- .3 Assemble the metal structures ensuring that they are square, plumb, aligned, accurately adjusted, and have tight joints and intersections.
- .4 Where indicated on the drawings, continuously seal all steel members with a continuous weld bead and grind the welds.
- .5 Obtain the Departmental Representative's written authorization before cutting or modifying structural steel members on site.

- .6 Once the assembly is completed, touch up the bolts, rivets, welds, and surfaces where the factory-applied galvanization is degraded.
- .7 Deliver, handle and store all steel on site to avoid any damage. Damaged members and joints shall be rejected.
- .8 Take measures so as not to overload on-site structures which are already completed or under construction, beyond the allowable loads indicated on the drawings for these structures.
- .9 Where required on the drawings, weld shear connectors to the load-bearing components of the frame, using steel decking if required, following the manufacturer's instructions.
- .10 Notify the Departmental Representative as soon as possible regarding any defects detected in the assembly of factory-built components and abide by his decision regarding the corrections to be made.
- .11 Straighten slightly deformed components before assembling them on site and replace those that are damaged to the point where the Departmental Representative raises doubts regarding their effectiveness.
- .12 It is strictly forbidden to perform joint welds on site unless they are indicated on the shop drawings or the Departmental Representative has approved them beforehand.
- .13 It is strictly forbidden to drill, cut or modify in any way a component of the frame on site without having obtained the Departmental Representative's written authorization beforehand.
- .14 Galvanized steel framing should not be cut, drilled, or modified in any way on site. If structural modifications are made to the galvanized steel structural framing, they must be returned to the workshop to be re-galvanized.

3.4 ON-SITE QUALITY CONTROL

- .1 The Departmental Representative shall have access to the shop at all times to inspect the manufacturing and assembly work performed there.
- .2 The Departmental Representative may require that analytical trials, estimates and calculations be performed. Replace all work or materials found to be defective, at no expense and without any unnecessary project delays.
- .3 At the Departmental Representative's request, provide a factory certificate attesting that the quality of the steel meets the requirements of the contract documents.
- .4 At the Departmental Representative's request, provide him with certified copies of the steel factory inspection reports concerning the chemical and physical properties of the steels used.

- .5 A testing laboratory approved by the Departmental Representative shall inspect and test materials and craftsmanship.
- .6 The Departmental Representative may require that the Laboratory assess certain welds he considers important through visual inspection, or by performing penetrating liquid, magnetic particle, x-ray or ultrasound examinations. Cooperate fully on the performance of these tests and if required make the necessary repairs following these inspections.
- .7 The parts of welds that have been repaired shall be fully re-inspected following the same method used to perform the first inspection.
- .8 The Laboratory shall check the shear connectors using the following method: after welding, the specialized Contractor shall remove the ceramic ring around each connector and the Laboratory shall visually inspect the weld bead. Beads extending less than 360 degrees shall undergo more thorough inspection. These types of connectors shall be tested using a hammer to bend the connector 15 degrees from vertical toward the nearest side of the embedded plate or structural component. Welds that bend without breaking are acceptable. Bent connectors shall not break when straightened after the test. In addition, the Laboratory shall use the same method to conduct random testing on one percent of connectors where the weld bead is visually acceptable. The specialized Contractor shall replace defective connectors at his expense.
- .9 The Departmental Representative may ask the specialized Contractor to check whether the columns are plumb, in his presence. The Contractor shall provide the equipment required to perform this audit.
- .10 The Departmental Representative may ask the specialized Contractor to check the bolted joints, in his presence. High-strength joint shall comply with the CAN/CSA-S16 Standard, clauses 23.7 and/or 23.8.
- .11 The inspection and verification to ensure the framework is aligned, plumb and level shall comply with the CAN/CSA-S16 Standard, clause 29.7.

3.5 JOINTS

- .1 Unless otherwise indicated on the drawings, all factory-built joints shall be welded. If friction joints are specified, high-strength bolts shall be used.
- .2 High-strength bolts shall be used on all friction joints performed on site, in accordance with Section 23 of the CSA-S16-01 standard.

3.6 TEMPORARY BRACING

- .1 Assemble the steel framework, ensuring it is aligned and plumb to specified tolerances. Use temporary bracing for the assembly where necessary to offset any load to which the frame may be subjected, including wind, snow, equipment, and its use.

Leave these braces in place without disturbing them as long as they are required for safety, and until final installation of permanent braces.

- .2 The specialized Contractor shall be responsible for any negligence in adequately anticipating the stresses exerted during assembly of the framework.
- .3 Do not perform permanent bolting, welding or riveting as long as the braced framework has not been properly aligned.
- .4 The specialized Contractor is entirely responsible for the temporary stability of the steel frame.

3.7 GROUT APPLICATION

- .1 Where indicated on the drawings, after the framework has been erected and aligned, completely fill the space under column base plates or other supports with the specified non-shrink grout, following the manufacturer's written instructions.
- .2 Install the grout and wait until it has achieved 75% of its specified strength before pouring the concrete slabs on steel decking.

3.8 ON-SITE PAINTING

- .1 Unless otherwise indicated, all damaged surfaces and unpainted surfaces in the workshop must be retouched with a paint conforming to ICCA / PSAC 1-73A or ICCA / PSAC 2-75, depending on the case. Prepare surfaces to be retouched in accordance with SSPC SP-3, Retouch for galvanized steel.
- .2 Following approval by the Departmental Representative, galvanized steel framing with surfaces that have been damaged or scuffed during transport, handling or assembly shall be retouched with a zinc-rich paint on the surfaces in question.
- .3 Galvanized steel framing with a damaged surface or cumulative scratches for an element greater than 10 cm² shall be disassembled, returned to the workshop to be re-galvanized and re-installed.

3.9 SUBSTITUTION

- .1 Do not change the dimension and size of the members shown on the drawings without the Departmental Representative's written authorization. Substitution of members with units stronger than those specified may be accepted at no additional cost.

END OF SECTION

PART 1 - GENERAL

- 1.1 Conditions**
- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
 - .2 This section and related drawings must be read and reviewed in conjunction with all sections and drawings describing works that are complementary, subordinate, prerequisite or otherwise related to work described.
 - .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for the complete execution of rough carpentry, so that works perfectly fulfill the purposes for which they are intended.
- 1.2 Related sections**
- .1 Division 1 – General Requirements
 - .2 Section 07 46 10 – Exterior preformed siding.
 - .3 Section 07 52 00 – Modified bituminous membrane roofing.
- 1.3 References**
- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
 - .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-O80.20-M, Fire Retardant Treated Lumber.
 - .2 CAN/CSA-O80.27-M, Fire Retardant Treated Plywood.
 - .3 CSA B111, Wire Nails, Spikes and Staples.
 - .4 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .5 CSA O121, Douglas Fir Plywood.
 - .6 CAN/CSA-O141, Softwood Lumber.
 - .7 CSA O151, Canadian Softwood Plywood.
 - .8 CAN/CSA-O325.0, Construction Sheathing.
 - .3 American National Standards Institute/National Particleboard Association (ANSI/NPA)
 - .1 ANSI/NPA A208.1, Particleboard.
 - .4 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2005.
 - .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S706, Standard for Wood Fibre Insulating Boards for Buildings.
- 1.4 Quality assurance**
- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
 - .2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

- 1.5 Action and informational Submittals**
- .1 Submit in accordance with Section 01 33 00 – Submittals Procedures.
 - .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
 - .4 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.
- 1.6 Delivery, storage and handling**
- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .3 Storage and Handling Requirements:
 - .1 Store materials [off ground] [indoors] [in dry location] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect [wood] from [nicks, scratches, and blemishes].
 - .3 Replace defective or damaged materials with new.
- 1.7 Waste management and disposal**
- .1 Works are governed by a Waste **management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The work of this section shall be made in accordance with the requirements of this plan.
- 1.8 Low VOC materials**
- .1 The VOC content of all adhesives, sealants and sealant primers used on the inside of the building (i.e. to the inside of the sealing system) must be less than the VOC content limits of the State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168, June 2006.
 - .2 All paints, coatings and architectural finishes used inside the building (i.e. to the inside of the sealing system) and applied on site must :
 - .1 Architectural paints and coatings applied to interior walls and ceilings must not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.
 - matte paintings;
 - Not matte paintings.

- .2 Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.
- .3 Clear wood finishes, floor coatings, stains, primers, and shellacs applied to interior elements must not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.

PART 2 - PRODUCTS

2.1 General

- .1 Glue used for ply-wood panel fabrication shall not contain urea formaldehyde . Provide data sheet to this regard.

2.2 Lumber Material

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
 - .1 S2S is acceptable.
 - .2 Board sizes: "Standard" or better grade.
 - .3 Dimension sizes: "Standard" light framing or better grade.
 - .4 Post and timbers sizes: "Standard" or better grade.

2.3 Plywood panels

- .1 Plywood (type 1) : Softwood wood, in accordance with CSA O121 and CSA 0151, construction classification, standard quality, thickness as indicated on drawings, moisture content of 8% at time of fabrication, phenol-formaldehyde glue;
 - .1 For use for nailers in partitions and other interior work.
- .2 Plywood (type 3): poplar, finished one side, 16mm and 19mm thick, treated with fire retardant.
 - .1 For use for all linings and roof assemblies, parapets and roofing works.
 - .1 16mm thick panels.

2.4 Wood fasteners

- .1 Except when a particular type is specified, comply with part 9 of the National Building Code, current edition, as well as the following requirements.
- .2 Nails, spikes and staples: to CSA B111.
- .3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer, in conformity with AINSI B18.6.1 and other applicable standards.

- .4 Fasteners for exterior work and interior work in highly humid areas, in conformity with CSA G174 with minimum zinc coating of 610 g / m² or stainless steel grade 302 or 304.
- .5 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, sheet metal, fibre, formed to prevent dishing. Bell or cup shapes not acceptable.

2.5 Fire Retardant for wood

- .1 Treat wood by pressure impregnation with chemicals fire-retardant in accordance with CSA-080.20-M Standard for wood lumber, and CSA-080.27-M Standard for plywood, and ULC-S102.
- .2 SCAQMD Rules 1113, Architectural coatings.
- .3 VOC content not exceeding 350 g/L.
- .4 After treatment with a soluble fireproofing, dry material so moisture content does not exceed 19%.
- .5 Works to be treated with fireproofing:
 - .1 all furring and blocking integrated into fire rated walls and partitions;
 - .2 any other work specifically indicated on the drawings.

2.6 Wood Adhesives

- .1 The glue used for plywood panels fabrication shall not contain urea formaldehyde. Provide information sheets for this purpose
- .2 Wood adhesives: polyvinyl acetate resin or urethane, for wood products, recommended for purpose by manufacturer.

PART 3 - EXECUTION

3.1 Examination

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

3.2 General

- .1 Comply with NBC requirements, most recent edition, part 9, supplemented with the following parts of this Section.
- .2 Execute carpentry work according to AWMAC recommendations, standard quality.
- .3 Execute carpentry finishes according to AWI norms.

- .4 Use only sound materials, in longest practical lengths to minimize joints. Use materials that are free of warping that cannot be corrected with fasteners or anchors. Remove warped and otherwise defective materials that may compromise the quality of work.
- .5 Coordinate work of the present section with other trades. Draw and adapt for precise adjustment. Match up placement of furring, nailers, setting blocks and similar support with fasteners of other trades. Verify indicated dimensions and re-measure prior to proceeding.
- .6 Use galvanized fasteners for exterior work or work in humid locations.

3.3 Installation

- .1 Form according to indications and cut as required for square, plumb and aligned installation of work. Fasten precisely and securely to substrate with bolts and other appropriate fasteners to withstand applied loads.
- .2 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .3 Align and plumb face of furring and blocking to tolerance of 1:600.
- .4 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
 - .1 Install plywood sheets (Type 3): all wooden parts and plywood used for roofing frames and works to be fire treated.
- .5 Provide required nailers whether indicated on drawing or not, which are necessary to carry out the works.
- .6 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.
- .7 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .8 Countersink bolts where necessary to provide clearance for other work.

3.4 Cleaning

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

3.5 Protection

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

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with sections and drawings depicting complementary works, prior or related to the work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for the complete execution of the preformed metal cladding work, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General Requirements.
- .2 Section 02 41 16 – demolition.
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .4 Section 07 92 10 – Joints Sealing.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 American Society of Mechanical Engineers (ASME).
 - .1 ASME B18.6.3, Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series).
- .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A653/A653M, Specification for Steel Sheet Zinc-Coated (Galvanized) by Hot-Dip Process, Structural (Physical) Quality).
 - .2 ASTM A924/A924M, Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process - Metric.
 - .3 ASTM D 2369, Test Method for Volatile Content of Coatings.
 - .4 ASTM D 2832, Guide for Determining Volatile and Non-volatile Content of Paint and Related Coatings.
 - .5 ASTM D 5116, Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
- .4 Canadian Standards Association (CSA International).
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-S136-M, Cold Formed Steel Structural Members.
 - .3 CSA S136.1-M, Commentary on CAN / CSA-S136-M, Cold Formed Steel Structural Members.
 - .4 CAN/CSA-S16.1-M, Limit States Design of Steel Structures.
- .5 Environmental Choice Program (ECP).
 - .1 CCD-045-95, Sealants and Caulking Compounds.
- .6 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN/ULC-S706-02, Wood Fibre Thermal Insulation for Buildings.

1.4 Submittals

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for [metal siding] and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
 - .2 Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, roof borders, metal furring and related work.
 - .3 The drawings must indicate the structural calculations for preformed metal siding and their support systems.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples of siding material, of colour and profile specified.
- .5 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.
- .6 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.5 Design Criteria

- .1 Calculate the metal panel wall siding in accordance with requirements of CAN / CSA-A136 and CSA-S136.1
- .2 Metal panel wall siding shall be designed to allow movement due to thermal contraction and expansion of component materials to a temperature differential of approximately 100° C without causing excessive stress to fastening devices, nor cause buckling of panels, rupture of joint seals or any other deterioration.
- .3 Joints shall be conceived to absorb expansion and contraction movements between panels and the building's structure and between the panels themselves, movements caused by structural displacement, without any permanent deformation, damage to filler materials, breakage of construction joints and seals nor any water infiltration.
 - .1 Ensure a minimum thermal resistance of RSI 2.84, calculated according to the conditions established by ASHRAE, according to nominal wind loads.
- .4 Panels shall be designed to take into account the allowable tolerances for the support structural assembly.

- .5 Snow load criteria for the roof :
 - .1 Snow loads on roofs portions are estimated at 2.16kPa (45 lbs / ft ²) which must be added the accumulations, these are specified in structural drawings.
- .6 Panels shall be conceived to ensure efficient evacuation to the exterior of condensation water that forms inside walls and rain water that penetrates joints, in accordance with the « rain screen » principle, described in the CCD, number 40F of the NRC (National Research Council).
- .7 Design and calculate metal siding works to free the final installation of vibration, wind whistles and noise due to thermal movement, structural and wind pressures.
- .8 Dimensions and thickness of elements indicated on drawings and specifications are minimums to be maintained at any time.
- .9 Spacing shown drawings are maximums to be obtained at all times.
- .10 The Contractor is responsible for the structural performance of the wall system and must adjust sizes, thicknesses or spacing accordingly, and respect the required criteria.

1.6 Quality assurance

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 The installation of metal siding must be performed by a company, with experience in the installation of metal sheets siding similar to those provided with the complexity and labor and equipment necessary to perform the work of this section.
- .4 Provide documentation certifying that the installer is accredited by the metal siding manufacturer.

1.7 Low VOC materials

- .1 The VOC content of all adhesives, sealants and sealant primers used on the inside of the building (i.e. to the inside of the sealing system) must be less than the VOC content limits of the State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168, effective on July 1st 2005. Spray adhesives must comply to GS-36 Green Seal standard, effective on October 19th 2000.

1.8 Waste management and disposal

- .1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The works of this section shall be made in accordance with the requirements of this plan.

1.9 Extended Warranty

- .1 For work of the present Section 07 26 00 – Preformed Metal Siding, the warranty period of 12 months is extended to **five (5) years**.
- .2 Provide written warranty, prepared and signed by both the manufacturer and the installer, in the name of Her Majesty the Queen, chief of Canada, certifying that the work specified under the present section shall remain free of defect due to workmanship or materials for a period **of five (5) years** from the date of final acceptance of the work. The warranty should indicate that the finishes are warranted against excessive non-uniform fading and pitting or corrosion and will remain consistent without cracking, chipping, and delamination or otherwise deteriorate or corrode.

PART 2 - PRODUCTS

2.1 Generals

- .1 The Contractor shall provide all materials required for the complete execution of the preformed metal cladding work, so that works perfectly fulfill the purposes for which they are intended.
- .2 Products and materials of the present section includes, without limitation, the following elements :
 - .1 All composite metal siding for exterior cladding of canopy metal roof assemblies, identified « preformed metal roof panel » on drawings, including, furring, metal flashings, air/vapor barrier transition membranes, moldings and all accessories required for a complete installation and sealing system.
 - .2 All steel profiles and finish sheet.
 - .3 Insulating tapes and sealants for metal related to metal siding works and flashings.
 - .4 All adhesives, anchors, fasteners, profiles, moldings, and other accessories required for the installation of preformed metal siding.

2.2 Materials and Finishes

- .1 Steel sheet hot dip galvanized, to ASTM A924M, structural quality grade 33, minimum tensile strength of 230 MPa, and maximum stress of 144 MPa, coated on each side with a layer of zinc of at least 275 g/m2 (designation Z275) to ASTM A653M.
- .2 Exterior metallic panel:
 - .1 Metal siding for roof siding assemblies: Preformed steel, hot dip galvanized or Galvalume treated (RM-1B), 22 gauge (0.76 mm) minimum before the zinc coating (or zinc / aluminum). Joints sealed system with a total thickness (height) of 33mm, and stapled caps, panel width 400mm.
 - .1 Finish: Epoxy primer factory applied system on both sides, and vinylidene fluoride resin on exposed surfaces; four (4) layers system. Color: « Red Carnival » no. UC51703.
 - .2 Metal siding to be free of any visible imperfections such as tool marks, stains etc. Uniform in colour and gloss. Panels to be plumbed, true, level and in alignment, and according to dimensions on drawings.
- .3 Welding materials for steel: in accordance with CSA W59-M1989, of same composition as the materials to be welded, certified by the Canadian Welding Bureau.

- .4 Exposed trim: inside corners, outside corners, cap strip, drip cap, under sill trim, starter strip and window/door trim of same material, same colour as cladding, with fastener holes pre-punched. Profiles as indicated on drawings, gauge 22 (0.76 mm) minimum thicknesses before the zinc coating.
- .5 Continuous joint cover (cap), snap attach, 50mm X 23,5mm, formed from the same material as the cladding panel.
- .6 Concealed metal flashing: hot-galvanized sheet steel, to Z-275 designation (G-90), 0.76mm minimum thickness or as indicated on drawings.

2.3 Accessories

- .1 Provide finish profiles, furring, wall baseboards and all other elements required to complete execution of metal cladding work.
- .2 Prepainted metal flashing and all required accessories, including exposed trim: inside corners, outside corners, cap strip, drip cap, undersill trim, starter strip and ridge enclosure and trims, galvanized steel, 0.61mm (cal.24) Minimum thickness of metal exposed, or as indicated, according to A653 / A653M same colour and gloss as cladding, with fastener holes pre-punched.
- .3 Semi-rigid mineral fibre panel insulation :
 - .1 Compliant with CAN/ULC S102, Type 1, thermal resistance RSI 0.74 per 25.4mm according to ASTM C518, moisture absorption of less than 0.1% by volume to ASTM C1104, Flame Spread: 0; Smoke Developed :0 to CAN/ULC S102, thickness and dimensions as indicated on drawings.
- .4 Butyl sealing tape, butyl-polyisobutylene 100% solid content, 3mm thickness 13mm width, provided in roll and covered with protective paper.
- .5 Sealants:
 - .1 Synthetic elastomer, 90% solids content, non-peelable and non-drying, for junctions between the air barrier / vapor barrier cladding.
 - .2 Butyl based, for concealed areas.
- .6 Touch-up primer for galvanized surfaces: zinc, flat – brush applied, or gloss spray applied, as recommended by the manufacturer.
- .7 Isolation tape for metals: polyethylene (EVA) waterproof, 3 mm (1/8") thick, self-adhesive on both sides for thermal and electrolytic separation
- .8 Air/vapour barriers, modified bituminous sheet, self-adhesive, refer to Section 07 26 00 – Vapour Retarders and Air Barriers.
- .9 Bituminous paint.

2.4 Plywood sheathing

- .1 Canadian exterior grade softwood plywood with phenol-formaldehyde resin pressured heat, 16mm and 19mm thickness, as indicated in drawings with fire retardant coating and stamp.

2.5 Fasteners

- .1 All fasteners for panels and anchor rails shall be stainless steel and in accordance with manufacturer's recommendations, in accordance with CSA B111 and ANSI B18.6.4.
- .2 Fasteners :
 - .1 Screws, to ANSI B18.6.4, special fabrication, size suited to work, self-tapping type, with a conical neoprene washer.
 - .2 Screws, material and finish:
 - .1 Exposed Attachments: hex head screws and washer, stainless steel 304 series, natural finish, with a conical neoprene washer.
 - .2 Unexposed Attachments: steel with a corrosion-resistant coating.

2.6 Caulking

- .1 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Test for acceptable VOC emissions in accordance with ASTM D 2369 and ASTM D 2832.

2.7 Cladding Fabrication

- .1 Fabricate and finish, in accordance with manufacturer's standard proven fabrication processes and in accordance with the performance requirements of the present specifications. Respect dimensions and structural requirements. Panels, trim and flashings shall be factory pre-cut.
- .2 Shop manufactured elements according to profiles shown in drawings, non-standard elements to be custom made in strict accordance with all indications to drawings, and all the elements to be ready for installation on site.
- .3 Fabricate parts by bending before applying the finish.
- .4 Shape the angle elements, level and precisely planned dimensions, so that they are free from distortion and other defects that may affect their appearance or efficiency.
- .5 Form each piece of maximum length. Provide at joints, spacing required for expansion

PART 3 - EXECUTION

3.1 Manufacturer's instructions

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

3.2 Examination

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

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

3.3 Preparation

- .1 Dissimilar metals to be separate with a coating or film to prevent galvanic action.
- .2 The Contractor shall, prior to the beginning of panels and sub-girts installation, examine structural supports alignment and advise the Departmental Representative in writing if support does not meet the standards for panels installation.

3.4 Installation

- .1 Install cladding in accordance with CGSB 93.5, AERMQ recommendations and manufacturer's written instructions
- .2 Install siding according to the manufacturer's written instructions and as indicated on shop drawings reviewed by the Departmental Representative
- .3 Seal all joints of the inside existing vapor barrier panels. Apply seal and a continuous strip 300mm width of self-adhesive membrane on the exterior portion of metal panels.
- .4 Where indicated on the drawings, and where required, install the insulation in panels, and tightening it between the sub-girts.
- .5 Install continuous starter strips, inside and outside corners, edgings, soffit, drip, cap, sill and window/door opening flashings as indicated.
- .6 Install siding using screws in each spline unless otherwise indicated, and at locations shown on shop drawings as reviewed by the Departmental Representative
- .7 Observe the location of the joints shown in the drawings and ensure that the face of the joints are perfectly aligned and butted.
- .8 Install soffits and fascia as indicated.
- .9 Carefully place the projecting corner pieces, filler pieces, and curved panels to obtain the required profile.
- .10 Fix elements to allow their expansion and thermal contraction.
- .11 Caulk the joints between the elements and structures with the specified sealant.
- .12 Install flexible expansion joints as indicated; hide flaps by screwing them to the sub-girts to 300mm maximum spacing before laying the facing panels. Seal the joints with the specified sealant.

3.5 Cleaning

- .1 Clean in accordance with Section 01 74 11 – Cleaning.
- .2 Replace damaged panels and accessories that could not be satisfactorily or adequately repaired by means of touch up paint or other minor repairs, all to the complete satisfaction of the Departmental Representative.

- .3 Remove protective coatings and films (as applicable) as work progresses. Have work completely washed by a specialist company upon completion.
- .4 As necessary, wash exposed exterior surfaces with a solution of hot water and gentle domestic use detergent and soft clean cloths.
- .5 Remove all debris, surplus sealing products as well as filing residues and clean sweep work area.
- .6 Protect complete work from damages that may result from adjacent work, until end of construction.

3.6 Protection

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

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with sections and drawings depicting complementary works, prior or related to the work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for the complete execution of roofing systems, including all the accessories required, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related Sections

- .1 Division 1 – General Requirements.
- .2 Section 02 41 16 –Demolition.
- .3 Section 06 10 11 – Rough Carpentry.
- .4 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .5 Division 22 – Plumbing.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM C303, Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.
 - .2 ASTM C 726, Standard Specification for Mineral Fiber Roof Insulation Board.
 - .3 ASTM C 1177/C 1177M, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .4 ASTM C 1278, Standard Specification for Fiber-Reinforced Gypsum Panel.
 - .5 ASTM C 1396/C 1396M, Standard Specification for Gypsum Board.
 - .6 ASTM D 41, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
 - .7 ASTM D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
 - .8 ASTM D 2178, Asphalt Glass Felt Used in Roofing and Waterproofing.
 - .9 ASTM D 6162, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.
 - .10 ASTM D 6163, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fibre Reinforcements.
 - .11 ASTM D 6164, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
 - .12 ASTM D 6222, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcement.

- .13 ASTM D 6223, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcement.
- .14 ASTM D 6509, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcement.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-56M Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 CRCA Roofing Specifications Manual.
- .4 Canadian Standards Association (CSA International).
 - .1 CSA-A123.3, Asphalt Saturated Organic Roofing Felt.
 - .2 CSA-A123.4, Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.
 - .3 CSA A231.1, Precast Concrete Paving Slabs.
 - .4 CSA O121, Douglas Fir Plywood.
 - .5 CSA O151, Canadian Softwood Plywood.
- .5 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA).
- .6 Factory Mutual (FM Global).
 - .1 FM Approvals - Roofing Products.
- .7 Health Canada / Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS)
- .8 Underwriters Laboratories' of Canada (ULC).
 - .1 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702.2, Standard for Mineral Fibre Thermal Insulation for Buildings.
 - .3 CAN/ULC-S704, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .4 CAN/ULC-S706, Standard for Wood Fibre Thermal Insulation for Buildings.
- .9 Roofing work in accordance with the latest edition of Roofing Specifications of the Québec Association of Roofing Contractors (Association des Maîtres Couvresseurs du Québec).
- .10 Roofing Work shall be executed in strict accordance with membrane manufacturers written recommendations.
- .11 All work shall be executed in accordance with the Fire Prevention Manual of the QARC (AMCQ).
- .12 In the case of different standard specified the highest standards apply.

- 1.4 Performance criteria**
- .1 The roofing system will have to be ULC certified - Class C type, full adhesion membrane and shall resist uplift force winds of 90 lb. / sq.ft.
- 1.5 Laboratory Tests**
- .1 Upon request of the Departmental Representative, elastomeric bitumen manufacturers shall supply, at their cost, the results of mechanical tests and chemical analysis practiced on the elastomeric bitumen supplied.
 - .2 Tests shall be conducted in order to verify conformance to CGSB 37 GP 56M.
- 1.6 Action and informational submittals**
- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Product Data:
 - .1 Provide two copies of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements, and indicate VOC content for:
 - .1 Primers.
 - .2 Asphalt.
 - .3 Sealers.
 - .3 Manufacturer's Certificate: certify that products meet or exceed specified requirements.
 - .4 Test and Evaluation Reports: submit laboratory test reports certifying compliance of bitumens and membrane with specification requirements.
 - .5 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.
- 1.7 Qualifications**
- .1 Installer: company or person specializing in application of modified bituminous roofing systems approved by manufacturer.
 - .2 Foreman shall have experience related to modified bituminous membrane application and at least one member of the work team shall also possess this experience.
 - .3 Manufacturers shall employ a competent technician to assist the Contractor, if necessary, in the application of the products and in roofing system inspections.
 - .4 All other workers shall possess certificates of competency required to execute roofing work.

1.8 Quality Control

- .1 Contractor shall ensure that the roofing membrane manufacturer's representative is present at the site, before, during and at the end of the roofing work.
- .2 Prior to membrane application, manufacturer's representative shall verify the substrate condition and submit a report to Departmental Representative.

1.9 Fire Protection

- .1 Only qualified labour, with certifiable experience in roofing work shall execute the work.
- .2 Weldable membrane installers shall have taken the fire security courses given by the Quebec Fire Prevention Institute (IPIQ) and at least 50% of them shall have taken the « Safe Welding Practice » courses given by QRCA (AMCQ).
- .3 Comply with safety measures recommended by the membrane manufacturer, local authorities and in accordance with the Fire Prevention Manual of the QRCA (AMCQ).
- .4 Prior to the beginning of work, inspect site conditions and ensure that all measures have been taken to reduce risks and danger of fire.
- .5 Never directly weld combustible materials. Under no circumstances shall torch flames penetrate areas that are not visible or easily controllable.
- .6 Throughout roofing installation, maintain a clean site and ensure sufficient number of fire extinguishers in good working condition are available (minimum 1 per torch).
 - .1 Maintain one cartridge operated type or stored pressure rechargeable type with hose and shut-off nozzle.
 - .2 ULC labelled for A, B and C class protection.
 - .3 Size 9 kg on roof per torch applicator, within 6m of torch applicator.

1.10 Monitoring

- .1 Contractor shall ensure the presence on-site for at least **2 hours** following completion of welding work, a specially trained supervisor for this type of work
 - .1 Supervisor shall be equipped with a fire extinguisher and a telephone and make site visits to ensure that there is no risk of potential fire. At the end of each work day, Supervisor shall inspect work area with a heat detector in order to detect any possible threat from fire.
 - .2 The supervisor will conduct a patrol every 15 minutes for the total hour following completion of welding work. A written report will be produced at the end of each round of monitoring.

1.11 Delivery, storage and handling

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
- .2 Storage and Handling Requirements:
 - .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
 - .2 All materials will be delivered and stored in their original packaging, displaying the manufacturer's name, product name, weight, and reference standards, as well as all other indications considered standard.

- .3 At all times, materials will be adequately protected and stored in a dry and properly ventilated area, weatherproof, so they are not in contact with the ground. Only materials destined for same-day use can be removed from this storage area. In cold weather, these materials should be stored in a heated area at a minimum temperature of +10°C and removed prior to application. They will be kept away from any welding flame or spark.
- .4 Store rolls of felt and membrane in upright position. Store membrane rolls with salvage edge up.
- .5 Remove only in quantities required for same day use.
- .6 Place plywood runways over completed Work to enable movement of material and other traffic.
- .7 Store sealants at +5 degrees C minimum. Store adhesives and solvent-based mastics at sufficient temperatures to ensure ease of application.
- .8 Store insulation protected from daylight, weather and deleterious materials.
- .9 Avoid material overloads which may affect the structural integrity of specific roof areas.
- .10 Keep insulation material away from the paint, plastics, adhesives and similar solvent based products; at all times protect them from direct sunlight with light-colored tarp.

.3 Packaging waste Management and disposal:

- .1 Works are governed by a Waste **management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The work of this section shall be made in accordance with the requirements of this plan.

1.12 Field conditions

- .1 Ambient Conditions:
 - .1 Do not install roofing when temperature remains below -18 degrees C for torch application, or -5 degrees C or to manufacturers' recommendations.
 - .2 Minimum temperature for solvent-based adhesive is -5 degrees C.
- .2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.13 On site Quality control

- .1 The inspection for roofing works will be performed by test laboratory designated by Departmental Representative and he will assume the related cost for these inspections. The contractor will have to follow the instructions of the inspector.

1.14 Roof – Extended warranty

- .1 Existing roof membrane is currently under AMCQ warranty.
 - .1 In accordance with the technical requirements of the AMCQ.
 - .2 Work described in this section will be carried out under the continuous supervision of an inspection firm accredited by the AMCQ and mandated by the Departmental Representative.
 - .3 Copies of the survey reports to be forwarded to the AMCQ.
- .2 For Work of the present Section, 07 52 00 – Modified Bituminous Membrane Roofing, the warranty period of 12 months is extended to **ten (10) years**, as follow :
 - .1 The product manufacturer will issue a written and signed document in the name of Canada, certifying that the roofing membranes products meet Canadian standards and are guaranteed for a period of **ten (10) years**

- .2 The contractor / roofer will provide a written and signed document to the name of Canada certifying that materials used and described in this section and the work executed will remain in place and free of waterproofing defect for a period of five (5) years.
- .3 This warranty will cover materials, labor and all damage caused by a lack in the quality of materials and labor.
- .4 During the warranty period, all repairs made to the roofing membranes, due to failure of performance, deterioration, wear naturally produced by the elements and defects of materials membrane, will be assume by the Contractor.

PART 2 - PRODUCTS

2.1 Performances criteria

- .1 Compatibility between components of roofing systems is essential. Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.
- .2 Roofing Systems: Provide Departmental Representative a written declaration stating that materials and components of the roofing system, as implemented, comply to CSA A123.21 for wind uplift resistance.

2.2 Generals

- .1 Compliance: comply with manufacturer's written recommendations and specifications, including product technical bulletins, handling instructions, storage and installation, and Product Data Sheets.
- .2 Apply sealing material assemblies in strict accordance with manufacturer's recommendations.

2.3 Deck support panels

- .1 Gypsum-Fiber Roof Board with non-structural reinforced fiberglass, impact resistant, made from 95% recycled material, and identified «Gypsum-Fiber board» on drawings. Moisture and mold resistant from edge to edge and across the surface and the core of the panel. Conforms to ASTM C1278, thickness as indicated on drawings.
- .2 Canadian outdoor type plywood with heat pressed phenol-formaldehyde resin, thickness as indicated on drawings, with fire retardant coating, and stamp.
 - .1 Continuous plywood strips to be installed on roof perimeter, along edges of parapets, under mechanical equipment and roof frames, and as indicated in detail.

2.4 Vapour Retarder

- .1 No. 15 asphalt saturated organic roofing felts to CSA A123.3.
- .2 Fiberglass roofing felts, type IV, bitumen saturated, in accordance with CSA 123.3 and ASTM D226.
- .3 Bitumen: Type 2 asphalt to CSA A123.4 (for slope less than 1: 12) and type 3 (for slope equal to or greater than 1: 12).
- .4 Bitumen: to CAN / CGSB-37-GP-9mA.

2.5 Roof Insulation

- .1 Expanded polystyrene insulation : to CAN/ULC-S701, Type 2, thickness as indicated, containing at least 10% recycled content, RSI factor 0.70 / mm, density 17.46 kg / m³, factory bitumen laminated fireproof fiberboard, shiplapped edges.
- .2 Slope insulation panels: expanded polystyrene insulation type 2, to CAN/ULC-S701, , thickness as indicated, containing at least 10% recycled content, RSI factor 0.70 / mm, density 17.46 kg / m³, factory bitumen fireproof fiberboard, shiplapped edges.
- .3 Expanded perlite insulation panels: Mineral aggregate thermal roof insulation to ASTM C728, RSI = 0.49 / 25 mm, 1220 x 1220 x 12.7mm thickness.
- .4 Rigid fire-retardant fiberboard panels to CAN/CSA-A247, Type 1 and CAN/CGSB-11.3, RSI = 0.27 / 25 mm, panels of 1220 x 1220 mm x 12, 7mm thickness.
- .5 Asphalt boards, to ASTM C472, ASTM C1278, ASTM D994 and ASTM E154, made of two saturated asphalt glass matt reinforcements and a mineral-reinforced asphalt core, thickness as indicated.

2.6 Elastomeric bitumen membrane

- .1 Roof membrane Base Sheet :
Membrane composed of SBS modified bitumen and reinforced with non-woven polyester reinforced. The two sides are covered with a thermofusible plastic film. The top face must be marked with three (3) chalk lines to ensure proper roll alignment. Type 1, category A, class 2, in conformance with: CGSB 37.56-M (9th Draft).
Physical properties: (Longitudinal and transversal).
Tensile strength: 17,0/16,0 KN/m.
Ultimate elongation: 60/60 %.
Static puncture: higher or equal to @ 380 N.
Cold bending: no cracks @ -30°C.
Dimensional stability: 0 % / 0 %.
Plastic flow: 105°C.
- .2 Roof membrane base sheet flashing:
Roofing membrane with composite heavy duty and glass mat, and SBS modified bitumen 2,5mm thickness. The top face is covered with a thermofusible plastic film. The underface is self-adhesive and protected by a silicone release plastic film. Type 1, category A, class 2 to CAN/CGSB 37.56-M (9° draft).
Physical properties :
Reinforcement: glass mat 130 gr.
Tensile strength : 18.0/16.0 KN/m.
Ultimate elongation: 55 @ 56 %.
Static puncture: higher or equal to @ 380 N.
Cold bending: no cracks @ -30°C.
Plastic flow: 105°C.

.3 Roofing membrane cap sheet flashings::

Roofing membrane with non-woven polyester reinforced elastomeric bitumen, with flame-retarding agent, 4mm thickness. The top face is protected by coloured granules. The underface is covered with a thermofusible plastic film. Type 1, category A, class 2, to CAN/CGSB 37.56-M (9° draft), ULC class A.

Physical properties :

Reinforcement: non-woven polyester: 250 g/m².

Tensile strength: 31/31 KN/m.

Ultimate elongation: 60 @ 65 %.

Static puncture: higher or equal to @ 540N.

Cold bending: no cracks @ -30°C.

Plastic flow: 105°C.

2.7 Transition and connection membrane

.1 Transition membrane for parapet junctions, wall and roof flashings:

.1 Self-adhesive membranes composed of SBS modified bitumen and a polyethylene woven complex. The self-adhesive underface is covered with a silicone release sheet, 1,0 mm minimum thickness with a Water Vapour permeance value of 2,8 ng/Pa.m².s and a Air permeability factor less than 0,01 L/m².s to 75 Pa, to ASTM E 96.

2.8 Fasteners

- .1 Screws to secure gypsum board to steel deck: No. 10 Phillips screw, flat head, self-tapping, type A or AB, with pressure washer, cadmium steel, length as required in accordance to ASTM C1002.
- .2 Fasteners for membrane layer: to CSA123.21 and CSA CAN / CSA B111, steel extra hard carbon and protected against corrosion 44mm (1-3 / 4 inches) long. Wood screws with threads up to the head are required.
- .3 Membrane galvanized plate: 1.0mm thick (cal.20), 50mm diameter, corrosion-resistant steel washer for use on elastomeric bitumen membrane and insulating boards, 1mm thickness and 75mm in diameter. Complies with FM 4470 and / or CSA 123.21, to meet FM Approval for wind uplift and corrosion resistance, as recommended by insulation manufacturer
- .4 Other screws: Concrete and / or wood screws as appropriate, galvanized and corrosion resistant.
- .5 Nails: to CAN / CSA B111, hot-dip galvanized steel, twisted, 25mm longer than the nailing assembly.

2.9 Materials and accessories

- .1 Flashing : See Section 07 62 00 – Sheet Metal Flashing and Trim.
- .2 Roof wooden construction : See Section 06 10 11 – Rough Carpentry.
- .3 Primer : As recommended by the manufacturer for the type of membrane and support.
- .4 Insulation adhesive : A highly elastomeric, two components foamable adhesive that can be applied at any temperature and sets in minutes.
- .5 Flame-stop tape : Self-adhesive membrane composed of a reinforced glass mat and SBS modified bitumen designed to prevent flames from penetrating into empty spaces and openings while installing heat-welded membranes.

- .6 Mounting bars: as recommended by the membrane manufacturer.
- .7 Sealants : As recommended by the membrane manufacturers.

PART 3 - EXECUTION

3.1 Work Coordination

- .1 Coordinate installation of new membranes sequences with the demolition of the roof.
- .2 Coordinate works to ensure waterproofing of roofs at all times and prevent water infiltrations in buildings.
- .3 Work sequences completion to be approved by Departmental Representative.

3.2 Examination of roof decks

- .1 Verification of Conditions:
 - .1 Inspect with Departmental Representative deck conditions including parapets, construction joints, roof drains, plumbing vents and ventilation outlets to determine readiness to proceed.
- .2 Prior to beginning of work ensure:
 - .1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.
 - .2 Curbs have been built.
 - .3 Roof drains have been installed at proper elevations relative to finished roof surface.
 - .4 Plywood and lumber nailer plates have been installed to deck, walls and parapets as indicated.
- .3 The start of roofing work will mean roofing conditions are acceptable for work completion.
- .4 Do not start any part of the work until all surfaces are smooth, dry and free of all waste material. Use of salts and calcium to remove snow or ice is forbidden.
- .5 Verify roof slopes.
- .6 Do not install roofing materials during rain or snowfall.

3.3 Protection of in-place conditions

- .1 Use non-staining protective sheets to protect exposed surfaces, adjacent walls and work in area of work or where materials will be used and hoisted. Assume complete responsibility for damage caused by work.
- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Clean off drips and smears of bituminous material immediately.

- .4 Protect roof from traffic and damage. Comply with precautions deemed necessary by Departmental Representative. Place plywood runways to enable movement of materials and other traffic. Repair and make good any damage caused by lack of precautionary care.
- .5 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- .6 Follow AMCQ and membrane manufacturer's recommendations regarding fire security.
- .7 Remove combustible materials as rapidly as possible.
- .8 Fill all spaces with torch flames may penetrate.
- .9 Ensure that roof drains are functional at the end of each work day.

3.4 Workmanship

- .1 Unless indicated otherwise, install waterproofing membranes on smooth surfaces, in accordance with requirements and manufacturer's recommendations, as well as those of the ACEC and QRCA (AMCQ). Should there be conflict between different requirement and recommendations, the highest standards apply.
- .2 Roofing work must be completed in a continuous fashion as surfaces are readied and weather conditions permit.
- .3 It's preferable to seal all seams that are not covered by a cap sheet membrane in the same day. The cap sheet cannot be installed if any moisture is present at/in the base sheet seams.
- .4 Whenever membranes are torch-applied, a continuous and even bead of molten bitumen must be visible as the membrane is unrolled and torched.
- .5 Ensure waterproofing conditions for roofs at all times, including protection during installation work by other trades and progressive protection as work is completed.

3.5 Support panels installation

- .1 Only the required amount of gypsum fiber boards panels that can be covered by the membrane on the same day, must be removed from storage and applied to the metal decking. Damaged panels are not acceptable (broken corners, cracks, moisture, etc.).
- .2 Place gypsum fiber panels to obtain tight butt joints. Place with long axis of each sheet transverse to steel deck ribs, with end joints staggered and fully supported on ribs. Panels end joints must be continuously supported on the top edge of the metal decking (support be 25mm minimum).
- .3 These boards must be screwed onto the steel deck's upper rib surfaces in conformance with Factory Mutual recommendations for corners and perimeters listed in the bulletin I-28. Use a minimum of screws and plates, 12 on a panel of 1220mm x 2440mm. Cut boards so edges rest on centre of upper ribs. Cut straight lines with adequate tools.

36 Vapour retarder installation

- .1 Install vapour barrier according to QRCA (AMCQ) recommendations. Ensure that the surface is dry and clean.
- .2 Embed two ply of felts organic or glass in hot bitumen spread at rate of 1 kg/m² for each sheet. Overlap each band to a width of 480mm.
- .3 Apply a layer of bitumen if the insulation is not put in place immediately.

3.7 Insulation application

- .1 Installation of insulation panels and sloped insulation with adhesive.
 - .1 Embed insulation to vapor barrier or underlying panel with specified adhesive applied in 2cm wide strips spaced 30 cm, according to the manufacturer's recommendations.
 - .2 Place boards in parallel rows with ends staggered, and in firm contact with one another.
 - .3 Cut end pieces to suit.
- .2 Place the panels in two layers thicknesses, offset joints, parallel to the length axis of the slope, the panels must be joined, in close contact.
- .3 All the panels must be in perfect connection, fill all spaces with a flexible insulation mineral rock fiber.
- .4 As indicated on drawings and where required to ensure proper water flow to drains, install and glue tapered insulation panels in full adhesion to base sheets.
- .5 Around the drains, cut out a slight slope of 0 to 10 mm. in a 600 mm. radius.
- .6 Apply only as many boards as can be covered in the same day.
- .7 Follow the manufacturer's written instructions, the QRCA (AMCQ) and architectural drawings. The most restrictive requirements prevail. All changes must be submitted and approved by the Departmental Representative prior to the work. Unauthorized work will be demolished at Contractor's expenses.

3.8 Sheathing installation

- .1 Install sheathing panels fully adhered, bitumen application, according to the manufacturer's recommendations.
- .2 All vertical joints between boards and insulation will be staggered. Ensure that there is no space between the support panels.
- .3 Reduce the panel thickness of 12mm around the drains, on a square 1m x 1m to facilitate the flow of water.

3.9 Flame-stop Tape installation

- .1 Apply tape directly to approved surfaces. Fill all voids, spaces or openings where flame may penetrate while installing heat-welded membranes.

3.10 Roof base layer membrane

- .1 Base sheet application:
 - .1 Starting at low point of roof, perpendicular to slope, unroll base sheet, align and reroll from both ends.
 - .2 Unroll and torch base sheet onto substrate taking care not to burn membrane or its reinforcement or substrate.
 - .3 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps. Stagger end joints by a minimum of 300 mm.
 - .4 Application to be free of blisters, wrinkles and fishmouths. In cold weather, adjust welding time to obtain homogenous seam.
- .2 Make sure all seals are completed at the end of each workday.
- .3 Install gussets at every angle, on inside and outside corners.

3.11 Base sheet layer installation

- .1 Ensure all surfaces are smooth dry and clean prior to application of primer.
- .2 Apply one coat of primer according to manufacturer's recommendations. Apply base sheet flashing only after primer coat is dry.
- .3 Install self adhesive base layer in strips 1 metre wide. Overlay the base layer of the flat roof by 100mm. Longitudinal overlaps shall be 75mm and staggered by at least 100mm relative to overlaps of the flat roof.
- .4 Adhere membranes to substrate. Burn off plastic film of base layer where overlaid. Press uniformly to obtain homogenous bond over whole area. Roll joints with rubber roller. Weld non adhesive portions of the joints.
- .5 Gradually peel back the remaining silicone release paper, pressing down on the membrane with an aluminum applicator to ensure good adhesion. Use the aluminum applicator to ensure a perfect transition between the upstand and the field surface. Smooth the entire membrane surface with a roller for full adhesion.
- .6 Cut off corners at end laps to be covered by the next roll.
- .7 Nail at 300 mm c / c top and longitudinal overlaps to upstands and parapets more than 450mm height.
- .8 Always seal overlaps at the end of the workday.
- .9 Install reinforcements according roofing details on drawings and manufacturer's recommendations.

3.12 Roofing Cap sheet installation

- .1 Ensure installation of base layer is complete and free of defect.
- .2 Take all necessary precautions to limit fire hazards associated with torch flames.
- .3 Unroll finish membrane starting at drain. Align with roof edge. Torch weld to base layer membrane in accordance with manufacturer's recommendations. Simultaneously melt base layer and finish membranes to fuse them together.

- .4 Weld over entire surface of membranes. Ensure total bonding of weld and leave no area unwelded.
- .5 Use starting rolls with double border for first strip.
- .6 Ensure layers are staggered at least 300mm between the joints of base layer and finish membrane. Overlap finish layer 75 mm at sides and 150 mm at ends. All overlaps shall be made on surfaces without pellets.
- .7 Bituminous beads at joints shall be apparent without being excessive. Ensure uniformity of bead.
- .8 Avoid creating folds, swells and gaps.
- .9 Complete perfect welds between two membranes. Leave no zone unwelded. In cold weather, adjust welding time to obtain homogenous seam
- .10 Once cap sheet is installed, carefully check all overlapped joints.

3.13 Roofing Cap sheets on upstands and parapets installation

- .1 Ensure installation of base layer is complete and free of defects.
- .2 Take all necessary precautions to limit fire hazards associated with torch flames.
- .3 Install finish layer in 1 meter widths. Longitudinal overlaps of 75mm and staggered by at least 100mm relative to overlay of flat roof. Overlaps of the flat part shall be 150mm.
- .4 Ensure stagger of 300mm between joints of finish membrane and base layer.
- .5 Weld finish layer to base layer of parapet and raised parts. Proceed from bottom to top. Soften both membranes with torch to obtain total and homogenous weld. For welds at flat part, embed pellets with torch and rounded end trowel.
- .6 Avoid creating folds, swells and gaps.
- .7 Cover all parapets and roof elements with cap sheet membrane as shown in the drawings.

3.14 Equipment and accessories

- .1 Mechanical Equipment: install cap sheet membrane and finishing on mechanical supports using the same method as the parapets.
- .2 Protection pads : Install a protection pads under equipment support points on the membrane.
- .3 Metal flashings : as shown in the drawings and Section 07 62 00 - Sheet Metal Flashing.

3.15 Field Quality Control

- .1 Inspections:
 - .1 Inspection and testing of roofing application will be carried out by testing laboratory designated by [Departmental Representative.
 - .2 Departmental Representative will pay for tests as specified in Section 01 45 00 - Quality Control.

3.16 Cleaning

- .1 At completion of work, the Contractor will inspect all works in this section and execute without delay all necessary work adjustment or repair. All adjacent surfaces that have been soiled during the work will be cleaned.
- .2 Remove bituminous markings from finished surfaces.
- .3 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.
- .4 Repair or replace defaced or disfigured finishes caused by work of this section.

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with sections and drawings depicting complementary works, prior or related to the work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for the complete execution of sheet metal flashings and trim, including all the accessories required, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General Requirements
- .2 Section 06 10 11 – Rough Carpentry.
- .3 Section 07 46 10 – Exterior preformed siding.
- .4 Section 07 52 00 – Modified Bituminous Membrane Roofing.
- .5 Section 07 92 10 – Joint Sealing.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A 167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A 240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .3 ASTM A 591/A591M, Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating [Mass] Applications.
 - .4 ASTM A 606, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .5 ASTM A 653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .6 ASTM A 755/A 755M, Steel Sheet, Metallic-Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - .7 ASTM A 792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .8 ASTM B 32, Standard Specification for Solder Metal.
 - .9 ASTM D 523, Standard Test Method for Specular Gloss.
 - .10 ASTM D 822, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual including all recent updates.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32, Sheathing, Membrane, Breather Type.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA A123.3, Asphalt Saturated Organic Roofing Felt.
 - .2 AAMA/WDMA/CSA 101/I.S.2/A440, Standard/Specification for Windows, Doors, and Unit Skylights.
 - .3 CSA B111, Wire Nails, Spikes and Staples.
 - .4 CSA-S136, North American Specification for the Design of Cold-Formed Steel Structural Members.
- .6 Health Canada / Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS)

1.4 Action and informational submittals

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies of WHMIS MSDS in accordance with General conditions and additional General conditions
- .3 Shop drawings:
 - .1 The drawings shall indicate the thicknesses, and the finish, dimensions, profiles, bending details and methods of fastening, gaskets and closure parts, and related work
- .4 Samples:
 - .1 Submit duplicate 100 x 100mm samples of each type of sheet metal material, finishes and colours.
 - .2 Submit duplicate 300mm length samples of bendings to be relized on work site.
- .5 Quality assurance:
 - .1 Submit following in accordance with Section 01 45 00 - Quality Control]
 - .2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
- .6 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.

- 1.5 Delivery, storage and handling** .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- 1.6 Waste management and disposal** .1 Works are governed by a Waste **management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The work of this section shall be made in accordance with the requirements of this plan.
- 1.7 Warranty** .1 For Work of the present Section, 07 62 00 – Sheet metal flashing and trim, the 12 month warranty period is extended to five (5) years for all of the work
.1 Provide a written and signed document to the name of Canada, stating that supplied and installed products are guaranteed against defects of chipping, fading, chalking, corrosion, and installation for the period specified above.

PART 2 - PRODUCTS

- 2.1 Sheet metal materials** .1 **Enamelled steel** : For flashing of parapets of buildings, including pilasters, caps, separation curbs, roof curbs for mechanical equipment, canopy junctions, gutters and other locations as indicated on the drawings;
.1 Hot dipped galvanized steel sheet, identified " prepainted metal flashing" or "flashing or prepainted metal trim or molding or fascia" on the documents.
.2 Commercial quality (QC) to ASTM A 653/A 653M, with Z275 designation zinc coating.
.3 Metal base thickness as indicated, not less than **0.65mm** (gauge 24).
.4 Prefinished steel with factory applied primer on both sides and a layer of polyvinylidene fluoride on one side.
.1 Finish: to AAMA 2605, 3 heat treatment enamel layers: primer, topcoat and a glossy varnish finish, containing 70% of fluoropolymer resin and polyvinylidene fluoride (PVDF).
.2 Color and finish should be uniform without visible change.
.3 Three (3) color selected by DCC Representative from manufacturer's complete range including special finishes, metallic finishes:
.4 Specular gloss: 30 units +/- in accordance with ASTM D 523
.5 Coating thickness: not less than 0,04mm (1.6 mil).
.6 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D 822 as follows:
.1 Outdoor exposure period 2500 hours.
.2 Humidity resistance exposure period 5000 hours.
- 2.2 Accessories** .1 Isolation coating: alkali resistant bituminous paint.
.2 Plastic cement: to CAN/CGSB 37.5.
.1 Maximum VOC limit 50g/L to SCAQMD Rule 1168.
.3 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

- .4 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .5 Washers: of same material as sheet metal, 1mm thick with rubber packing's.
- .6 Touch-up paint: as recommended by prefinished material manufacturer.
 - .1 Maximum VOC limit 50g/L to SCAQMD Rule 1168.
- .7 Self-adhesive flexible membrane for connections and junctions;
 - .1 Single membrane composed of elastomeric modified bituminous SBS, with fibreglass mesh reinforcement and self-adhesive, 1.0 mm minimum thickness, water vapor permeance of 49 ng / Pa.m2s, air leakage less than 0.0003 L / m2.s at 75 Pa pressure, to ASTM E 96.
- .8 Mastic based SBS modified bitumen, fiber, mineral and solvent. Sealant must contain an aluminum pigmentation for superior UV resistance, type recommended by the manufacturer.

2.3 Fabrication

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details and as indicated in the drawings.
- .2 Form pieces in 2400mm maximum lengths. Make allowance for expansion at joints.
- .3 Hem exposed edges on underside 12 mm.
 - .1 Mitre and seal corners with sealant.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .6 Where elements made of dissimilar metals meet, cover element with a dry film layer of plastic cement, of minimum 0.2mm thickness.

2.4 Metal flashings

- .1 Form flashings, copings and fascias to profiles indicated galvanized, prefinished, prefinished aluminum steel.

2.5 Gutters

- .1 Folded galvanized steel sheet 2mm thick.
- .2 Prepainted metal gutter, should be formed according to profiles and drawings.

PART 3 - EXECUTION

3.1 Manufacturer's instructions

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

3.2 Installation

- .1 Install sheet metal work in accordance with CRCA FL series details, FL Aluminum Sheet Metal Work in Building Construction.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal. .
 - .1 Secure in place and lap joints 100 mm. Bond joint overlap with plastic cement.
 - .2 Where installing flashing to existing exterior walls, place membrane underlay on vertical surface and immediately seal underneath the flashing.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips.
- .5 Lock end joints and caulk with sealant.
- .6 Install surface mounted steel edge true and level, and caulk top of steel edge with sealant.
- .7 Insert metal flashing into reglets, under cap flashing to form weather tight junction.
- .8 Caulk flashing at cap flashing with sealant.
- .9 Install pans, where shown around items projecting through roof membrane.
- .10 Form flashings according to profiles and slopes indicated in the drawings and to match existing conditions and surroundings.
- .11 Do not fasten mechanical attachments (nails) lower than 200mm from the surface of the roof.
- .12 Make good folds at junctions with existing flashing (vertical and horizontal).

3.3 Membrane protection

- .1 No drilling of membranes and flashings is allowed on top of walls and parapets except for openings sealed with putty boxes.
- .2 No screws are permitted below 200mm and no wiring or cable is allowed within 250mm of the finished roof surface.
- .3 Follow minimum piercing heights of membrane required by the AMCQ.

3.4 Cleaning

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

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with all sections and drawings describing works that are complementary, subordinate, prerequisite or otherwise related to work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for complete execution of joint sealing works, including all accessories required, so that works perfectly fulfill purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General requirements.
- .2 Division 3 – Concrete.
- .3 Section 06 10 11 – Rough Carpentry.
- .4 Section 07 46 10 – Exterior preformed siding.
- .5 Section 08 11 14 – Metal doors and frames
- .6 Section 08 44 13 – Glazed aluminum Curtain walls and Skylights.
- .7 Section 08 51 13 – Aluminum Windows.
- .8 Section 08 80 50 – Glazing.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C 919, Standard Practice for Use of Sealants in Acoustical Applications.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, (CEPA).
- .4 General Services Administration (GSA) - Federal Specifications (FS)
 - .1 FS-SS-S-200-E(2), Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

- 1.4 Action and informational Submittals**
- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Manufacturer's product to describe.
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
 - .3 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Submit duplicate samples of each type of material and colour.
 - .5 Cured samples of exposed sealants for each color where required to match adjacent material.
 - .6 Submit manufacturer's instructions in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Instructions to include installation instructions for each product used.
 - .7 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.
- 1.5 Quality assurance / mock-up**
- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct mock-up to show location, size, shape and depth of joints complete with back-up material, primer, caulking and sealant.
 - .3 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
 - .4 Locate where directed.
 - .5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sealant work.
 - .6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work. Approved mock-up may remain as part of finished Work.
- 1.6 Delivery, storage, and handling**
- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.7 Low VOC materials

- .1 The VOC content of all adhesives, sealants and sealant primers used on the inside of the building (i.e. to the inside of the sealing system) must be less than the VOC content limits of the State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168, June 2006.
- .2 All paints, coatings and architectural finishes used inside the building (i.e. to the inside of the sealing system) and applied on site must :
 - .1 Architectural paints and coatings applied to interior walls and ceilings must not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.
 - matte paintings;
 - Not matte paintings.
 - .2 Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.
 - .3 Clear wood finishes, floor coatings, stains, primers, and shellacs applied to interior elements must not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.

1.8 Waste management and disposal

- .1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The work of this section shall be made in accordance with the requirements of this plan.

1.9 Project conditions

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

1.10 Environmental requirements

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

- .3 Departmental Representative will arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of caulking and sealants. Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

PART 2 - PRODUCTS

2.1 Sealant materials

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers use only these primers.
- .4 Sealant products chosen for this project shall appear on the approved list drawn up by CGSB's Commission for the approval of sealant products.

2.2 Sealant materials designations

- .1 Low modulus, single component silicone sealant **(SC-1)** :
 - .1 To ASTM C679, neutral curing silicone; colors to be chosen among manufacturer standard series.
 - .2 Used for precast architectural concrete panels joints, for joints of the adjoining surfaces, and other locations indicated on the drawings.
- .2 Self-Levelling One-Part Polyurethane **(SC-2)** :
 - .1 To ASTM C920, type S, grade P, class 25 et TT-S-00230C, class A, moisture curing, single component.
 - .2 For concrete slabs joints and at junctions between walls, or concrete columns and concrete slabs.
- .3 Butyl Sealant **(SC-3)** :
 - .1 To ASTM C920, nonsag; colors to be chosen among manufacturer standard series.
 - .2 Used for interior joints, junctions of mullions and aluminum frames, and locations indicated on drawings.
- .4 Synthetic rubber and bitumen sealant **(SC-4)** :
 - .1 Reflective elastomeric bitumen sealant, aluminum color, anticorrosive.
 - .2 Used on roof perimeter, membrane tips, on metal flashings, and metallic structures, gutters, pipes, and locations indicated on drawings.
- .5 Acrylic latex sealant (exposed surfaces) **(SC-5)** :
 - .1 Acrylic sealant, low odor, mildew resistant to ASTM E90 and ASTM C-834.
 - .2 On drywall panel perimeter, against metal framing, between metal framing and concrete, under sills and head tracks, around electromechanical boxes and other openings, in concealed position, around doorframes, and exposed joints, exposed where painting or finishing is required.

- .6 Rubber based acoustical sealant (**SC-6**) :
 - .1 To ASTM C920, self-levelling, non-peelable, non-staining and thick, with a penetration of 290-310, to ASTM D217.
 - .2 On drywall perimeters, against metal framing, in concealed locations.
- .7 Silicone sealant, mildew resistant (**SC-7**) :
 - .1 One part, to ASTM C920, conforms to FDA regulations, colorless, translucent.
 - .2 In general, at all visible interior joints (except where noted otherwise), between door and window frames and other steel or aluminium fabrications and adjacent surfaces, around built-in furniture, around every mechanical, electrical or electronic control elements on shop walls and ceilings, around toilet and bath accessories, for interior glazing installation.
- .8 Polyurethane sealant, non-sag (**SC-8**) :
 - .1 To ASTM C920, grade NS, class 25 and TT-S-00230C, class A, humidity curing.
 - .2 Under aluminum door sills and as an adhesive between materials with dissimilar expansion factors.
- .9 Filler / High-Modulus, High-Strength, Structural, Epoxy paste Adhesive. Two-component, solvent-free, moisture-insensitive. Tensile strength : 24 Mpa. Elongation at break : 0,95 %.
 - .1 Two component grouting compound.
 - .2 For all junctions, on top of concrete blocks walls and existing slabs.
- .10 Polyurethane foam adhesive sealant: CFC free, space filler around steel or aluminum frames and adjacent surfaces (do not leave exposed).
- .11 Silicone structural glazing : high performance silicone sealant, single-component, medium-modulus, to ASTM C920 type S, Grade NS, Class 25.

2.3 Back-up materials

- .1 Primer: as recommended by the sealant's manufacturer.
- .2 Preformed Compressible and Non-Compressible back-up materials.
 - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
 - .1 Extruded closed cell foam backer rod.
 - .2 Size: oversize 30 to 50 %.
 - .2 Synthetic rubber (neoprene) or Butyl Rubber.
 - .1 Round solid rod, Shore A hardness 70.
 - .3 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
 - .4 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.4 Joint cleaner

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

PART 3 - EXECUTION

3.1 Generals

- .1 Compliance: comply with manufacturer's written recommendations and specifications, including product technical bulletins, handling instructions, storage and installation, and Product Data Sheets.
- .2 Apply sealing material assemblies in strict accordance with manufacturer's recommendations.
- .3 Make sure of the compatibility of substrates with the sealing product. Prepare surfaces according to manufacturer's recommendations..
- .4 Prepare and apply sealing assemblies in the locations shown in the drawings, including the following locations :
 - .1 Exterior joints sealing of openings affected or modified by works.
 - .2 Interior joints sealing.
 - .3 Finish sealants.
- .5 The sealing works must include all adhesives, anchors, fasteners, moldings and other items necessary for the complete execution of work described herein;

3.2 Protection

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

3.3 Surface preparation

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

3.4 Priming

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

3.5 Backup material

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

3.6 Mixing

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.
- .2 Prevent formation of air bubbles

3.7 Application

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

3.8 Protection

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

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with sections and drawings depicting complementary works, prior or related to the work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for supply and installation of metal doors and frames, including all the accessories required, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General requirements.
- .2 Section 02 41 16 – Demolition.
- .3 Section 07 92 10 – Joint Sealing.
- .4 Section 08 71 00 – Door Hardware.
- .5 Section 08 80 50 – Glazing.
- .6 Section 09 91 23 – Painting.
- .7 Division 26: Electricity.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A 653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM B 29, Specification for Refined Lead.
 - .3 ASTM B 749, Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-G40.20-04/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association, (CSDMA).
 - .1 CSDMA, Specifications for Commercial Steel Doors and Frames.
 - .2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors.

- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80, Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC-S704, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .4 CAN4-S104, Standard Method for Fire Tests of Door Assemblies.
 - .5 CAN4-S105, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.4 System description

- .1 Design Requirements:
 - .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35° C to 35° C.
 - .2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.
 - .3 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 for ratings specified or indicated.
 - .4 Provide fire labelled frames for openings requiring fire protection ratings, as scheduled. Test products in conformance with CAN4-S104, ASTM E 152 or NFPA 252 and listed by nationally recognized agency having factory inspection services and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

1.5 Action and informational Submittals

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

- .6 Submit one 300 x 300 mm corner sample of each type of frame.
 - .1 Show butt cut-out, glazing stops 300 mm long removable mullion connection, snap-on trim with clips and finishes.
- .7 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.

1.6 Low VOC materials

- .1 The VOC content of all adhesives, sealants and sealant primers used on the inside of the building (i.e. to the inside of the sealing system) must be less than the VOC content limits of the State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168, June 2006.
- .2 All paints, coatings and architectural finishes used inside the building (i.e. to the inside of the sealing system) and applied on site must :
 - .1 Architectural paints and coatings applied to interior walls and ceilings must not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.
 - matte paintings;
 - Not matte paintings.
 - .2 Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.
 - .3 Clear wood finishes, floor coatings, stains, primers, and shellacs applied to interior elements must not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.

1.7 Delivery, Storage and Handling

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

1.8 Waste management and disposal

- .1 Works are governed by a Waste **management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The work of this section shall be made in accordance with the requirements of this plan.

PART 2 - PRODUCTS

2.1 General

- .1 Unless otherwise indicated, install fire rated doors and frames with appropriate label and approval in accordance with NFPA 80 standard.

- .2 Work of the present section include, without limitation, supply and installation of the following elements :
 - .1 Steel doors and frames.
 - .2 Steel doors and frames preparation for hardware, glazing and paint finish;
 - .3 The supply of all steel frames for exterior doors and the supply and installation of all steel doors shown on the drawings, and described to the door and frame schedule.
 - .4 All adhesives, anchors, fasteners, profiles, moldings, and other accessories required for the installation of metal doors and frames.

2.2 Materials

- .1 Hot dipped galvanized steel sheet: to ASTM A 653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
- .2 Channels and reinforcing elements: steel to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.
- .3 Fire doors and frames: build doors, panels and frames as required for regulatory approval and labels. Unless otherwise specified, the minimum thickness of base of galvanized steel used for doors must be 1.2mm and 1.6mm for frames. Where doors and frames must be made with thicker steel for security reasons, provide a certificate from the manufacturer stating that the doors meet the degree of fire resistance indicated or required.
- .4 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250 degrees C at 30, 45, 60 or 90 minutes. Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in strict conformance with CAN4-S104, ASTM E 152 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .5 Manufacturer :
 - .1 Use only steel doors and frames from a single same manufacturer.

2.3 Doors and frames

- .1 Doors :
 - .1 Exterior doors :
 - .1 Steel, institutional type, **heavy-duty**, with internal reinforcements vertical Z 150mm o.c., with and/or without ULC listing;
 - .2 Insulated core (rigid polyurethane panel);
 - .3 Base metal thickness : 1.9mm (14 gauge);
 - .4 Door thickness : 51mm.
 - .2 Core for all door installed to be urea-formaldehyde resin free.
 - .3 Base metal thickness, hinges side and hardware reinforcements: 3.4mm thickness 3.4mm.
 - .4 Base metal thickness, opposite hinges side: 2.65mm.
 - .5 Provide reinforcement for future door closers: 2.65mm.
- .2 Exterior frames :
 - .1 Galvanized steel frame, welded, commercial quality, heavy-duty construction thermally broken ;

- .2 Thermal break, frames built in 2 pieces, as indicated in the drawings.
- .3 Inside of frames to be insulated with mineral wool;
- .4 Base metal thickness : 1.6mm, Except under the following conditions :
 - .1 For fire rated frames or acoustical frames, with openings greater than 1200mm, the frames to be 1.9mm thick, welded.

- .3 Hardware reinforcements: 3.4mm thick.
- .4 Protective housings: steel plates, 1.6mm thickness welded to frames, dimensions according to electrical hardware or components. Protective housings required for mortar filling operations
- .5 See doors and frames schedule for the materials description for each door and frame.

2.4 Adhesives

- .1 Honeycomb cores and steel components: heat-resistant adhesive contact, sprayable, based neoprene rubber (polychloroprene) with embedded load, low viscosity resins.
- .2 Doors stapled seam: fire resistant adhesive / sealant, polychloroprene based with incorporated high viscosity resins charges.

2.5 Primer

- .1 Touch-up prime CAN/CGSB-1.181.
 - .1 Maximum VOC limit 50 g/L to GC-03.
- .2 All doors and frames to be primed.

2.6 Paint

- .1 Field paint steel doors and frames in accordance with Sections 09 91 23 – Painting, before hardware installation. Touch-ups will be made as needed thereafter. No piece of hardware should be coated with paint. Protect weather strips from paint. Provide final finish shall be free of scratches or other blemishes.
 - .1 Maximum VOC emission level 50 g/L to GS-11.

2.7 Accessories

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Metallic paste filler: to manufacturer's standard.
- .3 Fire labels: metal riveted.
- .4 Sealant: in accordance with Section 07 92 10 – Joint Sealers.
- .5 Glazing: in accordance with Section 08 80 50 – Glazing.
- .6 Make provisions for glazing as indicated and provide necessary glazing stops.
 - .1 Provide removable painted steel glazing beads and secured with countersunk painted steel screws.
 - .2 Design exterior glazing stops to be tamperproof.

- .7 Glazing stops shall be fabricated from solid steel bars of 20mm X 20mm and 25mm X 25mm as indicated; accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws, tamperproof.
- .8 Security screws (tamperproof): For all assemblies such as removable glazing stops and other items, use safety screws type « HEX-Socket Pin » with countersunk heads installed using a special tool.
- .9 Astragal : commercial category, minimum 3mm thick steel, screwed and countersunk as indicated on the finish hardware schedule.

2.8 Frames fabrication general

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Blank, reinforce, drill and tap frames for mortised, template hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .4 Protect mortised cut-outs with steel guard boxes.
- .5 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .6 Manufacturer's nameplates on frames and screens are not permitted.
- .7 Conceal fastenings except where exposed fastenings are indicated.
- .8 Reinforce frame heads for doors of 1200 mm width or greater.
- .9 Provide the required openings to allow filling of concrete grout within frames.
- .10 Double frames to receive continuous hinges over complete length with continuous 3 mm thick plates, welded and prepared to receive hardware.
- .11 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .12 Insulate exterior frame components with polyurethane insulation.
- .13 For existing openings only, provide three pieces built in frames. Assemble parts carefully and assure that edges of the frames are flush with each other and the assembly meets the required fire resistance, see Doors and Frames Schedules.
 - .1 The corners joints should be ground and welded. Use paste filler with metal particles and sand until smooth and uniform finish. This requirement also applies to fire rated frames
- .14 Provide glazing and install beading as indicated. Fixed glazing beads must be made of solid steel bars, welded in place in steel plate assemblies. Removable beading must be made of solid steel bars in steel plates assemblies and be secured with a tamper proof screws (HEX – Socket Pin type) at 150 mm c / c maximum with a minimum of 2 screws per beading.

2.9 Frame anchorage

- .1 Provide appropriate anchorage to floor and wall construction.
 - .1 Ground anchor: steel plates "U" shaped, 1.9mm.
 - .2 Welded frames :
 - .1 Precast concrete wall, existing column and interior existing concrete beams: Anchor type "tubes and screws" at 400mm c. to c.
 - .3 Mechanical frame (3 pieces) :
 - .1 Existing masonry walls : Anchor type « tubes and screws» 400mm c. to c., 1,6mm thickness.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 3 anchors for rebate opening heights up to 1520mm and 1 additional anchor for each additional 600mm of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 150mm from top and bottom of each jambs and intermediate at 660mm on centre maximum.
- .5 Close openings and holes in the frames with metal filler, then sand to a smooth, even finish.

2.10 Frames: welded type

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.
- .7 In all cases use welded frames, except for existing walls of concrete blocks drilled or enlarged for the installation of new doors as indicated in doors and frames schedule.
- .8 When using frames with mechanical joints (three pieces), the welding of joints, grinding and sanding must be done on site after frames installation.

2.11 Door fabrication general

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
- .2 Fabricate doors with longitudinal edges welded. Seams: visible, fill with metallic paste filler and sand to a uniform smooth finish.
- .3 Doors: manufacturers' proprietary construction tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware in accordance with ASTM E 330.

- .4 Blank, reinforce, drill doors and tap for mortised, template hardware and electronic hardware.
- .5 Factory prepare holes 12.7mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .6 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .8 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in strict conformance with CAN4-S104, ASTM E 152 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .9 Adjacent fixed panels and / or transom, of fire doors must have the same composition and the same fire rating as the door and have the same approval label.
- .10 Manufacturer's nameplates on doors are not permitted.
- .11 Doors to receive continuous hinges shall be doubled along edges with concealed, continuous 3 mm thick steel plate, welded along top and prepared to receive hardware.

2.12 Thermally broken doors and frames

- .1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.
- .2 Thermal break: rigid polyvinylchloride extrusion
- .3 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .4 Apply insulation.

PART 3 - EXECUTION

3.1 Manufacturer's instructions

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

- 3.2 Installation general**
- .1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
 - .2 Install doors and frames to CSDMA Installation Guide.
- 3.3 Frame installation**
- .1 Set frames plumb, square, level and at correct elevation.
 - .2 Secure anchorages and connections to adjacent construction.
 - .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200mm wide. Remove temporary spreaders after frames are built-in.
 - .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
 - .5 Fill frames with thermal insulation where indicated and/or required. Caulk perimeter of frames between frame and adjacent material.
 - .6 Fill doors frames and glazed partitions frames with concrete grout where required. Seal openings and sand.
 - .7 Coordinate installation of electrical conduit and hardware elements required for electrified hardware components (See Section 08 71 00 – Hardware).
 - .8 Maintain continuity of air barrier and vapour retarder.
- 3.4 Door installation**
- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 10 - Door Hardware - General.
 - .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0mm.
 - .2 Latchside and head: 1.5mm.
 - .3 Finished floor, top of carpet and thresholds: 13mm.
 - .4 Observe the tolerances for specified for fire doors.
 - .5 Make sure the doors movement are not in contact with the finished floor.
 - .3 Adjust operable parts for correct function.
- 3.5 Fixed panels and glazing bead installation**
- .1 Coordinate installation of glazing beads with glass supplier.
 - .2 Beading welded: Perform welds 25 mm in length at each corner of the window and spaced 150 mm maximum along the beading at least two welds beading.
 - .3 Fully protect the glass during welding. Damaged glazing will be replaced.

- .4 Beading removable: Secure with screw tamperproof type "Torx Plus" to a maximum of 150mm c. to c. Use a minimum of two screws per section beading.

3.6 Touch-ups

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

3.7 Glazing

- .1 Install glazing for doors in accordance with Section 08 80 50 - Glazing.

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with sections and drawings depicting complementary works, prior or related to the work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for supply and installation of glazed aluminum curtain walls and skylight, including all the accessories required, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General Requirements.
- .2 Section 02 41 16 – Demolition.
- .3 Section 07 62 00– Sheet Metal Flashing and Trim.
- .4 Section 07 92 10 – Joint Sealing.
- .5 Section 08 80 50 – Glazing.
- .6 Section 09 91 23 – Painting.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 Aluminium Association Designation System For Aluminium Finishes (AA)-1997.
 - .1 DAF 45,Designation System For Aluminium Finishes.
- .3 American Architectural Manufacturers Association (AAMA).
 - .1 AAMA CW-DG-1, Aluminium Curtain Wall Design Guide Manual.
 - .2 AAMA CW-10, Care and Handling of Architectural Aluminium From Shop to Site.
 - .3 AAMA CW-11, Design Wind Loads for Buildings and Boundary Layer Wind Tunnel Testing.
 - .4 AAMA T1R-A1, Sound Control for Fenestration Products.
 - .5 AAMA 501, Methods of Test for Exterior Walls.
 - .6 AAMA 611, Voluntary Specifications for Anodized Finishes Architectural Aluminium.
 - .7 AAMA 612, Voluntary Specifications, Performance Requirements, and Test Procedures for Combined Coatings of Anode Oxide and Transparent Organic Coatings on Architectural Aluminium.
 - .8 AAMA 2603, Voluntary Specification Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminium Extrusions and Panels.

- .9 AAMA 2604, Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminium Extrusions and Panels.
- .4 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A 36/A36M, Specification for Carbon Structural Steel.
 - .2 ASTM A 123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM A 167-99, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .4 ASTM A 653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM B 209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .6 ASTM B 221, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .7 ASTM E 283, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .8 ASTM E 330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls, by Uniform Static Air Pressure Difference.
 - .9 ASTM E 331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference.
 - .10 ASTM E 1105, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- .5 Canadian Standards Association (CSA International).
 - .1 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
 - .2 CSA-S136, North American Specification for the Design of Cold-Formed Steel Structural Members.
 - .3 CAN/CSA-S157/S157.1, Strength Design in Aluminium / Commentary on CAN/CSA-S157, Strength Design in Aluminium.
 - .4 CSA W59.2, Welded Aluminium Construction.
- .6 Environmental Choice Program (ECP).
 - .1 CCD-45, Sealants and Caulking Compounds.
 - .2 CCD-47, Surface Coatings.
 - .3 CCD-48, Recycled Water-Borne Surface Coatings.
- .7 Society for Protective Coatings (SSPC).
 - .1 SSPC - Paint 20 Zinc Rich Coating.
 - .2 SSPC - Paint 25 Alkyd, Zinc Oxide Linseed Oil and Primer for Use Over Hand Cleaned Steel Type 1 and Type 2.

1.4 System description

- .1 Vertical glazed aluminum curtain wall system includes vertical glass panels and mullions with thermally broken tubular aluminum sections with supplementary support framing, shop fabricated, factory prefinished, vision glass, insulated metal panel, spandrel infill, column covers; related flashings, anchorage and attachment devices.
- .2 Skylight :
 - .1 Replacement of all glazing systems for existing skylights, including exterior caps and pressure strips, vision panels (sealed unit), all gaskets and sealing strips (interior and exterior), as indicated in drawings.
 - .2 Structural components and mullions are maintained.
- .3 Assembled system to permit re-glazing of individual glass (and infill panel) units without requiring removal of structural mullion sections.

1.5 Performance requirements

- .1 General:
 - .1 The curtain wall and other work making up the building envelope shall create a complete and uninterrupted barrier against water, humidity and air as well as thermal insulation running from the foundation wall to the roof.
 - .2 The curtain wall and glazing shall meet or surpass the requirements of the NBC and CAN/CSA-A440.
 - .3 In the event of contradictions, the directions given on drawings and the specifications of the present section indicate the essence of the work to be executed and the additional materials to those described on the drawings and to those described herein in order to accomplish the work in conformity with the requirements described herein. Where there is contradiction between the standards mentioned herein and those indicated on one and described in another, the more stringent standards shall apply and both shall be made compatible with each other. Any omission in the present section, of applicable requirements that are stipulated in related standards shall not be interpreted as the requirement being dropped.
 - .4 The Contractor acknowledges that the design details shown on architectural drawings do not cover any conditions or modifications which might eventually be required. It is understood that "not detailed" conditions will be developed into the Contractor's detailed shop drawings to achieve the same aesthetic quality in accordance with performance criteria, shown in the drawings and actual specifications.
 - .5 Final design of the Contractor shall be supervised by a qualified Professional Engineer licensed to practice in the province and the shop drawings and calculations shall bear his stamp and signature.
 - .6 Laboratory testing of glass glazing units shall achieve at minimum the following results :
 - .1 Air tightness: « A3 ».
 - .2 Water tightness: "B7".
 - .3 Structural performance: "C5".
 - .4 Thermal performance: I = 68.5.
 - .5 Break-in resistance: "F2".
 - .7 Minimal performance to be confirmed field tests shall comply with the following paragraphs.

- .2 Structural performance:
 - .1 Classification of glazed glass units: "C5".
 - .2 The curtain wall and glazed units shall resist positive or negative pressure of 1.33 kPa and a rupture resistance of force up to 2.0 kPa.
 - .3 Limit mullion deflection to $L/175$ of free span and no greater than 19 mm on the perpendicular plane to the wall ; and $1/360$ or a maximum of 3 mm on the parallel plane to the wall, in accordance with CAN3-S157 and ASTM E330 when the glazing is in place, with full recovery of glazing materials.
 - .4 Size glass units and glass dimensions to limits established in CAN/CGSB-12.20.
 - .5 The curtain wall shall accommodate admissible tolerances of the buildings structure and retain it visual and structural integrity
 - .6 System to provide for expansion and contraction within system components caused by a cycling temperature range of 110 degrees C (from -35 °C to 75 °C) over a 12 hour period without causing detrimental effect to system components.
 - .7 Joints shall be designed to allow movement within the system and movement between the system and the perimeter framing components caused by structural movement, without permanent distortion, damage to interior components, deformation of joints, deterioration of seals or water penetration.
 - .8 Design and size components, including anchorage and additional reinforcement required so that they support their own weight, the weight of the glass and the required design loads.
 - .9 Design and size components, including anchorage and fasteners to withstand seismic loads calculated for seismic requirements in accordance with NBC.
 - .10 Ensure no vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system occur.
- .3 Air and water tightness :
 - .1 Glazing classification:
 - .1 Air tightness : « A3 ».
 - .2 Watertightness : « B7 ».
 - .2 Air infiltration and seepage loss: in accordance with ASTM E283 :
 - .1 For the curtain wall : limit air infiltration through assembly to less than $0.0003 \text{ m}^3/\text{s}/\text{m}^2$ of wall area, measured at a reference differential pressure across assembly of 300 Pa.
 - .2 Vapour seal with interior atmospheric pressure of 25mm sp, 22 degrees C, 40% RH: No failure.
 - .3 Water leakage: none, when measured at a reference differential pressure 700 Pa exterior in accordance with ASTM E 331.
 - .4 The curtain wall design shall be based on a rain screen principal.
 - .5 The system shall include:
 - .1 The fittings, deflectors, overlays and joint sealers required to obtain a rain screen that will effectively drain water away from the system cavities.
 - .2 A drainage system to the exterior of any water that may penetrate joints, caused by condensation in glass mouldings or osmosis of humidity.

- .3 Seal joints from air to minimize the passage of air into the buildings system cavities, and vice-versa to ensure adequate balancing of pressure between the systems cavities and the exterior.
- .4 Maintain continuous air and vapour barrier at joints required to minimize airborne vapour seepage loss from the building into the system cavities
- .5 Openings between the these cavities and the exterior shall be of sufficient size to ensure balance of pressure. All openings shall be effectively protected through the use of deflectors or other means to minimize the direct entry of water.

.4 Thermal Performance :

- .1 Maintain continuous air barrier and vapour retarder throughout assembly, primarily in line with [inside] pane of glass and heel bead of glazing compound. Position thermal insulation on exterior surface of air barrier and vapour retarder.
- .2 Condensation resistance: No visible condensation on the interior side of all curtain walls parts and the vision glass frame, for an exterior temperature of - 29°C and an interior temperature of 21°C, with relative humidity of 40 %.

.5 Acoustic Performance :

- .1 Sound attenuation through wall system (exterior to interior): STC 45, measured to ASTM E 413.

1.6 Product Data

- .1 Submit Material Safety Data Sheets required under the Workplace Hazardous Materials Information System (WHMIS).
- .2 Submit in accordance with Section 01 33 00 – Submittals Procedures.
- .3 Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details and water flow diagrams as well as sizes of all components.
- .4 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.

1.7 Shop Drawings

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anchor details anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.

- .3 In general, thicknesses and tempering of glass are indicated in section 08 80 50 – Glazing. But it is engineer responsibility who signed and sealed shop drawings to verify and confirm in shop drawings, the required thickness and hardening of glass. Thicknesses and tempering of glass are indicated in documents as minimum Standard requirements; if thicker or stronger glass panels were required by calculations they will be stated in shop drawings and provided without additional cost.
- .4 All shop drawings must be signed and sealed by a qualified Structural Engineer, licensed to practice in the province and certifying that the work meets all codes requirements and all design and performances requirements indicated.

1.8 Samples

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit two samples 300 x 300 mm in size illustrating prefinished aluminium surface, finish, colour, texture, specified glass units, insulated infill panels, glazing materials illustrating edge and corner.

1.9 Low VOC materials

- .1 The VOC content of all adhesives, sealants and sealant primers used on the inside of the building (i.e. to the inside of the sealing system) must be less than the VOC content limits of the State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168, June 2006.
- .2 All paints, coatings and architectural finishes used inside the building (i.e. to the inside of the sealing system) and applied on site must :
 - .1 Architectural paints and coatings applied to interior walls and ceilings must not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.
 - matte paintings;
 - Not matte paintings.
 - .2 Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.

1.10 Design data

- .1 Submit design data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide framing member structural and physical characteristics, calculations dimensional limitations, special installation requirements.

1.11 Test reports

- .1 Submit test reports in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit substantiating engineering data, test results of previous tests by independent laboratory which purport to meet performance criteria, and supportive data.

- 1.12 Pre-installation meeting** .1 Convene one week before starting work of this section.
- 1.13 Delivery, storage, and handling** .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements
.2 Handle work of this section in accordance with AAMA CW-10.
.3 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
- 1.14 Site conditions** .1 Do not install sealants when ambient and surface temperature is less than 5 degrees C.
.2 Maintain this minimum temperature during and after installation of sealants.
- 1.15 Sequencing** .1 Coordinate work of this section with installation of air barrier placement, vapour retarder placement, flashing placement and components or materials.
- 1.16 Warranty** .1 For the Work of this Section, the 12 months warranty period prescribed in the General Conditions is extended to ten (10) years.
.2 Glazed aluminium curtain skylight will stay in place and remain leak proof including coverage for complete system failure for the entire warranty period. This warranty will include protection against any major failure of the structure.
.3 Provide a written guarantee, signed and issued in the name of Canada stating that the curtain walls of this section shall remain free from material, fabrication and installation defects and will remain air and water tight for a period **ten (10) years** after acceptance of work. The warranty will include an explicit procedure for rapid correction of defects and explicit protection against any structural failure.
.4 Provide a written guarantee that the "low E" insulated glazing will remain free from any leakage or manufacturing defect affecting visibility or thermal efficiency for a period of ten (10) years from the date of manufacture and that any deficient unit will be diligently replaced at no cost to Departmental Representative.
.5 Provide a written guarantee that the structural silicone will be free from adhesion defects or cohesion for a period of twenty (20) years from the provisional date of acceptance of the work.
.6 This guarantee will be signed by the manufacturer, the subcontractors and the Contractor.
.7 Repair or replacement, and any damage to other construction works by defective work of this section during the warranty period will be realized at warranty signatories' expenses.

1.17 Extra materials

- .1 Provide extra materials of glass units in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide protected and packaged in wood crates suitable for storage. Clearly identify each crate.
- .3 Deliver to Departmental Representative upon completion of the work of this section.
- .4 Store where directed by Departmental Representative.

1.18 Waste management and disposal

- .1 Works are governed by a Waste **management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The work of this section shall be made in accordance with the requirements of this plan.

PART 2 - PRODUCTS

2.1 Materials

- .1 Extruded aluminum: for tubular sections, plates and other profiles: 6063T5 alloy 6063T6 or 6063T54 (anodizing quality) to ASTM B221M, thicknesses to comply design loads.
- .2 Sheet and aluminum plates: ASTM B 209M.
- .3 Steel Sheet: to CSA-S136M galvanized to ASTM A653 / A653M.
- .4 Bituminous paint: without thinner.
- .5 Sealants for joints other than for structural glazing : in accordance with Section 07 92 10 – Joint Sealers.
- .6 Glazing: refer to Section 08 80 50 – Glazing.
- .7 Glazing trims, tapes and sealants as recommended by the manufacturer.

2.2 Components

- .1 Pressure plates and aluminum extrusions for curtain wall and skylight: aluminum extrusions, alloy and temper to AA-6063-T54, dimensions corresponding to the existing elements, according to the indications in the drawings.
- .2 Finishing covers: Extruded aluminum, of types and dimensions corresponding to the existing elements, according to the indications in the drawings.

2.3 Accessories

- .1 Setting blocks : for glazing, neoprene, appropriate dimensions, Shore A durometer index of 80-90.

- .2 Spacers, weep holes and sealant fittings for glass spandrels, as required and as recommended by manufacturer, with fittings to prevent penetration of exterior humidity.
- .3 Anchors and fasteners: stainless steel or aluminum, 3 mm minimum thickness.
- .4 Insulation tape and cushion: for use between steel anchors and aluminum extrusions, 3 mm thick, of closed cell polyethylene (EVA) as required.
- .5 Structural glazing Silicone sealant : High-Performance Silicone sealant, non-sag, medium-modulus single component, conforms to ASTM C920 type S, Grade NS, Class 25 and CAN/CGSB-19.13.
- .6 Joint sealer for glazing, co-extruded EPDM mastic: extruded glazing fitting composed of EPDM special rubber combined with a portion of pre-extruded sealant for mastic method.
- .7 Bituminous paint: alkali resistant.
- .8 Self-adhesive membrane for connections and junctions;
 - .1 Elastomeric modified bituminous SBS, with fibreglass mesh reinforcement and self-adhesive or integrally laminated to a cross woven polyethylene film, 1.0mm minimum thickness with a water vapour permeability rating of 49ng/Pa.m2.s and an air permeability rating less than 0.0003L/m2.s at 75Pa of pressure in accordance with ASTM E 96.
- .9 Sealant: Synthetic rubber base sealant plasticized with bitumen, as recommended by the membrane manufacturer.
- .10 Sealants and backup material:
 - .1 Terpolymer sealant of polyurethane epoxy and polyurethane adhesive foam sealant: Refer to Section 07 92 10 – Joint Sealers.
 - .2 Intermediate butyl rubber sealant: for concealed joints where mullions meet.
 - .3 Single component acrylic based elastomeric sealant: for concealed joints around air/vapour barrier troughs.
 - .4 Closed cell polyethylene backup material: Refer to Section 07 92 10 – Joint Sealers.
- .11 Rigid insulation, extruded or expanded polystyrene panels as specified, in accordance with CAN/ULC S701, Type 4, minimum thermal resistance RSI = 0.88/25mm, thickness as indicated on the drawings; minimum compressive strength: 210kPa, according to ASTM D1621.
- .12 Steel welding materials: in accordance with CSA W59, same composition as the materials to be welded, certified by the Canadian Welding Bureau.

2.4 Fabrication

- .1 Do not begin fabrication of components before shop drawings are reviewed and samples are approved.
- .2 Fabricate skylight system components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

- .3 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
Seal well where horizontal and vertical mullions meet.
- .4 Where possible, take on site dimensions and levels for proper layout and installation. Coordinate dimensional tolerances of building elements (especially steel framing) and confirm them before the beginning of work.
- .5 Fabricate elements according to profiles shown on drawings. The wall thickness of the profiles to meet design requirements.
- .6 Adjust and precisely fit joints, corners and tabs and assemble them securely. Carefully match elements to obtain perfect alignment and appearance. Seal outside joints so that they are weather resistant and seal inside joints to airtight, according to required performances. Metal work seams and joints to be tight. Open joints position to be approved by the Departmental Representative.
- .7 Seal capillary joints at frame elements junctions. Install sealant from the inside. Remove excess sealant exposed on frame.
- .8 Where frame elements overlap, exposed faces to be weathertight and complete sealed.
- .9 Fabricate exterior wall framing systems for exterior glass installation, complete with mullions, head and sill frames, sheaves, corner pads for horizontal members, thermal break, pressure plates, filler pieces, backing plates, pressure caps, and other items indicated and necessary..
- .10 Extremity of traverse beam nosing shall be equipped with a rubber corner pad to ensure continuity of the air/vapour barrier system between the traverse beam and the mullion. The corner pads shall be saturated with sealant and shall be of the same size as the mullion edge plus the thermal break.
Arrange fasteners and attachments to ensure concealment from view.
- .11 The selection of seals is the responsibility of the Contractor.
Selection to be made upon the following materials: neoprene, EPDM, silicone, polyisobutylene tape, vinyl, etc. Auto adhesive 'wet' tapes to be provided with a dense inner shim to prevent crushing. Dry liners to be provided with guides and retaining grooves for in place alignment and hold.
Contractor will have to make sure that the selected components will held in place without moving under any constraints.
- .12 Reinforce framing members for external imposed loads.
- .13 Visible manufacturer's identification labels not permitted.

2.5 Finishes

- .1 Curtain wall and skylight frames, caps and windows finish coatings:
 - .1 Interior and exterior exposed aluminum surfaces;
Natural anodized finish, matching existing finishes of existing curtain wall and skylight finishes.

2.6 Source quality control

- .1 Perform work in accordance with AAMA GSM-1, AAMA CW-I-9 and with the Curtain Wall Design and Installation Guide published by the QBEC (Quebec Building Envelope Council). Maintain one copy of the publications on site.
- .2 Manufacturer qualifications: company specializing in manufacturing the products specified in this section.
- .3 Installer qualifications: company specializing in performing the work of this section and approved by manufacturer.
- .4 Design structural support framing components to CAN/CSA-S157 under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the Province of Quebec.
- .5 Perform welding Work in accordance with CSA W59.2.

PART 3 - EXECUTION

3.1 Examination

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for aluminum skylight and curtain wall installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Verify dimensions, tolerances, and method of attachment with other work.
 - .3 Verify wall openings and adjoining air barrier and vapour retarder materials are ready to receive work of this Section.
 - .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .5 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.2 Installation

- .1 Install Skylights and curtain system in accordance with manufacturer's instructions.
- .2 Provide thermal isolation where components penetrate or disrupt building insulation.
- .3 Install sill flashings.
- .4 Co-ordinate attachment and seal of perimeter air barrier and vapour retarder materials.
- .5 Pack fibrous insulation in shim spaces at perimeter of assembly (as indicated in the plan details) with insulating materials, around the edges of the joints to maintain continuity of thermal barrier.
- .6 Install glass and infill panels in accordance with Section 08 80 50 - Glazing to glazing method required to achieve performance criteria.

- .7 Install perimeter sealant to method required to achieve performance criteria
Sealant and backing materials installation criteria in accordance with Section
07 92 10 - Joint Sealing.

3.3 Cleaning

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove protective material from prefinished aluminum surfaces.
 - .3 Wash down surfaces with a solution of mild detergent in warm water,
applied with soft, clean wiping cloths. Take care to remove dirt from
corners. Wipe surfaces clean.
 - .4 Remove excess sealant by moderate use of mineral spirits or other solvent
acceptable to sealant manufacturer.
 - .5 Final Cleaning: upon completion remove surplus materials, rubbish, tools
and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 Protection

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by glazed aluminum curtain wall
installation.

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section must be read and related drawings examined, together with all sections and drawings describing works that are complementary, subordinate, prerequisite or otherwise related to the work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for complete execution of work related to Aluminum windows, including all accessories required, so that works perfectly fulfill purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General Requirements.
- .2 Section 07 92 10 – Joint Sealing.
- .3 Section 08 44 13 – Glazed aluminum Curtain walls and Skylights.
- .4 Section 08 80 50 – Glazing.
- .5 Section 09 91 23 – Painting.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 Aluminum Association (AA), Designation System for Aluminum Finishes
- .3 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A 123/A 123M, Standard Specification for Zinc (Hot-Dip galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM B209M, Aluminum and Aluminum - Alloy Sheet and Plate (Metric).
 - .3 ASTM B221M, Aluminum and Aluminum - Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
 - .4 ASTM E283, Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .5 ASTM E330, Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
 - .6 ASTM E331, Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - .7 ASTM E783, Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
 - .8 ASTM E1105, Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference.
 - .9 ASTM E 1748, Standard Test Method for Evaluating the Engagement Between Windows and Insect Screens as an Integral System.

- .4 Canadian Standards Association (CSA) International
 - .1 AAMA/WDMA/CSA 101/I.S.S/A4408, North American fenestration Standard (NAFS)/ Specification for windows, doors, and skylights.
 - .2 CSA A440.2/CSA A440.3, Fenestration energy performance/User guide to CSA A440.2, Fenestration energy performance.
 - .3 CSA A440.4, Window, door, and skylight installation.
 - .4 CSA A440S1, Canadian Supplement to l'AAMAIWDMA/CSA 101/I.S.21A440 – North American Fenestration Standard (NAFS) / Specification for windows, doors, and skylights.
- .5 Office of Energy Efficiency Natural Resources Canada.
 - .1 « Energy Star » Certification.
- .6 Screen Manufacturers Association (SMA)
 - .1 SMA 1201 Specification for Insect Screens for Windows, Sliding Doors and Swinging Doors.

1.4 Action and informational Submittals

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two (2) copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
 - .1 For caulking and windows sealing materials during application and curing.
 - .2 Cleaning and painting systems for the exterior metal components of windows.
 - .3 Product samples:
 - .1 Submit samples drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit sample of proposed hardware and opening mechanisms for replacement of existing windows components.
 - .3 Submit a sample of insect screens including proposed aluminum frame for replacement of existing opening window components.
 - .4 Submit a sample of the proposed paint system.
 - .5 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.
 - .6 Manufacturer's Instructions:
 - .1 Submit instructions provided by the manufacturer.

1.5 Low VOC materials

- .1 The VOC content of all adhesives, sealants and sealant primers used on the inside of the building (i.e. to the inside of the sealing system) must be less than the VOC content limits of the State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168, June 2006.

1.6 Waste management and disposal

- .1 Works are governed by a Waste **management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The work of this section shall be made in accordance with the requirements of this plan.

PART 2 - PRODUCTS

2.1 Materials

- .1 Materials: to CSA-A440/A440.1 supplemented as follows:
- .2 All aluminum windows components by same manufacturer.
- .3 Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.
- .4 Sealant: refer to Section 07 92 10 - Joint Sealant.

2.2 Hardware

- .1 General: Replace all existing hardware components to opening window's panels according to the locations shown on drawings.
Provide heavy-duty hardware made of aluminum, stainless steel or other corrosion-resistant material compatible with aluminum; designed to operate efficiently, seal tightly and securely lock aluminum windows, sized to match weight and dimensions of the window and complying to existing hardware components to be replaced.
- .2 For each opening window, provide the following hardware items:
 - .1 Handle: Continuous and integrated pull handles, two (2) handles per window.
 - .2 Stainless steel pivots.
 - .3 Aluminum support arm, satin finish.
 - .4 Aluminum limit blocks.
 - .5 "ZAMAC" molded latches actuated by removable locking handles, chrome finish.
 - .6 Surface mounted molded latches, chrome finish.
 - .7 Quantities for each hardware item per window must match the existing conditions.

2.3 Insect screens

- .1 Insects screens: in accordance with SMA 1201.
- .2 General: Replace all opening windows screens as described on drawings. Install insect screens on the inside of the opening windows.
- .3 Comply with SMA 1004, "Specs for Aluminum Window Tubular Nets" for minimum appearance, manufacture, net fabric installation, hardware and accessories standards.

- .4 Aluminum Safety Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate corner mounts frames with concealed fasteners (brackets) on all corners.
 - .1 Extruded aluminum or aluminum tubular frame sections and bracing: 1.3 mm (0.050 ") minimum profile thickness.
 - .2 Finish: Paint, same type and color as the exterior windows.
- .5 Safety Screen net combined fixed and sliding window as shown on drawings and having the following characteristics:
 - .1 12 mesh to inch, 1.22mm (0.048 ") diameter wire, interwoven, 3.20mm openings (57.20%), stainless steel, type 316;
 - .2 Insect screens to meet ASTM F2006 and withstands impact energy of 900Lbs-feet (1220J).
 - .3 Black color.

2.4 Finished exterior surfaces

- .1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes, published by the Aluminum Association, according to the paint system described below.
- .2 Finished window frames and adjacent flashing elements, and all exterior exposed surfaces:
 - .1 Preparation: Thoroughly clean all metal surfaces to be coated. Perform a complete blast cleaning of the existing finish, using hand or power tools as specified in SSPC-SP3. Surfaces must be clean, dry and free of any trace of contamination.
 - .2 Undercoat: Apply one (1) coat of chemical-based, corrosion-resistant, 58% solids, high-performance anti-rust epoxy primer. Roller or brush application. Thickness of dry film 3mils (75 microns). Color: matt gray.
 - .3 Finish: Apply one (1) coat of high-gloss, two-component, high-performance, 63% solids, aliphatic urethane topcoat. Roller or brush application. Thickness of dry film 3mils (75 microns). Color: Carnival Red (UC51703). Brilliant finish.

2.5 Examination

- .1 Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight window installation.

PART 3 - EXECUTION

3.1 Manufacturer's instructions

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

- 3.2 Preparation** .1 Install and seal flashings (membranes) on openings perimeter.
- 3.3 Installation** .1 Install in accordance with CSA-A440/A440.1.
- 3.2 Window modifications** .1 At the indicated windows, remove the protective grids for painting (Section 09 91 23) and reinstall the cleaned and painted grids in the same locations.
- .2 Repair and modify windows according to locations and descriptions on drawings.
- .3 On the inside, replace all hardware elements.
- .4 Outside: replace insect screens as indicated.
- 3.3 Caulking** .1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in bedding compound. Caulk between sill up stand and window-frame. Caulk butt joints in continuous sills.
- .2 Apply sealant in accordance with Section 07 92 10 - Joint Sealing.
- 3.4 Cleaning** .1 Once installation is complete, clean the site to remove dirt and debris.
- .2 Remove all traces printing product, caulking or sealing.
- .3 Clean finished surfaces of any glazing material.
- .4 Remove all labels, once the work is completed.
- .5 Clean glazing with a non-abrasive product, according to the manufacturer's instructions.
- .6 On completion of the work, the contractor shall clean all aluminum according to the manufacturer's instructions and to Departmental Representative satisfaction.

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with all sections and drawings describing works that are complementary, subordinate, prerequisite or otherwise related to work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for installation of architectural hardware, including all the accessories required, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General Requirements.
- .2 Section 08 11 14 – Metal Doors and Frames.
- .3 Division 26 – Electrical.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.
- .3 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI/BHMA A156.1, American National Standard for Butts and Hinges.
 - .2 ANSI/BHMA A156.2, Bored and Preassembled Locks and Latches.
 - .3 ANSI/BHMA A156.3, Exit Devices.
 - .4 ANSI/BHMA A156.4, Door Controls - Closers.
 - .5 ANSI/BHMA A156.5, Auxiliary Locks and Associated Products.
 - .6 ANSI/BHMA A156.6, Architectural Door Trim.
 - .7 ANSI/BHMA A156.8, Door Controls - Overhead Stops and Holders.
 - .8 ANSI/BHMA A156.10, Power Operated Pedestrian Doors.
 - .9 ANSI/BHMA A156.12, Interconnected Locks and Latches.
 - .10 ANSI/BHMA A156.13, Mortise Locks and Latches Series 1000.
 - .11 ANSI/BHMA A156.16, Auxiliary Hardware.
 - .12 ANSI/BHMA A156.17, Self-closing Hinges and Pivots.
 - .13 ANSI/BHMA A156.18, Materials and Finishes.
 - .14 ANSI/BHMA A156.19, Power Assist and Low Energy Power - Operated Doors.
 - .15 ANSI/BHMA A156.20, Strap and Tee Hinges and Hasps.

- 1.4 Action and informational submittals**
- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, Finishes and hardware package number.
 - .4 After approval samples will be returned for incorporation in the Work.
 - .4 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, Finish and other pertinent information.
 - .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - .6 Manufacturer's Instructions: submit manufacturer's installation instructions.
 - .7 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.
- 1.5 Closeout submittals**
- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.
- 1.6 Maintenance materials submittals**
- .1 Extra Stock Materials:
 - .1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Tools:
 - .1 Supply 2 sets of wrenches for door closers, locksets and fire exit hardware.
- 1.7 Quality assurance**
- .1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.8 Delivery, storage, and handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect door hardware from nicks, scratches, and blemishes.
 - .3 Protect prefinished surfaces with wrapping or strippable coating.
 - .4 Replace defective or damaged materials with new.

1.9 Waste disposal and management

- .1 Works are governed by a Waste **management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The work of this section shall be made in accordance with the requirements of this plan.

1.10 Warranty

- .1 For work of the present Section 08 71 10 – Door Hardware, the warranty period of 12 months is extended to **two (2) years**.
- .2 The hardware supplied as per requirements of present section will be warranted against defect caused by materials or workmanship, not attributable to normal wear, for a **two (2) years** period from the final acceptance of work date, with exception of the door closers that will be warranted for a period of **five (5) years** and the mechanical panic devices for **three (3) years**. Electrified hardware will be warranted for a period of **two (2) years**.

PART 2 - PRODUCTS

2.1 General

- .1 Use one manufacturer's products only for similar items.
- .2 Verify the pressure differentials between room en ensure that door closers are of strength required for adequate operation.
- .3 Work of the present section includes, without limitation, the supply and installation of the followings :
 - .1 All architectural hardware for exterior doors;
 - .2 All attachments, fasteners, adhesives and mouldings as required to complete work of the present section.

2.2 Door hardware

- .1 Refer to Hardware Groups, for listed items for hardware groups.
- .2 Unless indicated otherwise, only hardware that complies with ANSI/BHMA are acceptable for the present project. Supply hardware shall be as specified.
- .3 Supply ULC listed hardware for fire-stopping doors and emergency exit doors.
- .4 All Electronic hardware items to comply to CAN/ULC-S533 and must have a certificate of ULC or WHI for action in case of fire.
- .5 Use products from only single source manufacturer for like items of hardware.

2.3 Fastenings

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match Finish of hardware.
- .4 Fastening devices for stainless steel elements shall be stainless steel.
- .5 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .6 Use fasteners compatible with material through which they pass.
- .7 Unless indicated otherwise, use countersinking headed, cross-threaded screws for pushplates, footplates, etc.

2.4 Keying

- .1 All keys, including master keys shall be provided by the manufacturer and remitted directly to the Departmental Representative in clearly identified envelopes.
 - .1 Keys and key groups will be generated to correspond to the specifications of each federal building groups.
- .2 All lock cylinders and barrels for doors shall be subject to the existing master key system which shall be coordinated with the Departmental Representative. The locks will be subject to a system of temporary keys or temporary barrels during construction period. Temporary barrels to be provided, installed and removed by the Contractor.
- .3 For BEST keys provide:
 - .1 3 keys for every lock.
 - .2 Provide three (3) copies for each Master Key group (each system).
 - .3 Six (6) Grand Master Keys
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Plan necessary meetings to establish the keying system and submit the key list for approval.

- .6 Keying systems will be coordinated with Departmental Representative and CSA representatives. The Contractor shall use provider services authorized by the CSC Representative for the supervision, production and transfer of keys.

PART 3 - EXECUTION

3.1 Manufacturer's Instructions

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

3.2 Installation

- .1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
- .2 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .3 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .4 Remove construction cores and locks when directed by Departmental Representative; install permanent cores and check operation of locks.
- .5 Conserve construction core and locks in exterior doors when turning completed building over to Departmental Representative.
- .6 Install weatherstrips before door closers, so as not to damage the weatherstrips.

3.3 Adjusting

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Verify all keys and master keys and replace defective keys and cylinders.
- .3 Verify door closers after pressurisation and final balancing of the building ventilation system have been completed.
- .4 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .5 Lubricate hardware, operating equipment and other moving parts.

- .6 Replace items of hardware that cannot be adjusted and lubricated to function normally.

3.4 Cleaning

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

3.5 Demonstration

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

3.6 Protection

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

3.7 Hardware Groups

.1 GROUP 5

- 1 Continuous hinge WATSON - FM300 x 2134 C32D.
- 1 Anti-panic lock set SA-6963 STS GCM CMC C32D.
- 1 Door closer SA-EN250 PS x bolts.
- 1 Protection plate MH-100 - 750 x L.R. C32D (interior).
- 1 Protection plate MH-100 - 300 x L.R. C32D (exterior).
- 1 Weatherstrip package UN-17S - 1/top 2/sides C28 and screws.
- 1 Combined aluminum threshold UN-A series AB according to door frame thickness x L.O. C28 screws and buffers.
- 1 Seal (brush) and water protection x L.R. R480

.2 GROUP 16

- 2 Pair of hinges MH-STs-BB1099 114 x 100 FNA C32D.
- 1 Anti-panic lock set SA-6963 STS GCM CMC C32D.
- 1 Door closer SA-EN250 PS x boulons.
- 2 Protection plates MH-100 - 300 x L.R. C32D.
- 1 Weatherstrip package UN-17S - 1/top 2/sides C28 and screws.
- 1 Combined aluminum threshold UN-A series AB according to door frame thickness x L.O. C28 screws and buffers
- 1 Seal (brush) and water protection x L.R. R480

.3 GROUP 29

- 1 1/2 Pair of hinges MH-STs-BB991 114 x 100 FNA C32D.
- 1 Jeu de serrure SA-7726 OB GCM CMC C32D.
- 1 Door closer SA-EN250-0.
- 1 Weatherstrip package UN-17S - 1/top 2/sides C28 and screws.
- 1 Combined aluminum threshold UN-A series AB according to door frame thickness x L.O. C28 screws and buffers
- 1 Seal (brush) and water protection x L.R. R480

END OF SECTION

PART 1 - GÉNÉRAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with all sections and drawings describing works that are complementary, subordinate, prerequisite or otherwise related to work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for supply and installation of glass and glazing, including all accessories required, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General Requirements
- .2 Section 08 11 14 – Metal Frames.
- .3 Section 08 44 13 – Glazed aluminum Curtain walls and Skylights.
- .4 Section 08 71 00 – Doors Hardware

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 American National Standards Institute (ANSI).
 - .1 ANSI/ASTM E330, Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - .2 ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings.
- .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM C 542, Specification for Lock-Strip Gaskets.
 - .2 ASTM C 1036, Standard Specification for Flat Glass.
 - .3 ASTM C 1172, Standard Specification for Laminated Architectural Flat Glass.
 - .4 ASTM C 790, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - .5 ASTM D 1003, Test Method for Haze and Luminous Transmittance of Plastics.
 - .6 ASTM D 1929, Test Method for Determining Ignition Temperature of Plastics.
 - .7 ASTM D 2240, Test Method for Rubber Property - Durometer Hardness.
 - .8 ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .9 ASTM E 119, Standard Test Method for Fire Tests of Building Construction and Materials.
 - .10 ASTM E 330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

- .11 ASTM E2010, Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.
- .12 ASTM F 1233, Test Method for Security Glazing Materials and Systems.
- .4 Canadian General Standards Board of Canada (CGSB).
 - .1 CAN/CGSB-12.1, Safety Glass.
 - .2 CAN/CGSB-12.2, Flat, Clear Vision Glass.
 - .3 CAN/CGSB-12.3, Flat, Clear Float Glass.
 - .4 CAN/CGSB-12.4, Heat Absorbing Glass.
 - .5 CAN/CGSB-12.8, Insulating Glass.
- .5 Canadian Standards Association (CSA)/CSA International.
 - .1 CSA A440.2, Energy Performance Evaluation of Windows and Sliding Glass Doors.
 - .2 CSA, Certification Program for Doors and Windows 2000.
- .6 Environmental Choice Program (EPA).
 - .1 DCC-045, Sealant Products.
- .7 Flat Glass Manufacturers Association (FGMA).
 - .1 FGMA Glazing Manual.
- .8 Glass Association of North America (GANA)
 - .1 GANA Glazing Manual.
 - .2 GANA Laminated Glazing Reference Manual.
- .9 Laminators Safety Glass Association (LSGA).
 - .1 LSGA Laminated Glass Design Guide.
- .10 National fire protection Association (NFPA)
 - .1 NFPA 80, Standard for fire doors and other opening protective's.
 - .2 NFPA 252 – Fire Tests of Door Assemblies.
 - .3 NFPA 257 – Fire Tests of Window Assemblies.
- .11 Standard Council of Canada:
 - .1 ULC Standard CAN4-S104: Fire Tests of Door Assemblies.
 - .2 ULC Standard CAN4-S106: Fire Tests of Window Assemblies.
 - .3 CAN/ULC-S101M: Standard Methods of Fire Endurance Tests.

1.4 System Description

- .1 Performance requirements
 - .1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
 - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
 - .2 Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to a design pressure of 2kPa as measured in accordance with ANSI/ASTM E330.
 - .3 Limit glass deflection to 1/200 flexural limit of glass with full recovery of glazing materials.
 - .4 Fire-rated Glazing without mesh in fire-rated partition must have 60min fire-rating and must comply with UL10C, UBC 7-2 and UBC 7-4 tests.

1.5 Action and informational Submittals

- .1 Product data
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 – Submittals.
 - .2 Submit two (2) copies of WHMIS (Workplace Hazardous Materials Information Sheet) data sheets in accordance with Section 01 33 00 – Submittals. Indicate VOC's :
 - .1 For glazing materials during application and curing.
 - .3 Shop Drawings
 - .1 Submit required shop drawings in accordance with Section 01 33 00 – Submittals.
 - .2 All calculations, documents and shop drawings must be signed and sealed by a qualified Structural Engineer, licensed to practice in the province and certifying that the work meets all codes requirements and all design and performances requirements indicated.
 - .4 Samples
 - .1 Submit samples in accordance with Section 01 33 00 – Submittals.
 - .2 Submit duplicate 300mm size samples of each type of glazing materials and accessories.
 - .5 Manufacturer's instructions
 - .1 Submit manufacturer supplied instructions.
 - .6 Closeout submittals
 - .1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
 - .7 Submittals
 - .1 The Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.

1.6 Low VOC materials

- .1 The VOC content of all adhesives, sealants and sealant primers used on the inside of the building (i.e. to the inside of the sealing system) must be less than the VOC content limits of the State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168, June 2006.

1.7 Quality Assurance

- .1 Execute the work in accordance with directives specified in the document published by Insulating Glass Manufacturers Association of Canada (IGMAC) and the Laminators Safety Glass Association Standards Manual as regards the types of glass panel assemblies.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

- 1.8 Performance Criteria**
- .1 Glass thicknesses indicated on drawings and in specifications are minimal. Ensure that glass panels meet requirements of CAN/CGSB-12.20-M. As necessary, increase glass panel thickness.
 - .2 Glass panels must meet the requirements of CAN/CGSB-12.20. If required, increase the thickness of the glass panels.
 - .3 Submit calculations executed by a Professional Engineer experienced in structural design and a licensed member of the Quebec Order of Engineers. The engineer shall provide proof that the glazing works meet the requirements of NBC regarding structural performance under the various constraints to which it is exposed.
- 1.9 Warranty**
- .1 For work of the present Section 08 80 50 – Glazing, the warranty period of 12 months is extended to **ten (10) years**.
 - .2 Provide written warranty, in the name of Canada, certifying that the work specified under the present Sections shall be free of all defects, both of materials and labour, for a period of **ten (10) years** from the date of final acceptance of the work.
 - .3 The warranty shall cover all defects of insulating glass panels, including that they will remain free of materials that may obstruct vision resulting from dust or the formation of an opaque film over the interior panel surfaces, no matter what the cause, under normal conditions of use other than broken glass, except where breakage is due to thermal shock or temperature differentials due to an inherent defect of the glass (resistance to internal fogging of the glass, etc...)
- 1.10 Site Conditions**
- .1 Environmental Requirements:
 - .1 Install glazing when ambient temperature is 10degrees C minimum. Maintain ventilated environment for 24 hours after application.
 - .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
- 1.11 Waste management and disposal**
- .1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The work of this section shall be made in accordance with the requirements of this plan.

PART 2 - PRODUCTS

- 2.1 General**
- .1 Refer to doors and frames schedule for of various glass type locations.
 - .2 Work of the present section includes, without limitations, the followings:
 - .1 The supply and installation of exterior doors glazing.
 - .2 The supply and installation of skylights glazing.
 - .3 The supply and installation of glazing, for the curtain wall sections, interior street level.

- .4 All other glazing work including adhesives, anchors, fasteners, moldings and other accessories needed to complete the work of this section.

2.2 Flat Glass

- .1 Polished or float glass (V) : to CAN/CGSB-12.3, "glazing quality", 6mm thick.
- .2 Wired glass (**V-9**) : Polished both sides to CAN/CGSB-12.11, square style wire mesh, 6 mm thick.
- .3 Safety glass (**V-11**) : Clear tempered glass to CAN/CGSB-12.1, 6 mm thick.
- .3 Heat strengthened (HS) : to ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass and to CAN / CGSB 12.1, Tempered or laminated safety glass, thickness as required in this section.
- .4 Surface compressive stresses limits are:
 - .1 35MP minimum and 50 MPa maximum for heat strengthened glass.
 - .2 100MPa for tempered glass.

2.3 Vitrage isolant scellé

- .1 Refer to doors and frames schedule for of various glass type locations.
- .2 Insulating glass unit (**V-1**) for vision glass of curtain walls, to CAN/CGSB-12.8, **25mm** total thickness, with following composition:
 - Exterior
 - .1 Heat strengthened (HS) glass, 6,4mm, with low emissivity film **LoE³366** on surface 2.
 - .2 13mm air space sealed and separated with non-metallic black spacer around perimeter. Inert gas fill, Argon, to a minimum of 90%.
 - .3 Clear tempered glass, 6,4mm thick.
 - Interior
- .3 Insulating glass unit (**V-3**) for vision glass of skylights, to CAN/CGSB-12.8, **25mm** total thickness, with following composition:
 - Exterior
 - .1 Clear tempered glass, 6,4mm thick, with low emissivity film **LoE³366** on surface 2.
 - .2 10mm air space sealed and separated with non-metallic black spacer around perimeter. Inert gas fill, Argon, to a minimum of 90%.
 - .3 Laminated glass 8,79mm thick, with following composition:
 - .1 Heat strengthened (HS) glass, 4mm thick;
 - .2 Interlayer film SGP (Sentry Glass) clear 0.79mm thick;
 - .3 Clear tempered glass, 4mm thick;
 - Interior

2.4 Accessories

- .1 Setting blocks: Neoprene, 80-90 Shore A durometer hardness to ASTM D2240, minimum 100 mm length, to suit glazing method, glass light weight and area
- .2 Spacer shims: Neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

- .3 Glazing tape:
 - .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; gray colour.
- .4 Glazing bead: resilient polyvinyl chloride or silicone, extruded shape to suit glazing channel retaining slot, colour as selected for installation in aluminum mouldings.
- .5 Beading (for doors and steel frames): Glazing beads shall be manufactured from steel bars of 20mm x 20mm or 25mm x 25mm as indicated; glazing beads should fit properly, butted joint corners and secured to frame members with self-tapping screw.
- .6 Glazing clips: manufacturer's standard type.
- .7 Lock-strip gaskets: to ASTM C542, black neoprene for cavity model or splinted for bedded strip. Sill gaskets must bear interior channel and evacuation holes for water, corners gasket, moulded but injection-bedded to main gaskets.
- .8 Sealant: silicone rubber bases single component or according to glass manufacturer's recommendations.
- .8 Prime-sealers and cleaners: to glass manufacturer's standard.

2.4 Fabrication

- .1 Tempered glass shall be fabricated using horizontal dipping process, without the use of clamps and discretely bear the marking « architectural tempered glass ».
- .2 All sealed glass units shall be fabricated in accordance with CAN/CGSB-12.8 and by a manufacturer who shall provide a certificate confirming that the sealed glass units comply with IGMAC certification requirements. Insulating glass products shall bear a valid number listed on the IGMAC certified product list, latest edition, and shall be clearly identified as IGMAC certified.
- .3 The glass assemblies must be constructed so that no Low E film, comes into contact with the interlayer spacers (Delete Edge), in accordance with applicable standards.

PART 3 - EXÉCUTION

3.1 Manufacturer's Instructions

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

- 3.2 Examination**
- .1 Verify that openings for glazing are correctly sized and within tolerance.
 - .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
- 3.3 Preparation**
- .1 Clean contact surfaces with solvent and wipe dry.
 - .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
 - .3 Prime surfaces scheduled to receive sealant.
- 3.4 Exterior Glass Panels – Dry Mount (premoulded panels)**
- .1 Cut self-adhesive tape to appropriate length and place on glazing glass. Seal corners by abutting the self-adhesive tape and covering the joints with sealant product.
 - .2 Place setting blocks at an interval equivalent to one quarter of the glass panel width, in a manner that the end blocks are maximum 150 mm from the panel corners.
 - .3 Place glass panel on setting blocks and press to fixed glass bead exerting sufficient pressure to obtain perfect contact between surfaces.
 - .4 Place moveable glass beads without displacing glass panel self-adhesive tape and exert sufficient pressure to obtain perfect contact between surfaces.
 - .5 Cut away excess self-adhesive tape.
- 3.5 Cleaning**
- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
 - .2 Remove traces of primer, caulking.
 - .3 Remove glazing materials from finish surfaces.
 - .4 Remove labels after work is complete.
 - .5 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacture's instructions.
 - .6 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.
- 3.6 Protection**
- .1 After installation, mark light with an "X" by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with all sections and drawings describing works that are complementary, subordinate, prerequisite or otherwise related to work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required the complete execution of painting work, inside and outside, as shown in architectural drawings, the finishes schedule, the doors and frames schedule and requirements of this section including all the accessories required, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General requirements.
- .2 Section 07 46 10 – Exterior preformed siding.
- .3 Section 07 92 10 – Joint Sealing.
- .4 Section 08 11 14 – Metal doors and frames.
- .5 Section 08 51 13 – Aluminum Windows.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .3 Environmental Protection Agency (EPA)
 - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).
- .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, 2004.
- .6 National Fire Code of Canada
- .7 Society for Protective Coatings (SSPC)
 - .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.
- .8 Transports Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34 .

- .9 Green Seal Environmental standards
 - .1 Standard GS-11, Paints.
 - .2 Standard GC-03, Anti-Corrosive Paints

1.4 Quality assurance

- .1 Qualifications
 - .1 Contractor must have experience in performing similar work..
 - .2 Journeymen: qualified journeymen who have « Tradesman Qualification Certificate of Proficiency » engaged in painting work.
 - .3 Apprentices: working under direct supervision of qualified trades' person in accordance with trade regulations.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .4 Air quality Requirements :
 - .1 Paints VOC contents shall meet with requirements of Green Seal standards GS-11.
 - .2 Rustproof coatings VOC contents shall meet with requirements of Green Seal standards GC-03.
 - .3 VOC contents of paints not covered by GS-11 and GC-03 shall conform to rule no 1113 (2004) of South Coast Air Quality Management District of California.

1.5 Scheduling

- .1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Departmental Representative for changes in work schedule.
- .3 Schedule painting operations to prevent disruption of adjacent buildings.

1.6 Action and informational Submittals

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit product data and instructions for each paint and coating product to be used.
 - .2 Submit product data and instructions for each paint and coating product to be used.
 - .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOCs during application and curing.
- .3 Samples:
 - .1 Submit full range colour sample chips to indicate where colour availability is restricted.

- .2 Submit duplicate 200x300mm sample panels of each paint, stain and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials :
 - .1 3mm plate steel for finishes over metal surfaces.
 - .2 10mm hardboard for finishes over wood surfaces.
 - .3 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
- .4 Test reports: submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .1 Lead, cadmium and chromium: presence of and amounts.
 - .2 Mercury: presence of and amounts.
 - .3 Organochlorines and PCBs: presence of and amounts.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation and application instructions.
- .7 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following :
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 The VOC content in gram per litre.
- .8 Submittals
 - .1 Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.

1.7 Low VOC materials

- .1 The VOC content of all adhesives, sealants and sealant primers used on the inside of the building (i.e. to the inside of the sealing system) must be less than the VOC content limits of the State of California's South Coast Air Quality Management District (SCAQMD) Rule #1168, June 2006.
- .2 All paints, coatings and architectural finishes used inside the building (i.e. to the inside of the sealing system) and applied on site must :
 - .1 Architectural paints and coatings applied to interior walls and ceilings must not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.
 - matte paintings;
 - Not matte paintings.

- .2 Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.

1.8 Maintenance

- .1 Extra Materials:
 - .1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.
 - .2 Delivery, storage and protection : comply with Departmental Representative requirements for delivery and storage of extra materials.

1.9 Delivery, storage and handling

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Pack, ship, handle and unload materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.
- .2 Acceptance at Site:
 - .1 Identify products and materials with labels indicating:
 - .1 Manufacturer's name and address;
 - .2 Type of paint or coating;
 - .3 Compliance with applicable standard;
 - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Storage and Protection:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
- .5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.
- .7 Remove paint materials from storage only in quantities required for same day use.
- .8 Fire Safety Requirements:
 - .1 Provide one fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.10 Waste Management and Disposal

- .1 Works are governed by a Waste **management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The work of this section shall be made in accordance with the requirements of this plan
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with Provincial and Municipal regulations.
- .4 Ensure emptied containers are sealed and stored safely.
- .5 Unused paint and coating materials must be disposed of at official hazardous material collections site as approved by Departmental Representative.
- .6 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .7 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .8 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .9 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
 - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .10 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
- .11 Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection by organizations for verifiable re-use or re-manufacturing.

1.11 Site conditions

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces lower part so to withdraw from the work area all solvents and chemicals suspended in the air.

- .2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
- .3 Provide continuous ventilation for 7 days after completion of application of paint.
- .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- .5 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless pre-approved written approval by Departmental Representative and product manufacturer, perform no painting when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturers prescribed limits.
 - .4 The relative humidity is under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
- .2 Perform painting work when maximum moisture content of the substrate is below :
 - .1 Allow new concrete and masonry to cure minimum of 28 days.
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .4 2% for concrete (walls and ceilings) and masonry blocks.
- .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using « Cover patch test ».
- .4 Test concrete, masonry and plaster surfaces for alkalinity as required. Alkalinity level in accordance with manufacturer's instructions.
- .3 Surface and Environmental Conditions:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.
 - .4 Provide shelter when the paint is applied in cold or wet condition.. Heat the substrate and the ambient air to comply with the of temperature and humidity conditions recommended by the manufacturer. Protect areas until the paint is dry or the weather conditions are adequate.

- .5 Organize work so that the painting surface exposed to direct sunlight is completed early in the morning.
- .6 Removing paint coatings that were exposed to frost, excessive moisture, rain, snow or condensation. Prepare these surfaces again and repaint.
- .4 Additional interior application requirements:
 - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
 - .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.
- .5 The beginning of coating work or paint coating means the acceptance of the substrate condition by the applicator and that the manufacturer certifies that all support verifications indicated above are satisfied.
- .6 Protect against stains and spills all the elements with a permanent finish. Removed during painting works, electrical plates, sockets and other similar equipments, and protect all the hardware surface mounted.

PART 2 - PRODUCTS

2.1 General

- .1 Refer to drawings for different types of finishes locations.
- .2 Work described in this section include, without limitation, the supply and application of paint on the following new and existing finishes, within the work areas indicated in the drawings:
 - .1 Metal doors and frames within work areas.
 - .2 Painting all exterior bollards.
 - .3 Metal windows grids.
 - .4 Handrails and railings as indicated on the drawings.
 - .5 Existing elements of steel structure, columns and canopies, as indicated in the drawings.
 - .6 Steel component of the gatehouse signage.
 - .7 The new metal roofing.
 - .8 Exterior window frames and and screen frames.
 - .9 Cleaning and preparation work required to all existing items indicated to be painted.
 - .10 Steel structures elements around garage doors C1 and C2 to be repainted as the existing.
 - .11 Painting new bollards.
 - .12 Temporary protections of adjacent structures.
 - .13 Any other elements indicated on drawings.

2.2 Materials

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.

- .3 Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.
- .6 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.
- .7 Provide paint products meeting MPI "Environmentally Friendly" E1, E2 or E3 ratings based on VOC (EPA Method 24) content levels.
- .8 Use MPI listed materials having minimum E2 or E3 rating where indoor air quality (odour) requirements exist.
- .9 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
 - .1 Water-based;
 - .2 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere;
 - .3 Manufactured without compounds which contribute to smog in the lower atmosphere;
 - .4 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments;
- .10 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .11 Flash point: 61 degrees C or greater for water-borne surface coatings and recycled water-borne surface coatings.

2.3 Colours

- .1 Departmental Representative will provide Colour Schedule after Contract award.
- .2 Colour schedule will be based upon selection of five base.
- .3 Selection of colours from manufacturers' full range of colours.
- .4 The number of coats in a paint system indicated below is a minimum. Apply the required number of coat as needed to ensure a finish of uniform color.

2.4 Mixing and tinting

- .1 Perform colour tinting operations prior to delivery of paint to site.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions. Kerosene or similar organic solvent should not be used to dilute water-based paints.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.5 Gloss/Sheen ratings

- .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values :

	Gloss @ 60 Degrees	Sheen @ 85 degrees
Gloss Level 1 – Matte Finish (Flat)	Max. 5	Max. 10
Gloss Level 2 – Velvet-Like Finish	Max. 10	10 to 35
Gloss Level 3 – Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 – Satin-Like Finish	20 to 35	Min. 35
Gloss Level 5 – Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 – Traditional Gloss	70 to 85	
Gloss Level 7 – High Gloss Finish	More than 85	

- .2 Gloss level ratings of painted surfaces as indicated and as noted on Finish Schedule.

2.6 Interior painting systems

- .1 **System No.1**, For galvanised metal surfaces (Exterior steel doors and frames) and the metallic roofs (canope) :
 - .1 Preparation :

Before paint application, evaluate and treat all surfaces according to ISO 8504.

Thoroughly clean metal surfaces to be coated.

Remove oil or grease with solvent cleaning as specified in SSPC-SP16.

Surfaces must be clean, dry and free of any trace of contamination.
 - .2 Undercoat: Apply one (1) layer of high performance rustproof epoxy primer at 68% solids. Air-gun application only.
 - .3 Finish coat: Apply one (1) coat of high-performance, semi-gloss, two component, 64% solids, chemical-cured aliphatic urethane topcoat. Air-gun application only.
- Thickness of dry film 3mils (75 microns).
- Color : Rouge Carnival (UC51703).
- Degree of brilliance 5.

**2.7 Special paint systems
for steel**

- .1 **System No 2**, For existing and new metallic surfaces, galvanized steel and / or aluminum (existing structure, window grilles, handrails and railings, bollards, etc.):
 - .1 Preparation :

Before paint application, evaluate and treat all surfaces according to ISO 8504.
Thoroughly clean metal surfaces to be coated.
Perform a complete blast cleaning of the existing paint finishes, using mechanical tools, as prescribed in SSPC-SP3.
Surfaces must be clean, dry and free of any trace of contamination.
 - .2 Undercoat: Apply one (1) coat of chemical-based, corrosion-resistant, 58% solids, high-performance anti-rust epoxy primer. Air-gun application to the rifle only.

Thickness of dry film 3mils (75 microns).
Color: matt gray.
 - .3 Finish coat: Apply one (1) coat of high-gloss, two-component, high-performance, 63% solids, aliphatic urethane topcoat. Recommended application: Air-gun.

Thickness of dry film 3mils (75 microns).
Color: To be selected by Departmental Representative.
Degree of brilliance 5.

PART 3 - EXECUTION

**3.1 Manufacturer's
instructions**

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

3.2 General

- .1 Sauf indication contraire, préparer les surfaces intérieures et effectuer les travaux de peinture conformément aux exigences du MPI Architectural Painting Specifications Manual.
- .2 Existing conditions
 - .1 Examine all existing supports in order to verify that their state could compromise preparation of the surfaces to be painted. Prior to the start of work, indicate to Departmental Representative all damages, defaults or unfavorable or disatisfying conditions noted.
- .3 Start of paint work will signal an unlimited approval of concerned surfaces and the contractor will then be responsible for the consition of the finished work.
- .4 Protect all surfaces, including surfaces to receive scelants against paint splatters and other damages resulting from pait work. Use protection tarpaulin and self-adhesive, non stain and non permanent, protection tape.

- .5 Protect adequately or remove all hardware and all other prefinish pieces, such as appliances, equipments or accessories adjacent to work, using tarpaulins, protection tape or any other appropriate means. After paint work is completed, clean and make good these elements in order that they recover their original appearance.
- .6 Paint prepared metal, galvanised or covered with zinc surfaces, according to indications.
- .7 Make sure that ambient lighting conditions are similar the ones that will prevail at the end of the project.

3.3 Inspection

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work. The corrections must be made before starting work. The application of materials represents an implicit acceptance of surfaces.
- .2 Surfaces must be free of curing compound, laitance, dust, dirt, grease, oil and other contaminants that can affect the adhesion of the coating.
- .3 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "Cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .4 Maximum moisture content as follows:
 - .1 Plaster and gypsum board: 12%.
 - .2 Concrete : 4 %.
 - .3 Wood : 15 %.

3.4 Preparation

- .1 Protection
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining Covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
 - .4 Protect building occupants and general public in and about the building.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place « WET PAINT » signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.

- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming and wiping with dry, clean cloths.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .5 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .6 Sand existing surfaces with smooth and high gloss finish coating in order to facilitate adhesion of new paint.
- .7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air or vacuum cleaning.
- .8 Touch up of shop primers with primer as specified.
- .9 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.5 Application

- .1 Method of application to be as approved by Departmental Representative and product manufacturer.
Apply paint by brush, roller, air sprayer or airless sprayer.
Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in uniform layer using brush and/or roller type suitable for application, and required finish surface.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.

- .5 Remove runs, sags and brush marks from finished work and repaint.
 - .6 Apply one coat of paint on all edges of wooden doors and steel doors (4 edges).
 - .3 Spray application:
 - .1 Isolate application area to prevent surrounding air contamination by toxious fumes.
 - .2 Protect adjacent surfaces and equipment against off limits projection damage.
 - .3 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .4 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .5 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
 - .6 Brush out immediately all runs and sags.
 - .7 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
 - .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
 - .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
 - .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
 - .7 Sand and dust between coats to remove visible defects.
 - .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
 - .9 Unless otherwise noted, apply at least 2 coats of paint on all surfaces to be painted over primer and base coats.
 - .10 Paint glazing rabbet and stops prior to glass installation.
 - .11 Generally, do not paint over caulking except those in modified elastomeric latex, which should be painted a minimum of three days after their application; color adjacent substrates.
- 3.6 Site tolerances**
- .1 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.7 Restoration

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

3.8 Cleaning

- .1 At completion, clean paint stains on surfaces that have not been painted (hardware, equipment or accessories).
- .2 Clean and evacuate daily from site, all debris and unused materials generated by the work of this section.
- .3 At completion, remove all debris, unused materials and tools.

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with sections and drawings depicting complementary works, prior or related to the work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for the complete execution of the bird control system work, including all accessories required, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General requirements.
- .2 Section 02 41 16 – Demolition.

1.3 System Description

- .1 The bird protection and control nets (bird nets) will be installed under exterior roof structural elements as shown in the drawings.
- .2 Components and mesh of the bird nets system shall be designed to prevent the migration of birds towards the apparent elements of structure.

1.3 Quality assurance

- .1 Obtain from manufacturer all required technical information and installation methods appropriate to the specific project conditions.
- .2 Installer of bird protection systems must be approved by the product manufacturer.
- .3 Installer of the bird protection systems must understand specific site condition to ensure that its system meets all the installation requirements.
- .4 All parts and accessories required for the installation of bird protection kits must come from the same single manufacturer.

1.5 Action and informational Submittals

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data
 - .1 Submit the required data sheets and manufacturer's documentation for the proposed control system. Data sheets must indicate product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings
 - .1 Shop drawings must include dimensions, fasteners, finishes, and installation details.
- .4 Samples :
 - .1 Submit required samples in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Submit 300mm x 300mm corner of each type of net proposed.
- .3 Submit samples of moldings, profiles, fasteners and other accessories and fasteners for prescribed birdnets.
- .5 Manufacturer's instructions
 - .1 Submit instructions provided by the manufacturer.
- .6 Certificates: submit documents signed by the manufacturer, certifying that the products, materials and equipment meet the required physical characteristics and performance criteria.
- .7 Submittals
 - .1 Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.

1.6 Delivery, storage and handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and protection of bird nets.
 - .1 Temporary cover finished surfaces. Remove this protective coating once assembly is complete. Protective material should be removed perfectly and leave no residue.
 - .2 Protect finished surfaces from damage before, during and after the bird control system installation.

1.7 Coordination

- .1 Coordinate the work of this Section with other sections.
- .2 The installer will have to have a complete understanding of existing site conditions.
- .3 Provide all necessary anchoring devices to attach the system to the existing building structure and around structural components.
- .4 Take all measurements on site before proceeding with the bird control system fabrication.

1.8 Waste management and disposal

- 1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The works of this section shall be made in accordance with the requirements of this plan.

1.9 Warranty

- .1 For Work of the present Section 10 81 00 – Bird control system, the 12 month warranty period is extended to **two (2) years** for all of the work.
- .2 Provide written warranty, prepared and signed by both the manufacturer and the installer, in the name of Canada, certifying that work specified under the present section shall defects in material and workmanship, for a period of **two (2) years**.

PART 2 - PRODUCTS

2.1 Material

- .1 Work of the present section includes, without limitation, the supply and installation of the followings :
 - .1 The supply and installation of loading dock seals where indicated, according to dimensions and location on drawings.
 - .2 Refer to drawings for locations, dimensions and types of dock seals.
 - .3 All adhesives, anchors, fasteners, profiles, moldings, and other accessories necessary for the installation of loading dock seals.

2.2 Loading dock seals

- .1 Thread knotted meshes consisting of polyethylene stabilized against the ultra violet light, 1.2mm in diameter with flame degree resistance of 250 ° F (melting point). Rot-proof, non-conductive and dimensionally stable at temperatures below zero. Net made of grid sections of 19mm x 19mm, black.
- .2 All hardware fasteners, cables, screws, tensioners, brackets, dowels, ferrules and clips, made of stainless steel, in accordance with CAN3-G40.21, type 316.
- .3 Tape zipper of 40mm width X 1500mm length to allow access to electromechanical equipment through the net, black color, (4 bands required).
- .4 Use 3mm thick neoprene sealing washers to all anchors and penetrations of walls.
- .5 Epoxy polyurethane terpolymer seals to CAN / CGSB-19.24, non-sagging, for walls penetrations.
 - .1 Colors to be selected by Departmental Representative in the manufacturer's standard series.
- .6 Anchors, trim and fasteners and gaskets as recommended by the manufacturer.
- .7 Refer to drawings for proposed locations for bird control on building edges and cornices.

PART 3 - EXECUTION

3.1 Manufacturer's instructions

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

3.2 Preparation

- .1 Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable in accordance with manufacturer's written instructions.
- .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
- .3 Installation surfaces must be thoroughly cleaned of rust, peeling paint or other debris.

3.3 Installation

- .1 Install the bird control system sections securely according to the manufacturer's recommendations. Perfectly adjust nets perimeters to walls and ceiling profiles and components to prevent the passage of birds to the protected areas.
- .2 Fasten the threads around the walls using stainless steel cables tensioned with turnbuckle tensioners, provide turnbuckles for each 9 meters lengths of cable.
- .3 Secure the cables to the walls every 610mm. Secure nets mesh to the tensioned cables
- .4 Attach nets to bottom of structural elements every 9 meters with folded stainless steel wire clips.
- .5 At locations identified by Departmental Representative, provide "V" access hatches to allow access to electromechanical equipment. These access hatches shall consist of two (2) 900mm long zipper strips installed at 90° angle to form a "V" on the ceiling. Provide four (4) of these hatches to the various nets installed on the ceilings.
- .6 Ensure the continuity of bird control system around columns, ducts, and other equipment. Secure net sections around these components.
- .7 Bird nets and bird control system must not allow the migration of birds to secure areas. No openings larger than 19mm x 19mm will be accepted.

3.4 Cleaning

- .1 Progress Cleaning: clean in accordance with Section 1 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Clean all surfaces where bird control strips are installed, according to the manufacturer's instructions

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with all sections and drawings describing works that are complementary, subordinate, prerequisite or otherwise related to work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for the complete execution of loading dock bumper works, including all accessories required, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General requirements.
- .2 Section 02 41 16 – Demolition.
- .3 Section 07 92 10 – Joint Sealing.
- .4 Section 11 13 16 – Dock Seals.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM D 624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - .2 ASTM D 1171, Standard Test Method for Rubber Deterioration-Surface Ozone Cracking Outdoors or Chamber.
 - .3 ASTM D 2632, Standard Test Method for Rubber Property-Resilience by Vertical Rebound.
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-11, Paints and Coatings.
 - .2 GS-36, Commercial Adhesives.

1.4 Action and informational Submittals

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data
 - .1 Submit manufacturer's printed product literature and data sheets for loading dock bumpers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings
 - .1 Indicate on drawings:
 - .1 Dimensions and required clearances.
 - .2 Fastening methods for dock bumpers.

.4 Submittals

- .1 Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.

1.5 Delivery, storage and handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements
 - .1 Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect loading dock bumpers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.6 Waste management and disposal

- 1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The works of this section shall be made in accordance with the requirements of this plan.

PART 2 - PRODUCTS

2.1 General

- .1 Work of the present section includes, without limitation, the supply and installation of the followings :
 - .1 The supply and installation of loading dock bumpers where indicated, according to dimensions and location on drawings.
 - .2 Refer to drawings for locations, dimensions and types of loading dock bumpers.
 - .3 All adhesives, anchors, fasteners, profiles, moldings, and other accessories necessary for the installation of loading dock seals.

2.2 Manufactured units

- .1 Laminated Dock Bumper :
 - .1 Provide five (5) laminated bumpers for each door, according to layouts and dimensions shown on drawings.
 - .2 Laminated dock bumpers to be made of a rubberized fabric truck tires cut to uniform size pads, 250mm x 150mm, punched to receive two steel supporting rods, 20mm diameter. Bumpers must be assembled to cover indicated lengths.
 - .3 Bumpers impact surface to be galvanized steel plate 12.7mm thickness protecting rubberized cushions.

- .4 Rubber pads laminated between galvanized steel structural steel angles 75mm x 75mm x 6mm and compressed under approximately 6.5kN pressure. One steel angle welded to 19mm steel rods at one end and closed with threaded rod and nut at other end.
 - .1 Existing anchors should not be reused. Replace with new anchors all existing anchors.
- .5 Anchor leg of angle extends 75mm beyond rubber surface at each end and contains three (3) 21mm anchor bolt holes as required.
- .6 Setbacks (projection between the face of dock seal and dock bumper's face) shall be as shown in the drawings, unless otherwise indicated by manufacturers. Coordinate exact bumpers depth accordingly.
- .7 Hot-dipped galvanized finish for exposed metal parts.

PART 3 - EXÉCUTION

3.1 Examination

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

3.2 Installation

- .1 Install loading dock bumpers in accordance with manufacturer's instructions and as indicated.

3.3 Cleaning

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

3.4 Protection

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

END OF SECTION

PART 1 - GENERAL

1.1 Conditions

- .1 All General Conditions, general instructions, additional specific instructions and addendum are part of this section.
- .2 This section and related drawings must be read and reviewed in conjunction with sections and drawings depicting complementary works, prior or related to the work described.
- .3 The Contractor / subcontractor shall provide all materials, equipment, labor and services required for the complete execution of loading dock seal works, including all accessories required, so that works perfectly fulfill the purposes for which they are intended.

1.2 Related sections

- .1 Division 1 – General requirements.
- .2 Section 02 41 16 – Demolition.
- .3 Section 07 92 10 – Joint Sealing.
- .4 Section 11 13 13 – Loading Dock Bumpers.

1.3 References

- .1 Works covered by this section must comply with the latest version or latest revision, of standards, codes and regulations listed below or referred in this section.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 653/A 653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A 924/A 924M, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-11, Paints and Coatings.
 - .2 GS-36, Commercial Adhesives.

1.4 Action and informational Submittals

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data
 - .1 Submit manufacturer's printed product literature and data sheets for loading dock seals and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings
 - .1 Indicate on drawings :
 - .1 Dimensions and required clearances.
 - .2 Fastening methods for dock seals.
 - .3 Sealing dock components and characteristics.

- .4 Samples :
 - .1 Submit duplicate samples of :
 - .1 300mm x 300mm pieces of dock seal and covering material.
 - .2 300mm x 300mm pieces of door seal foam material.
- .5 Submittals
 - .1 Contractor shall submit Materials identification and information sheets (Annex A) duly completed in block letters for all the products described in each section of this specification and at the same time as data sheets and shop drawings. No data sheet or shop drawing will be considered if the material information sheet is not included and duly completed. Data sheets and shop drawings will be automatically rejected.

1.5 Closeout submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data
 - .1 Submit operation and maintenance data for dock shelter seal care, cleaning and maintenance for incorporation into manual.

1.6 Delivery, storage and handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements
 - .1 Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect loading dock seals from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.7 Waste management and disposal

- 1 Works are governed by a **Waste management plan** in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal. The works of this section shall be made in accordance with the requirements of this plan.

1.8 Warranty

- .1 For Work of the present Section 11 13 16 – Dock Seals, the 12 month warranty period is extended to **five (5) years** for all of the work.
- .2 Provide written warranty, prepared and signed by both the manufacturer and the installer, in the name of Canada, certifying that work specified under the present section shall defects in material and workmanship, for a period of **five (5) years**.

PART 2 - PRODUCTS

2.1 General

- .1 Work of the present section includes, without limitation, the supply and installation of the followings :
 - .1 The supply and installation of loading dock seals where indicated, according to dimensions and location on drawings.
 - .2 Refer to drawings for locations, dimensions and types of dock seals.
 - .3 All adhesives, anchors, fasteners, profiles, moldings, and other accessories necessary for the installation of loading dock seals.

2.2 Loading dock seals

- .1 Head curtain dock seal for loading dock doors with fixed header and sides, identified « Door dock seals » on documents, composed of 300mm x 300mm high density polyurethane foam pads attached to 50mm thick dried wooden frames and covered with fabrics :
 - .1 Polyurethane foam: ASTM D 1056, unaffected by moisture, heat or cold and retaining resiliency to -40 degrees C.
 - .2 Covering fabric: minimum (40 oz.) 1,13 kg/m, vinyl coated nylon, waterproof under a static pressure of 500mm water column, and remaining flexible to -40 degrees C.
 - .3 Lateral sections 350mm width, beveled, and thickness (projection) 350mm from the head to the base.
 - .4 Adjustable head of 400mm x 610mm, width appropriate to the width of the door, fixed to a galvanized steel tray, sliding in metal side rails.
 - .5 Adjustable springs and lever system allowing a balance adjustment for smooth operation, without blocking.
 - .6 The fabric must be provided with air evacuation openings; provide 125mm wide integral yellow guide stripes sewn to full length of each jamb and header.
 - .7 Vertical cushions are beveled at the bottom to prevent their sagging, pinching and wearing during compression.
 - .8 All required mounting hardware to be galvanized steel.
 - .1 Existing anchors should not be reused. Replace with new anchors all existing anchors.

PART 3 - EXÉCUTION

3.1 Examination

- .1 Verification of Conditions: verify conditions of substrates and elements previously installed under other Sections or Contracts are acceptable for loading dock seals installation in accordance with manufacturer's instructions prior to loading dock seals installation.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval from Departmental Representative.
- .2 Before loading dock seals installation, ensure that old anchors openings in masonry walls have been repaired and sealed.

- 3.2 Installation**
 - .1 Install loading dock seals in accordance with manufacturer's instructions and as indicated.

- 3.3 Adjusting**
 - .1 Adjust loading dock seals components for correct function and operation in accordance with manufacturer's written instructions.
 - .2 Lubricate moving parts to operate smoothly and fit accurately.

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

- 3.5 Protection**
 - .1 Protect installed products and components from damage during construction.
 - .2 Repair damage to adjacent materials caused by loading dock seals installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 09 91 23 - Painting.
- .2 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

1.2 REFERENCE STANDARDS

- .1 "Code de construction du Québec - Chapitre I - Bâtiment 2010".

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature, and datasheets for all material and specified equipment listed in this specification.
- .3 Shop drawings:
 - .1 Drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .2 Drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable Codes.
 - .3 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
 - .1 Operation and maintenance manual approved by Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation, and troubleshooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required, and task time.
 - .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting, and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.5 Approvals:

- .1 Submit two copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
- .2 Make changes as required and re-submit as directed by Departmental Representative.

.6 Additional Data:

- .1 Prepare and insert into Operation and Maintenance Manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site Records:

- .1 Departmental Representative will provide one set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems, and low voltage control wiring.
- .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
- .3 Use different colour waterproof ink for each service.
- .4 Make available for reference purposes and inspection.

.8 As-Built Drawings:

- .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of As-Built drawings.
- .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
- .3 Submit to Departmental Representative for approval and make corrections as directed.
- .4 Perform testing, adjusting, and balancing for HVAC using as-built drawings.
- .5 Submit completed reproducible As-Built drawings with Operating and Maintenance Manuals.

- .9 Submit copies of As-Built drawings for inclusion in final TAB report.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
 - .2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

- .1 Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: Prior to proceed with equipment relocation (nitrogen tank, liquid chiller).
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PAINTING REPAIRS AND RESTORATION

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

3.3 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units located inside the work area.

3.4 CLEANING

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

3.5 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 09 91 23 - Painting.
- .2 Section 21 05 01 - Common Work Results for Mechanical.

1.2 REFERENCE STANDARDS

- .1 "Code de construction du Québec - Chapitre I - Bâtiment 2010".
- .2 NFPA 13-2013, Standard for the Installation of Sprinkler Systems.
- .3 NFPA 14-2010, Standard for the Installation of Standpipe and Hose Systems.

PART 2 - PRODUCTS

- .1 Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: Prior to exterior shell repair work.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PAINTING REPAIRS AND RESTORATION

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

3.3 CLEANING

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

3.4 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 23 05 05 - Installation of Pipework.

1.2 REFERENCE STANDARDS

- .1 Unless otherwise indicated, all the works must be done in accordance with the in force edition of the "Code de construction du Québec - 2010", including Chapter 3 - Plumbing.
- .2 American Society of Mechanical Engineers International (ASME).
 - .1 ANSI/ASME B16.15-2011, Cast Copper Alloy Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-2001, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-2011, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
 - .5 ASME B16.26-2011, Cast Copper Alloy Fittings for Flared Copper Tubes.
- .3 ASTM International.
 - .1 ASTM B32-08(2014), Standard Specification for Solder Metal.
 - .2 ASTM B42-10, Seamless Copper Tube, Standard Sizes.
 - .3 ASTM B88M-09, Standard Specification for Seamless Copper Water Tube (Metric).
- .4 National Sanitation foundation (NSF).
 - .1 NSF/ANSI 61-13, Drinking Water System Components-Health Effects.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

- .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Closeout Submittals:

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: Remove for reuse packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.

PART 2 - PRODUCTS

2.1 PIPING

- .1 Domestic hot, cold, and recirculation systems, within building.
 - .1 Above ground:
 - .1 Copper tube, hard drawn, type "L": To ASTM B88M.
 - .2 Buried or embedded:
 - .1 Copper tube, soft annealed, type "K": To ASTM B88M, in long lengths and with no buried joints.

2.2 FITTINGS

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

- .5 NPS 2 and larger:
 - .1 Roll grooved to ANSI/ASME B16.18 or ANSI/ASME B16.22 and CSA B242 Standards.
- .6 NPS 1½ and smaller:
 - .1 Wrought copper to ANSI/ASME B16.22, cast copper to ANSI/ASME B16.18; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1,380 kPa.

2.3 JOINTS

- .1 Rubber gaskets, latex-free 1.6 mm thick: To AWWA C111.
- .2 Bolts, nuts, hex head, and washers: To ASTM A307, heavy series.
- .3 Solder: Tin copper alloy 95/5.
- .4 Teflon Tape: For threaded joints.
- .5 Grooved Couplings: Designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.
- .6 Dielectric connections between dissimilar metals: Dielectric fitting, complete with thermoplastic liner.

2.4 SWING CHECK VALVES

- .1 NPS 2 and under, soldered:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.
- .2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.
- .3 NPS 2½ and over, flanged:
 - .1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, renewable seat, bronze disc, bolted cap.

2.5 BALL VALVES

- .1 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle.
- .2 NPS 2 and under, soldered:
 - .1 To ANSI/ASME B16.18, Class 150.
 - .2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland, and PTFE seat, steel lever handle, with NPT to copper adaptors.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

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

.7 Valves:

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

3.3 FIELD QUALITY CONTROL

.1 Pressure Tests:

- .1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.
- .2 Test pressure: Greater of 1 times maximum system operating pressure or 860 kPa.

3.4 FLUSHING

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean to copper Provincial potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

3.5 PRE-START-UP INSPECTIONS

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

3.6 DISINFECTION

- .1 Flush out, disinfect, and rinse system to Departmental Representative.
- .2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

3.7 START-UP

- .1 Timing: Start up after:
 - .1 Pressure tests have been completed.

- .2 Disinfection procedures have been completed.
- .3 Certificate of static completion has been issued.
- .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.
- .3 Start-up Procedures:
 - .1 Establish circulation and ensure that air is eliminated.
 - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing, and/or cavitation.
 - .3 Bring HWS storage tank up to design temperature slowly.
 - .4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
 - .5 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

3.8 PERFORMANCE VERIFICATION

- .1 Scheduling:
 - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify that flow rate and pressure meet Design Criteria.
 - .2 Sterilize HWS and HWC systems for Legionella control.
 - .3 Verify performance of temperature controls.
 - .4 Verify compliance with Safety and Health Requirements.
 - .5 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers.
 - .6 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

.3 Reports:

- .1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.9 OPERATION REQUIREMENTS

- .1 Co-ordinate operation and maintenance requirements including, cleaning, and maintenance of specified materials and products with Section 23 05 05 - Installation of Pipework.

3.10 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

- .1 ASTM International Inc.
 - .1 ASTM B32-08, Standard Specification for Solder Metal.
 - .2 ASTM B306-09, Standard Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C564-03a, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-B70-12, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .2 CAN/CSA-B125.3-12, Plumbing Fittings.

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 adhesives, and include product characteristics, performance criteria, physical size, finish, and limitations.

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 and address.
- .3 Packaging Waste Management: Remove for reuse of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary, storm, and vent Type DWV: To ASTM B306.
 - .1 Fittings.
 - .1 Cast brass: To CAN/CSA-B125.3.
 - .2 Wrought copper: To CAN/CSA-B125.3.
 - .2 Solder: Tin-lead, 50:50, type 50A, to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Buried storm, sanitary, and vent minimum NPS 3: To CAN/CSA-B70, with one layer of protective coating.
 - .1 Joints:
 - .1 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets: To CAN/CSA-B70.ASTM C564 or CAN/CSA-B70.
 - .2 Stainless steel clamps.
 - .2 Hub and spigot:
 - .1 Caulking lead: To CSA B67.
 - .2 Cold caulking compounds.
 - .2 Above ground sanitary, storm, and vent: To CAN/CSA-B70.
 - .1 Joints:
 - .1 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 In accordance with Section 23 05 05 - Installation of Pipework.
- .2 Install in accordance with Provincial Plumbing Code.

3.3 TESTING

- .1 Pressure test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

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

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM International.
 - .1 ASTM A126-(2009), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2 American Water Works Association (AWWA).
 - .1 ANSI/AWWA C700-09, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 ANSI/AWWA C701-12, Standard for Cold Water Meters-Turbine Type for Customer Service.
 - .3 ANSI/AWWA C702-10, Standard for Cold Water Meters-Compound Type.
- .3 CSA International.
 - .1 CSA-B64 Series-11, Backflow Preventers and Vacuum Breakers.
 - .2 CSA B79-08, Commercial and Residential Drains and Cleanouts.
 - .3 CAN/CSA-B356-10, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .4 National Research Council Canada (NRC).
 - .1 National Plumbing Code of Canada 2010 (NPC) (Including modifications from Quebec).
- .5 Plumbing and Drainage Institute (PDI).
 - .1 PDI-G101-R2010, Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.
 - .2 PDI-WH201-R2010, Water Hammer Arresters Standard.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish, and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings to indicate dimensions, number of anchors, materials, finishes, construction and assembly details, and method of anchorage.
- .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.

1.3 CLOSEOUT SUBMITTALS

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

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and, handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location, indoors, and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
 - .2 Store and protect plumbing materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

- .4 Packaging Waste Management: Remove for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 WATER HAMMER ARRESTORS

- .1 Copper construction, piston type: To PDI-WH201.

2.2 BACK FLOW PREVENTERS

- .1 Preventers: To CSA-B64 Series, application, reduced pressure principle type.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Install in accordance with National Plumbing Code of Canada (NPC) of the province in which the work is.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.4 WATER HAMMER ARRESTORS

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

3.5 BACK FLOW PREVENTERS

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

3.6 TESTING AND ADJUSTING

- .1 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
- .2 Application Tolerances:
 - .1 Pressure at fixtures: ± 70 kPa.
 - .2 Flow rate at fixtures: $\pm 20\%$.
- .3 Adjustments:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
- .4 Vacuum breakers, backflow preventers, and backwater valves:
 - .1 Test tightness, accessibility for O&M.
 - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
 - .3 Verify visibility of discharge from open ports.
- .5 Access Doors:
 - .1 Verify size and location relative to items to be accessed.
- .6 Water Hammer Arrestors:
 - .1 Verify proper installation of correct type of water hammer arrestor.

3.7 CLEANING

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

3.8 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 All division 23 sections defined in the list of sections are an integral part of this section.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit 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 the province.
 - .2 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Submit operation and maintenance data.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.

- .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
- .4 Operation instruction for systems and component.
- .5 Description of actions to be taken in event of equipment failure.
- .6 Valves schedule and flow diagram.
- .7 Colour coding chart.
- .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation, and troubleshooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required, and task time.
- .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .5 Approvals:
 - .1 Submit 2copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit to Departmental Representative.
- .6 Additional Data:
 - .1 Prepare and insert into Operation and Maintenance Manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site Records:

- .1 Departmental Representative will provide one set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems, and low voltage control wiring.
- .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
- .3 Use different colour waterproof ink for each service.
- .4 Make available for reference purposes and inspection.

.8 As-Built Drawings:

- .1 Prior to start of Testing, Adjusting, and Balancing for HVAC, finalize production of as-built drawings.
- .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
- .3 Submit to Departmental Representative for approval and make corrections as directed.
- .4 Perform testing, adjusting, and balancing for HVAC using as-built drawings.
- .5 Submit completed reproducible As-Built drawings with Operating and Maintenance Manuals.

.9 Submit copies of As-Built drawings for inclusion in final TAB report.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish spare parts as follows:
 - .1 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .3 Provide one set of special tools required to service equipment as recommended by manufacturers.

- .4 Furnish one commercial quality grease gun, grease, and adapters to suit different types of grease and grease fittings.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location, indoors, and off ground, in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: Remove for reuse packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

- .1 Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: Verify that conditions of substrate previously installed
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PAINTING REPAIRS AND RESTORATION

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

3.3 SYSTEM CLEANING

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

3.4 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 - ACTION AND INFORMATIONAL 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.

3.5 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment, and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting, and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use Operation and Maintenance Manual, As-Built drawings, and audiovisual aids as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.

3.6 CLEANING

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

3.7 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 21 05 01 - Common Work Results for Mechanical.

1.2 REFERENCE

- .1 Furthermore, the works will be done in accordance with any other code or norm having jurisdiction, as per the latest edition, notably including, but not limited to:
 - .1 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

1.3 SUBMITTALS

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

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 and address.

PART 2 - PRODUCTS

- .1 Not Used.

PART 3 - EXECUTION

3.1 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.

3.2 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, and maintenance, and as recommended by Departmental Representative.
- .2 Provide space for disassembly, removal of equipment and components (whichever is greater) without interrupting operation of other system, equipment, and components of network. Fitted out space has to be of dimensions as indicated on drawings or as recommended by manufacturer, the most raised value must be retained.

3.3 PIPEWORK

- .1 Protect openings against entry of foreign material.
- .2 Assemble piping using fittings manufactured to ANSI Standards.
- .3 Install exposed piping, equipment, rectangular cleanouts, and similar items parallel or perpendicular to building lines.
- .4 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .5 Group piping wherever possible or as indicated.
- .6 Ream pipes, remove scale, and other foreign material inside out before assembly. Clean also when Work is completed.
- .7 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .8 Provide for thermal expansion, as indicated.

3.4 SLEEVES

- .1 Sealing.
 - .1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.
 - .2 Ensure no contact between copper pipe or tube and sleeve.

3.5 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 Division 23.

- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant sections of Division 23.
- .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.

3.6 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.

3.7 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE).
 - .1 ASHRAE 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).
- .2 Electrical Equipment Manufacturers' Association Council (EEMAC).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

- .1 Submittals: In accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data.
 - .1 Submit manufacturer's printed product literature, specifications, and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .2 Submit two copies of the material safety data sheets as required by the Workplace Hazardous Materials Information System (WHMIS) in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Closeout Submittals.
 - .1 Provide maintenance data for motors, drives, and guards for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Motors: High efficiency, in accordance with local electrical energy company Standards and to ASHRAE 90.1.

2.2 MOTORS

- .1 Provide motors for mechanical equipment and systems.
- .2 Motors 373 W (½ HP) and larger: EEMAC Class B, 3-phase, 600 V, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C, unless otherwise indicated.
- .3 Motors connected to variable frequency drives must be of "Inverter Duty" or "Inverted Ready" type and complying with NEMA MG-1, Part 31.
- .4 Thermistors are required on all motors that are 15 kW or greater.

2.3 BELT DRIVES

- .1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.
- .2 Use cast iron or steel sheaves secured to shafts with removable keys, unless otherwise indicated.
- .3 For motors under 7.5 kW: Standard adjustable pitch drive sheaves, having ±10% range. Use mid-position of range for specified r/min.
- .4 For motors 7.5 kW, and over: Sheave with split tapered bushing and keyway having fixed pitch unless otherwise specified. Provide sheave of correct size to suit balancing.
- .5 Correct size of sheave determined during commissioning.
- .6 Minimum Drive Rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .7 Motor slide rail adjustment plates to allow for centre line adjustment.
- .8 Supply one set of spare belts for each set installed in accordance with Section 01 78 00 - Closeout Submittals.

2.4 DRIVE GUARDS

- .1 Provide guards for unprotected drives.
- .2 Guards for belt drives.
 - .1 Expanded metal screen welded to steel frame.
 - .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
 - .3 38 mm dia holes on both shaft centres for insertion of tachometer.
 - .4 Removable for servicing.
- .3 Provide means to permit lubrication and use of test instruments even with guards in place.
- .4 Install belt guards to allow movement of motors for adjusting belt tension.
- .5 Guard for flexible coupling:
 - .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
 - .2 Securely fasten in place.
 - .3 Removable for servicing.
- .6 Unprotected fan inlets or outlets:
 - .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
 - .2 Net free area of guard: Not less than 80% of fan openings.
 - .3 Securely fasten in place.
 - .4 Removable for servicing.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Fasten securely in place.
- .2 All equipment and elements have to be removable for servicing, easily returned into, and fixed in position.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 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.

3.4 CLEANING

- .1 Execute all cleaning work in accordance with section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 23 05 00 - Common Work Results for HVAC.
- .2 Section 23 05 49.01 - Seismic Restraint Systems (SRS).

1.2 REFERENCES

- .1 Unless otherwise indicated, all the works must be done in accordance with the "Code de construction du Québec - 2010".
- .2 Furthermore, the works will be done in accordance with any other code or norm having jurisdiction, as per the latest edition, notably including, but not limited to:
 - .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A125-1996(R2007), Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307-07b4, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A563-07a, Specification for Carbon and Alloy Steel Nuts.
 - .2 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS).
 - .1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 ANSI/MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.
 - .3 Underwriter's Laboratories of Canada (ULC).
 - .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Submittals: In accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings and product data for following items:
 - .1 Bases, hangers, and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.
- .3 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Instructions:
 - .1 Submit manufacturer's installation instructions.
- .5 Closeout Submittals.
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, materials to site in original packaging, which must be label with manufacturer's name and address.
- .3 Management of packaging waste: Reclaim packaging waste for reuse and pick-up of pallets, crates, padding, and other packaging materials, in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Design Requirements.
 - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and, assemblies.

- .2 Base maximum load ratings on allowable stresses prescribed by MSS SP58 or ASME B31.1 Standard.
- .3 Design hangers and supports to support piping, air ducts, systems and mechanical equipments under operating conditions allow free expansion and contraction of supported elements, prevent excessive stress from being introduced into piping or connected equipments.
- .4 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58 Standard.
- .2 Performance Requirements.
 - .1 Design supports, platforms, catwalks, and hangers, to withstand seismic events as specified Section 23 05 49.01 - Seismic Restraint Systems (SRS).

2.2 GENERAL

- .1 Fabricate hangers, supports, and sway braces in accordance with ANSI B31.1 and MSS SP58 Standards.
- .2 Use components for intended design purpose only. Do not use for lifting or erection purposes.

2.3 PIPE HANGERS

- .1 Finishes.
 - .1 Pipe hangers and supports: Galvanized after manufacture.
 - .2 Use electro-plating galvanizing process.
 - .3 Ensure steel hangers in contact with copper piping are copper plated epoxy coated.

2.4 INSULATION PROTECTION SHIELDS

- .1 For protection shells, use high density insulation with continuous vapour-barrier for cold coolants.
- .2 Horizontal suspension for saddles and shells for insulated pipes, with the following characteristics:
 - .1 Stiff copper piping, greater than NPS 6: Protection shell.

- .2 Ferrous metal pipes, greater than NPS 6:
 - .1 On stirrups: Protection shell;
 - .2 On rollers: Protection shells.

2.5 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 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.
- .2 Anchorage components for hangers mounted on concrete structure.
 - .1 Attach elements (plates and stirrup) using at least four (4) concrete inserts, one at each corner.

3.3 SPACING BETWEEN SUPPORTS AND SUSPENSIONS

- .1 Follow the requirements of the Quebec Construction Code, Chapter III, Plumbing.
- .2 Install supports/suspension at each 1.5 m for ½ NPS or smaller copper piping.
- .3 Install a support/suspension at a maximum of 300 mm from each elbow.

- .4 Install supports/suspensions at each joint for piping with notched extremities using flexible joints.
- .5 In addition to the above required supports, install supports and suspensions on the straight lengths of the piping as described in the tables below:

HEATING, COOLING, AND PLUMBING PIPING						
MAXIMUM SPACING FOR HORIZONTAL PIPING, IN METERS						
Ø PIPING (NPS)	Ø ROD mm	STEEL	COPPER	ASBESTOS CEMENT	ABS PVC	CPVC
Up to ½	10	2.1	1.5	---	0.9	0.8
¾	10	2.1	1.5	---	1.0	0.9
1	10	2.1	1.8	---	1.1	1.0
1¼	10	2.1	2.1	2.0	1.2	1.2
1½	10	2.7	2.4	2.0	1.3	1.3
2	10	3.0	2.4	2.0	1.5	1.4
2½	13	3.4	2.7	2.0	---	1.7
3	13	3.6	3.0	2.0	1.9	1.8

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 Hangers and Supports.
 - .1 Ensure that rod is vertical under operating conditions.

- .2 Equalize loads.
- .2 Adjustable Clevis.
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
- .3 C-Clamps.
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam Clamps.
 - .1 Hammer jaw firmly against underside of beam.

3.7 FIELD QUALITY CONTROL

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

3.8 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Dispose of construction materials surplus, waste, tools and, equipment.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 23 05 49.01 - Seismic Restraint Systems.

1.2 REFERENCES

- .1 National Fire Protection Association (NFPA).
 - .1 NFPA 13-2007, Standard for the Installation of Sprinkler Systems.
- .2 National Building Code of Canada (NBC) - 2010.

1.3 SUBMITTALS

- .1 Submit documents and samples 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 performance criteria, and limitations.
- .2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Provide shop drawings for the whole installation, complete with performance and product data.
 - .2 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 criterion and physical properties.
 - .2 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 and store materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: In accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 USE OF VIBRATION AND SEISMIC CONTROL EQUIPMENT

- .1 Install vibration control equipments to the following table:

Equipment	Power (HP) and Other	RPM	Location of Equipment											
			Ground Base			Base - Size								
						Up to 6 m			6 to 9 m			9 to 12 m		
			Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)
Chillers and Other Cooling Equipment														
Reciprocating	All	All	A	2	6	A	4	20	A	4	40	A	4	65
Centrifugal, screw type vis, Scroll	All	All	A	1	6	A	4	20	A	4	40	A	4	40
Absorption	All	All	A	1	6	A	4	20	A	4	40	A	4	40
Centrifugal Pumps														
Single piece	≤ 7,5	All	B	2	6	C	3	20	C	3	20	C	3	20
	≥ 10	All	C	3	20	C	3	20	C	3	40	C	3	40
Vertical in line	5 à 25	All	A	3	20	A	3	40	A	3	40	A	3	40
	≥ 30	All	A	3	40	A	3	40	A	3	40	A	3	65

Equipment	Power (HP) and Other	RPM	Location of Equipment											
			Ground Base			Base - Size								
						Up to 6 m			6 to 9 m			9 to 12 m		
			Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)
Horizontal, end suction type	≤ 40	All	C	3	20	C	3	20	C	3	40	C	3	40
	50 à 125	All	C	3	20	C	3	20	C	3	40	C	3	65
	≥ 150	All	C	3	20	C	3	40	C	3	65	C	3	90
Ventilation Unit	All	All	A	1.1	-	A	1.1	-	A	1.1	-	A	1.1	-
Axial Fans														
Diameter to 560 mm	All	All	A	2	5	A	3	20	A	3	20	C	3	20
Diameter 600 mm and more	S.P. ≤ 500 Pa	Up to 300	B	3	65	C	3	90	C	3	90	C	3	90
		301 to 500	B	3	20	B	3	40	C	3	65	C	3	65
		501 and more	B	3	20	B	3	40	B	3	40	B	3	40
	S.P. ≥ 501 Pa	Up to 300	C	3	65	C	3	90	C	3	90	C	3	90
		301 to 500	C	3	40	C	3	40	C	3	65	C	3	65
		501 and more	C	3	20	C	3	40	C	3	40	C	3	65
Centrifugal Fans														
Diameter up to 560 mm	All	All	B	2	5	B	3	20	B	3	20	C	3	40

Equipment	Power (HP) and Other	RPM	Location of Equipment											
			Ground Base			Base - Size								
						Up to 6 m			6 to 9 m			9 to 12 m		
			Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)
Diameter 600 mm and more	≤ 40	Up to 300	B	3	65	B	3	90	B	3	90	B	3	90
		301 to 500	B	3	40	B	3	40	B	3	65	B	3	65
		501 and more	B	3	20	B	3	20	B	3	20	B	3	40
	≥ 50	Up to 300	C	3	65	C	3	90	C	3	90	C	3	90
		301 to 500	C	3	40	C	3	40	C	3	65	C	3	65
		501 and more	C	3	25	C	3	40	C	3	40	C	3	65
Condensin g Units	All	All	A	1	5	A	4	20	A	4	40	A/ D	4	40
Package Units														
All	10	All	A	3	20	A	3	20	A	3	20	A	3	20
	≥ 15 Pa S.P. ≤ 1,000 Pa	Up to 300	A	3	20	A	3	90	A	3	90	C	3	90
		301 to 500	A	3	20	A	3	65	A	3	65	A	3	65
		501 and more plus	A	3	20	A	3	40	A	3	40	A	3	40
	≥ 15 Pa S.P. > 1,000 Pa	Up to 300	B	3	20	C	3	90	C	3	90	C	3	90
		301 to 500	B	3	20	C	3	40	C	3	65	C	3	65
		501 and more	B	3	20	C	3	40	C	3	40	C	3	65

Equipment	Power (HP) and Other	RPM	Location of Equipment											
			Ground Base			Base - Size								
						Up to 6 m			6 to 9 m			9 to 12 m		
			Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)	Base	Isolator	Flexion min. (mm)
Stand Alone Rooftop Units	All	All	A/ D	1	5	D	3	20	See note 17 in: <i>notes for Table 48: Selection Guide for Vibration Isolation, in 2007 ASHRAE Handbook HVAC Applications, Chapter 47.</i>					
Small Fans and Fan Powered Terminal Boxes														
	≤ 285 L/s	All	A	3	15	A	3	15	A	3	15	A	3	15
	> 285 L/s	All	A	3	20	A	3	20	A	3	20	A	3	20

Base Types:

- A. No base, isolators attached to equipment.
- B. Base or structural steel rail (2.9).
- C. Inertia base, concrete (2.10).
- D. Roof curb isolation rails (2.11).

Isolators Types:

- 1. Elastomeric pads (2.2).
 - 1.1 Elastomeric pads, rubber/steel/rubber (2.2, EP4).
- 2. Elastomeric mounts or suspension (2.3, 2.6).
- 3. Floor springs or suspension (2.6).
- 4. Spring mounts (2.5).
- 5. Horizontal strain restraints (2.8).

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Size and shape of bases type and performance of vibration isolation as indicated.
- .2 All products must conform to anti-seismic standards.

2.2 ELASTOMERIC PADS

- .1 Type EP1 - Neoprene waffle or ribbed; 12 mm minimum thick; 50 durometer; maximum loading 621 kPa.
 - .1 Acceptable products: Vibro-Acoustics, type R, Vibra-Sil; Ingenia "Amber/Booth".

- .2 Type EP2 - Rubber waffle or ribbed; 12 mm minimum thick; 30 durometer natural rubber; maximum loading 345 kPa.
 - .1 Acceptable products: Vibro-Acoustics, type R, Vibra-Sil; Ingenia "Amber/Booth".
- .3 Type EP3 - Neoprene-steel-neoprene; 12 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 621 kPa.
 - .1 Acceptable products: Vibro-Acoustics, type NSN, Vibra-Sil; Ingenia "Amber/Booth".
- .4 Type EP4 - Rubber-steel-rubber; 12 mm minimum thick rubber bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 345 kPa.
 - .1 Acceptable products: Vibro-Acoustics, type RSR, Vibra-Sil; Ingenia "Amber/Booth".

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.
 - .1 Acceptable products: Vibro-Acoustics, type MD, Vibra-Sil; Ingenia "Amber/Booth".

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 all installations.
- .4 Colour code springs.

2.5 SPRING MOUNT

- .1 Zinc or cadmium plated hardware; housings coated with rustproof paint.
 - .1 Type M2 - Stable open spring: Support on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad.
 - .1 Acceptable products: Vibro-Acoustics, type SL, Vibra-Sil; Ingenia "Amber/Booth".

- .2 Type M4 - Restrained stable open spring: Supported on bonded 12 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.
 - .1 Acceptable products: Vibro-Acoustics, type CSR or CT, Vibra-Sil; Ingenia "Amber/Booth".
- .3 Type M5 - Enclosed spring mounts with snubbers for isolation up to 950 kg maximum.
 - .1 Acceptable products: Vibro-Acoustics, type SWSR, Vibra-Sil; Ingenia "Amber/Booth".
- .2 Performance: Minimum damping efficiency of 95%.

2.6 HANGERS

- .1 Colour coded springs, rustproof, painted box type hangers. Arrange to permit hanger box or rod to move through a 30° arc without metal to metal contact.
 - .1 Type H1 - Neoprene - In-shear, moulded with rod isolation bushing which passes through hanger box.
 - .1 Acceptable products: Vibro-Acoustics, type HD, Vibra-Sil; Ingenia "Amber/Booth".
 - .2 Type H2 - Stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.
 - .1 Acceptable products: Vibro-Acoustics, type SH, Vibra-Sil; Ingenia "Amber/Booth".
 - .3 Type H3 - Stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.
 - .1 Acceptable products: Vibro-Acoustics, type SHR, Vibra-Sil; Ingenia "Amber/Booth".
 - .4 Type H4 - Stable spring, elastomeric element with precompression washer and nut with deflection indicator.
 - .1 Acceptable products: Vibro-Acoustics, Vibra-Sil; Ingenia "Amber/Booth".
- .2 Performance: Minimum damping efficiency of 95%.

2.7 ROOF CURB ISOLATION RAILS

- .1 General: Type B4, completely factory assembled.
- .2 Lower Member: Continuous rectangular steel tube or "C" extruded aluminum channel.
- .3 Upper Member: Continuous rectangular steel tube or extruded aluminum "C" shaped channel to provide continuous support for equipment, complete with all-directional neoprene snubber bushings 6 mm thick to resist wind and seismic forces.
- .4 Springs: Steel, adjustable, removable, selected for 50 mm maximum static deflection plus 50% additional travel to solid, cadmium plated, sized and positioned to ensure uniform deflection.
- .5 High Frequency Isolation: 6 mm minimum thick continuous gasket on top and bottom of complete assembly or pads on top and bottom of each spring. Material: Closed cell neoprene.
- .6 Weatherproofing: Continuous flexible counterflashing to curb and providing access to springs. Material: aluminum or neoprene.
- .7 Hardware: Cadmium plated or galvanized.
- .8 Acceptable Products: Vibro-Acoustics; Vibra-Sil; Ingenia "Amber/Booth".

2.8 SEISMIC CONTROL MEASURES

- .1 General:
 - .1 Following systems and/or equipment to comply with protection level indicated in section 23 05 49.01.
 - .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, nor 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 supports to structure.

- .2 Suspended equipment:
 - .1 Use one or more of following methods depending upon site conditions, and 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 approved by Departmental Representative:
 - .1 Structural angles or channels.
 - .2 Cable restraint system incorporating grommets, shackles, and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Seismic control measures to meet requirements of NBC 2005.
- .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 NPS 4: First 3 points of support. NPS 5 to NPS 8: first 4 points of support. NPS 10 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.
- .7 Place ventilation units on elastomeric pads with 4 mm static flexion, with a maximum distance of 2,400 mm between centers.

3.3 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 CODES AND REFERENCES NORMS

- .1 Unless otherwise indicated, all the works must be done in accordance with the in force edition of the "Code de construction du Québec".
- .2 Furthermore, the works will be done in accordance with any other code or norm having jurisdiction, as per the latest edition, notably including, but not limited to:
 - .1 American Iron and Steel Institute (AISI).
 - .1 AISI, Specification for the Design of Cold-Formed Steel Structural Members.
 - .2 American Society of Civil Engineers (ASCE).
 - .1 ASCE 96, Structural Applications of Steel Cables for Buildings.
 - .3 American Society for Testing Materials (ASTM).
 - .1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - .2 ASSTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A475, Standard Specification for Zinc-Coated Steel Wire Strand.
 - .4 ASTM A603, Standard Specification for Zinc-Coated Steel Structural Wire Rope.
 - .5 ASTM A1011/A1011M, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - .6 ASTM E488, Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
 - .4 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).
 - .1 ASHRAE, A Practical Guide to Seismic Restraint.

- .5 American National Standards Institute (ANSI)/National Fire Protection Association (NFPA).
 - .1 ANSI/NFPA 13, Installation of Sprinkler Systems.
- .6 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA, Seismic Restraint Manual: Guidelines for Mechanical Systems, 3rd Edition, ANSI-SMACNA 001-2008.
- .7 National Building Code of Canada (NBC).
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .9 Requirements from CSA S832-01 - Guideline for Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

1.2 SEISMIC RESTRAINT SYSTEMS CHARACTERISTICS

- .1 Every seismic restraint systems must be entirely integrated and compatible with the following items:
 - .1 Prescript acoustic and anti-vibrations devices;
 - .2 Design characteristics of building and electrical and mechanical installations.
- .2 Each division is responsible for seismic restraints systems regarding its field.
- .3 On a seismic event, electromechanical systems don't have to be fully functional following the event. Seismic restraints systems are intended to prevent equipment from moving or rolling over in order to protect occupants during a seismic event.
- .4 Design of seismic restraints systems must be done by an engineer, specialized in paraseismic engineering and recognized in the Province of Quebec.

1.3 SUBMITTAL PRODUCTS

- .1 The documents to be submitted are:
 - .1 A detailed version of the design criterions.

- .2 Execution drawings (of same quality and format as the drawings part of the contractual documents), lists of materials and equipments, schematic representations as well as detailed specifications for all the elements of each of the foreseen devices and earthquake-resistant devices.
- .3 The design documents, work sheets and charts, including the calculation of the strain rates that can be attributed to seismic forces, as per the CNB.
- .4 Distinct shop drawings for each earthquake-resistant device or system as well as for each of their elements.
- .5 A document specifying the location of every device or system.
- .6 Lists of the different types of earthquake-resistant devices or systems and their related elements.
- .7 A document showing or indicating the details of the anchoring and mounting devices, the anchoring loads as well as the mounting methods to the frame elements.
- .8 A document specifying the instructions and installation methods.
- .2 Submit to the Departmental Representative, for review, location of seismic restraints systems and equipments attachments points to building structure. Submit one sample of shop drawings and technical sheets.
- .3 Submit documents signed and sealed by an engineer, specialized in paraseismic engineering and recognized in the Province of Quebec, certifying that seismic restraints systems meet the characteristics and performances requirements.
- .4 Submit installation instruction provided by manufacturer.

1.4 CLOSEOUT SUBMITTALS

- .1 Include instructions regarding control of seismic restraint systems and devices to maintenance sheets.

1.5 PROTECTION LEVEL

- .1 Install seismic anchorage and stabilisation devices on piping, else than fire protection piping and ventilation ducts, in accordance with prescriptions from the "Seismic Restraint Manual" published by SMACNA.
 - .1 Protection level required for current building:
 - .1 SHL-"A" for equipments;
 - .2 SHL-"B" for flat bottom tank;

- .3 SHL-"C" for piping and ducts.

PART 2 - PRODUCTS

2.1 SUPPLY SOURCE

- .1 The devices and seismic restraint systems must be supplied by only one manufacturer possessing experience in that subject area.
 - .1 Acceptable products: Mason Industries; Hilti; Tolco.
- .2 Seismic restraint systems for fire protection piping in accordance with NFPA 13 standard. Protection level required is $V_p = 0.5 W_p$.

2.2 GENERAL

- .1 The seismic restraint devices must prevent the permanent displacements as well as the damages caused by horizontal, vertical, and reversing movements.
- .2 The seismic restraint devices must be compatible with the electromechanical conception. They must not impede the normal operation of the electromechanical systems.
- .3 The seismic restraint devices must act flexibly and in every directions. They must not impede the sound damping and anti-vibration elements.
- .4 The mountings and attachment points must be able to resist to the same maximal loads as the seismic restraint devices.
- .5 Mounting of the seismic restraint devices and systems to reinforced concrete frames:
 - .1 The anchors used must be of expansive type and must present a high degree of mechanical strength.
 - .2 No anchor must be fixed by a needle-gun.
 - .3 Acceptable products: Hilti, HSL type.
- .6 No device, nor connected holder, nor electrical contact rivet must yield before the frame or the structure yields.
- .7 The seismic restraint devices composed of cast iron, threaded tubes or other frangible materials will not be accepted.
- .8 The seismic restraint devices must not obstruct the operation of fire-stop devices nor compromise their integrity.

- .9 To stabilize all the accessories, such as diffusers and lighting appliances installed in suspended ceilings.

2.3 STEEL ANGLES

- .1 Angles made from cold shaped steel plate and meeting AISI requirements, with minimum ultimate stress value, $F_u = 410$ MPa and an elastic limit stress of $F_y = 300$ MPa.

2.4 "C" CHANNELS

- .1 "C" channels manufactured following ASTM A1011/A1011M GR 33 Standard.

2.5 STRUCTURAL PIPING

- .1 Structural piping, manufactured following ASTM A53/A53M standard, type E or S, grade B.

2.6 CABLE

- .1 Cable, manufactured following ASTM A603 or ASTM A475 Standard, with at least seven wires, and Class A coating.
- .2 Connection parts, meeting ASCE 19 Standard Requirements and tested to hold at least 110% of the ultimate tensile stress of the cable.

2.7 BOLTS

- .1 Bolts manufactured in accordance with ASTM A307 Standard, grade A, hex head.

2.8 SEISMIC RESTRAINT FOR EQUIPMENT REQUIRING STATIC SUPPORT

- .1 Attach equipments to hanging supports mounted on the structure.
- .2 Install devices in order to avoid horizontal oscillation, vertical tipping over as well as axial sliding or buckling.
- .3 Use buckling resistant suspension rods.

2.9 SEISMIC RESTRAINT FOR EQUIPMENT REQUIRING ELASTIC SUPPORT

- .1 Attach equipments to hanging supports attached to the structure by the means of rigid rods on the three axes.
- .2 Restraint devices must act with flexibility and in a continuous manner. To do so, those must contain elastomeric elements, or any other parts meant to minimize impact effects.

- .3 Seismic restraint devices must not impact the efficiency of the noise and antivibration elements. During normal operation, the clearance between seismic restraint devices and material must be between 6 mm and 12 mm.
- .4 If paraseismic isolators are used, those shall be designed and installed in order to hold minimum acceleration forces.
- .5 Devices must never be compressed at the point of loss of efficiency.
- .6 Seismic restraint devices must avoid the complete discharge of anti-vibration devices.
- .7 If standard isolators are used, seismic restraint devices must be incorporated to anti-vibration elements in order to prevent those from tipping over.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Attachment points and fastening devices:
 - .1 Carefully verify that the anchoring bolts, the diameters of dowels, the depth of recesses in the concrete as well as the length of welds are in conformity to the drawings submitted for approval.
 - .2 Bolt to the frame or structure all the material that is not insulated against the transmission of vibrations.
 - .3 The oblong drillings for the adjustment of bolts is prohibited.
 - .4 For earthquake-resistant purposes, the lines of a small diameter can be attached to lines of bigger diameter that will hold them. The reverse practice is prohibited.
 - .5 The anchoring points inside concrete slabs must be kept away from the edges as per ASTM E-488 Standard and the recommendations of the manufacturer of the anchors.
 - .6 The depth of anchorage in concrete slabs must be at least eight times the hole diameter.
 - .7 Install restraining straps on every C-clamp used to support piping, in order to hold those in place in the occurrence of a seism. Straps must be provided by the C-clamp manufacturer.

- .2 Holding Cables:
 - .1 Link the holding cables to the hanging appliances in a manner that their axial incidence corresponds to the gravity center of the protected appliances.
 - .2 Tighten the cables attaches following the manufacturer's recommendations.
 - .3 Use wire ways, lugs and other appropriate hardware to ensure the alignment of the earthquake-resistant devices and to prevent the cables from bending at the fastening points.
 - .4 In the case of equipment hanging on the ceiling, set the holding cables at a 90° angle one from each other in the plans, and fix them to the frame of the building at a 45° angle.
 - .5 Adjust the tension of the lines in a manner that they do not seem loose but that they do not bother the normal operation of the anti-vibration devices.
 - .6 Tighten the cables in a manner that reduces the slack to 40 mm under a thumb pressure. In normal operation, the lines must not support the weight of the equipment held.
- .3 Tighten bolts to the C-channel with following torque:
 - .1 NS ½: 68 Nm;
 - .2 NS ¾: 169 Nm.
- .4 Install the earthquake-resistant devices and systems to at least 25 mm from any other appliance or utility line.
- .5 Miscellaneous equipments not insulated against vibrations:
 - .1 Bolt the equipment to the assembly base then to the frame using crossing anchor bolts.
- .6 Coordinate the connecting operations with the other building trades.
- .7 Vertical tanks:
 - .1 Anchor the tanks to their assembly base then to the frame using crossing anchor bolts.
 - .2 Lay retaining collars in steel strips above the gravity center.
- .8 Horizontal tanks:
 - .1 Foresee at least two bucking straps, with anchoring bolts fixed to the frame.

- .9 Brace the equipments independently from the ventilation ducts.
- .10 Never use two types of bracing in the same direction.
- .11 Do not stabilize equipments which hanging rods are smaller than 300 mm long.
- .12 Do not install seismic restraint devices at an angle over 60° or under 45° from the horizontal.
- .13 Install transversal seismic restraint devices, square to the direction of the duct or pipe, with a maximum variation angle of 2.5°.
- .14 Install longitudinal seismic restraint devices parallel to the direction of the duct or pipe, with a maximum variation angle of 2.5°.
- .15 Install at least two transversal and one longitudinal seismic restraint device or system on every straight piping segment.
- .16 Install transversal and longitudinal seismic restraint devices at a maximum distance of 100 mm from a vertical support, which must be reinforced as needed.

3.2 MANUFACTURER INSTRUCTIONS

- .1 Comply with manufacturer's requirements, recommendations and written specifications, including any available technical bulletin, as well as with any instructions regarding handling, storage and installations of the products, and indications from the technical sheets.

3.3 ONSITE QUALITY CONTROL

- .1 Once the works achieved, seismic restraint devices must be inspected and certified by an engineer specialized in this field and recognized within the Province of Quebec.
- .2 Provide a written report with the conformity certificate to the Departmental Representative.
- .3 If needed, the Contractor must apply required modifications and settings, according with the report presented by the specialized engineer.

3.4 DOCUMENTS NEEDED FOR STARTING UP

- .1 Once the certification is completed and the report accepted, submit to the Departmental Representative a complete copy of the project record reviewed and annotated in a manner that displays the conditions after execution.

3.5 INSTALLATION FOR PLUMBING PIPING

- .1 Do the installation and design of the earthquake-resistant systems as per the "ASHRAE, A Practical Guide to Seismic Restraint" manual and the ANSI/SMACNA 001-2008 Standard.

- .2 The earthquake-resistant devices and systems must permit the observance of the requirements relating to the anchoring and guiding of pipes.
- .3 Stabilize the piping of NPS 3 and more.
- .4 Stabilize the fuel, NPS 1 and more compressed air running lines.
- .5 Install the devices for mechanical restraint for piping at the following frequency:
 - .1 For the transversal stabilization:
 - .1 NPS 8 and less: 12.2 m.
 - .2 NPS 10 and more: 6.1 m.
 - .3 Reduce by two those lengths in the case of non-ductile or screwed piping.
 - .2 For the longitudinal stabilization:
 - .1 NPS 5 and less: 24.4 m.
 - .2 NPS 6 and NPS 8: 12.2 m.
 - .3 NPS 10 and more: 6.1 m.
 - .4 Reduce by two those lengths in the case of non-ductile or screwed piping.
- .6 In the case of plastic piping, a standard support must be provided, in accordance with manufacturer's recommendations or halfway between joints.
- .7 The transversal seismic restraint system or device of a piping section can also be used as a longitudinal seismic restraint system or device for a piping section of the same dimension installed square to the first section, if the bracings are located within 610 mm from an elbow or a "T" fitting.
- .8 Install seismic separation assemblies wherever piping crosses a seismic separation within the building. Stabilize transversally and longitudinally this assembly within 1.83 m on each side of the separation.
- .9 Stabilize each side of a 90° direction change of cast iron, copper, steel and stainless steel piping.
- .10 Do not stabilize piping hanging by supports located at 300 mm less than of the structure.

3.6 INSTALLATION FOR VENTILATION DUCTS

- .1 Do the installation and design of the seismic restraint systems as per ANSI/SMACNA 001-2008.

- .2 Stabilize the rectangular and oblong ventilation ducts whose surface is 0.55 m² and more and the circular ducts whose diameter is of 700 mm or more.
- .3 A transversal seismic restraint device or system installed to stabilize a duct section can also be used as a longitudinal seismic restraint device or system to stabilize another duct section of same or smaller dimensions, if the two duct sections are mounted square to each other and if the seismic restraint device or system is installed within 610 mm from the intersection.
- .4 A wall (including gypsum wall) can be used as a transversal seismic restraint system, if the duct is solidly attached at its surrounding, to the wall.
- .5 Install the mechanical restraint devices at the follow frequency:
 - .1 For the vertical stabilization:
 - .1 The vertical stabilization is ensured by regular supports.
 - .2 For the transversal stabilization: 9.1 m.
 - .3 For the longitudinal stabilization: 18.3 m.
- .6 Do not stabilize ducts hanged by supports, which are located less than 300 mm below structure. Supports must be mounted on ducts using at least two No.10 metal screws, installed at least 50 mm from the upper side of the duct.

3.7 RIGID RODS AND ATTACHMENT POINTS

- .1 Link the restraint rods to the hanging equipment in a manner that their axial incidence go through the gravity center of the equipment to protect.
- .2 Use rod diameters as needed and in accordance with the requirements of the manufacturer of the seismic supports.
- .3 The vertical, lateral, and longitudinal rods must be installed as per the recommendations of the manufacturer of the supports.

END OF SECTION

PART 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 13-2007, Standard for the Installation of Sprinkler Systems.

1.2 SUBMITTALS

- .1 Product Data.
 - .1 Submittals: In accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Product data to include paint colour chips and other products specified in this section.
- .2 Samples.
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Samples to include nameplates, labels, tags, and lists of proposed legends.

1.3 QUALITY ASSURANCE

- .1 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety:
 - .1 Apply pertinent safety rules 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.

1.5 IDENTIFICATION

- .1 Mechanical and network identification must be in accordance with Client's identification system.

PART 2 - PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

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

2.2 NETWORK NAMEPLATES

- .1 Colours.
 - .1 Hazardous: Red letters, white background.
 - .2 Elsewhere: Black letters, white background (except where required otherwise by applicable code).
- .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 As per 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.

.3 Indicate the number and the type of system as well as the service and the area it serves.

.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 Where existing identification system does not cover for new work, use identification system specified in this section.

- .3 Before starting work, obtain written approval of identification system from Departmental Representative.

2.4 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3, except where specified otherwise.
- .2 Pictograms.
 - .1 In accordance with Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .3 Legend.
 - .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3 and indications here after.

Exterior pipe or insulation diameter	Letters height
(mm)	(mm)
30	13
50	19
150	32
250	63
Larger than 250	88

- .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, and arrows.

- .1 Pipes and tubing 20 mm and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.
- .2 Other pipes: Pressure sensitive plastic-coated cloth or vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150°C and intermittent temperature of 200°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
<i>Add design temperature</i>		
<i>Add design temperature and pressure</i>		
Chilled water supply	Green	CH. WTR. SUPPLY
Chilled water return	Green	CH. WTR. RETURN
Hot water supply	Yellow	HEATING SUPPLY
Hot water return	Yellow	HEATING RETURN
Steam	Yellow	STEAM
Gravity condensate	Yellow	GR. CONDENSATE
Pressure condensate	Yellow	PR. CONDENSATE
Safety valve	Yellow	SAFETY VALVE
Domestic hot water	Green	DOM. HOT WTR
Domestic chilled water	Green	DOM. CH. WTR
Sewage	Green	SEWAGE

Contents	Background colour marking	Legend
<i>Add design temperature</i>		
<i>Add design temperature and pressure</i>		
Storm water	Green	STORM
Sanitary	Green	SAN
Ventilation (sanitary)	Green	VENT. SAN
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration steam return	Yellow	REF. RETURN
Compressed air (<700 kPa)	Green	COMP. AIR ... kPa
Compressed air (>700 kPa)	Yellow	COMP. AIR ... kPa
Water - Fire protection	Red	FIRE
Water - Sprinklers	Red	SPRINKLERS
Air - Process	Green	AIR PROCESS

2.5 IDENTIFICATION DUCTWORK SYSTEMS

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
- .2 Colours: Back, or co-ordinated with base colour to ensure strong contrast.

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 Inscriptions used for system identification must be written in French and English.
- .2 French and English identification must be written on the same identification plate, label, etc.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXECUTION

- .1 Start network and equipment identification work only when painting is done.

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.
- .4 Materials for background color, lettering and arrow markings:
 - .1 Affix the tape to dry and clean surfaces prepared for this purpose. Roll the tape around the pipe with an overlap equivalent to at least one pipe diameter.

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.

- .4 Submit a nameplate list for approval before engraving.
- .5 The following systems are to be identified:
 - .1 Air condensers;
 - .2 Air Handling Units;
 - .3 Fans;
 - .4 Coils;
 - .5 Terminal boxes.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- .1 Affix identification tags on the following pipe and ductwork locations:
 - .1 On long straight runs in open areas, 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, or 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.
 - .10 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.
- .2 Mark the piping with a stencil once the last paint layer has been applied.

3.6 VALVES, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each Operating and Maintenance Manual.
- .3 Number valves in each system consecutively.

3.7 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Division 23 - Heating, Ventilation, and Air-Conditioning (HVAC).
- .2 Division 26 - Electrical.

1.2 SUMMARY

- .1 TAB is used throughout this Section to describe the process, methods, and requirements of testing, adjusting, and balancing for air systems and hydronics systems.
- .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 Departmental Representative 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.
 - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
 - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.
- .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. Provide, if necessary, pulleys and belts to achieve system performance.

1.5 EXCEPTIONS

- .1 TAB of systems and equipment regulated by Codes, and Standards to be executed at satisfaction of authority having jurisdiction.

1.6 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.7 PRE-TAB REVIEW

- .1 Review Contract documents before project construction is started and confirm in writing to Departmental Representative 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 contractual documents.

1.9 OPERATION OF SYSTEMS DURING TAB

- .1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

1.10 START OF TAB

- .1 Notify Departmental Representative 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
 - .1 Installation of ceilings, doors, windows, other construction affecting TAB.
 - .2 Application of weatherstripping, sealing, and caulking.
 - .3 Provisions for TAB installed and operational.
 - .4 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 Duct systems clean.
 - .2 Ducts, air shafts, and ceiling plenums are airtight to within specified tolerances.
 - .3 Outlets installed and volume control dampers open.

1.11 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 Air 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 Departmental Representative 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 Departmental Representative.

1.14 SUBMITTALS

- .1 Submit, prior to commencement of TAB:
 - .1 Proposed methodology and procedures for performing TAB, if different from referenced Standards.

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 six copies of TAB Report to Departmental Representative for verification and approval, in both official languages, in "D-ring" binders, complete with index tabs.

1.17 DATA 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, or ASHRAE.
- .2 Do TAB of systems, equipment, components, and controls specified in contractual documents.
- .3 Qualifications: Personnel performing TAB qualified to Standards of AABC or NEBB.
- .4 Locations of equipment measurements: To include as appropriate:
 - .1 At controllers and controlled devices.

- .5 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, and run-out (grille 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.

PART 2 - PRODUCTS

- .1 Not Used.

PART 3 - EXECUTION

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 23 05 05 - Installation Pipework.
- .2 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipments.

1.2 REFERENCES

- .1 Unless otherwise indicated, all the works must be done in accordance with in force edition of the "Code de construction du Québec".
- .2 Furthermore, the works will be done in accordance with any other code or norm having jurisdiction, as per the latest edition, notably including, but not limited to:
 - .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
 - .1 ASHRAE Standard 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).
 - .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM B209M-04, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.
 - .2 ASTM C335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411-04, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C533-2004, Calcium Silicate Block and Pipe Thermal Insulation.
 - .6 ASTM C547-2003, Mineral Fiber Pipe Insulation.
 - .7 ASTM C795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .8 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

- .3 Manufacturer's Trade Associations.
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).
- .4 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings.
 - .4 CAN/ULC-S702.2-03, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.
- .5 Canadian General Standards Board (CGSB).
 - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts.
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).

1.3 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.

1.4 SUBMITTALS

- .1 Submittals: In accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Assurance.
 - .1 Installer: Specialist in performing work of this Section successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling, and Unloading:
 - .1 Deliver, store, and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store, and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions required by manufacturer.

PART 2 - PRODUCTS

2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335 Standard.
- .2 TIAC Code P-1: Rigid moulded mineral fibre without factory applied vapour retarder jacket.
 - .1 Mineral fibre: To CAN/ULC-S702 and ASTM C547 Standards.
 - .2 Vapour retardant to CGSB 51GP-52Ma Standard.
 - .3 Maximum "k" factor: of 0.033 W/m°C at an average temperature of 24°C.
 - .4 Temperature limits: -29°C to 454°C.

- .3 TIAC Code P-2: mineral fibre blanket faced with factory applied vapour retarder.
 - .1 Mineral fibre: To ASTM C547 and CAN/ULC-S702 Standards.
 - .2 Jacket: to CGSB 51-GP-52Ma Standard.
 - .3 Maximum "k" factor of 0,035 W/m·°C at a mean temperature of 24°C.
 - .4 Temperature limits: 120°C.
 - .5 Density: 24 kg/m³
- .4 TIAC Code P-3: Flexible unicellular tubular elastomer.
 - .1 Insulation to CAN/CGSB-51.40 Standard.
 - .2 Maximum "k" factor of 0,039 W/m·°C at a mean temperature of 24°C
 - .3 Temperature limits: -57°C to 105°C.
 - .4 Certified by manufacturer: Free of potential stress corrosion cracking corrodants.

2.3 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum reinforced, 50 mm wide minimum.
 - .1 Acceptable products: Tape Fattal Insultape made by S. Fattal Canvas Inc.
- .2 Vapour Retarder Lap Adhesive.
 - .1 Water based, fire retardant type, compatible with insulation.
 - .2 Acceptable products: Foster 87-75 without asbestos fiber, with a coverage density of 6 m²/L.
- .3 Indoor Vapour Retarder Finish.
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
 - .2 Acceptable products: Foster 30-36 without asbestos fiber, with a coverage density of 1.25 m²/L.

2.4 JACKETS

- .1 Canvas:
 - .1 ULC homologated cotton with fire resistance of 220 g/m² for exposed elements and 120 g/m² for concealed elements, plain weave, coated with heat insulating glue and flame retardant, diluted according to ASTM C921.
 - .2 Lagging adhesive: Compatible with insulation.

2.5 ACCEPTABLE PRODUCTS

- .1 Specify product or equivalent of Owens Corning, Johns Manville, Knauf, Certain Teed.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PRE-INSTALLATION REQUIREMENT

- .1 Install insulation only after the hydrostatic test of the system (piping and equipment to which it is connected) has been completed and the results certified by the competent authority that attended the test.
- .2 Surfaces clean, dry, and free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and this section.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers and supports outside vapour retarder jacket.

.5 Supports and Hangers:

- .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 PIPING INSULATION SCHEDULES

- .1 Unless otherwise specify, the insulation of the piping include the insulation of the valve, filters, and accessoires
- .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, and fittings.
- .3 Insulate the piping and equipment as indicated in the following table:

	Systems and equipments	Fluid temperature °C	Insulation Type
.1	Potable cold water network	4	P-1
.2	Potable hot water network	60	P-1
.3	Exposed vent pipe on a 5 m length starting from the roof, on main and branch pipe	--	P-1
.4	Hidden vent pipe on a 5 m length starting from the roof, on main and branch pipe, thickness of insulation 25 mm.	--	P-2
.5	Drainage piping of HVAC units and air plenum, thickness of insulation 25 mm.	--	P-1
.6	Humidifier steam supply, drainage, and purge piping	118	P-1
.7	On expansion joint, thickness of insulation 25 mm	--	P-2
.8	Refrigerant piping suction side and liquid side, thickness of insulation 19 mm, both pipes must be insulated independently.	--	P-3

- .4 Thickness of the P-1 insulation type.

FLUID TEMPERATURE °C	NOMINAL DIMENSION OF THE PIPING (NPS)			
	1 and less	1¼ to 2	2½ to 4	5 and more
	Thickness in mm			
151-240	64		76	89
121-150	51	64		76
96-120	38		51	

FLUID TEMPERATURE °C	NOMINAL DIMENSION OF THE PIPING (NPS)			
	1 and less	1¼ to 2	2½ to 4	5 and more
	Thickness in mm			
50-95	25		38	
14-49	25		38	
5-13	25	38		
Less than 5	25	38		

3.5 FINISHES

- .1 Exposed Indoors: Canvas jacket.
- .2 Concealed, indoors: Canvas on valves and fittings. No further finish.
- .3 Installation: To appropriate TIAC.

3.6 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 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.

1.2 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.
 - .2 Indicate following:
 - .1 Capacity;
 - .2 Throw and terminal velocity;
 - .3 Noise criteria;
 - .4 Pressure drop;
 - .5 Neck velocity.
- .2 Quality Assurance: Submit the following in accordance with section 01 33 00 - Submittal Procedures.
 - .1 Certificate: Submit catalogued or published ratings obtained from tests carried out by the manufacturer or those ordered by the manufacturer from an independent testing agency demonstrating adherence to codes and standards.
 - .2 Instructions: Submit manufacturer's installation instructions:

1.3 QUALITY ASSURANCE

- .1 Health and Safety: Apply pertinent measures in accordance to 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.

1.5 MAINTENANCE

- .1 Extra Materials.
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Include:
 - .1 Keys for volume control adjustment.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Standard products meeting requirements regarding following items: air flow, pressure loss, air terminal velocity, range, noise level and velocity at maximum narrowing point (clamp).
- .2 Casing.
 - .1 Aluminum casing: Extruded aluminum, satin finish, with mechanical fasteners and miter joints at the angles.
 - .2 Sealing trim surrounding casing.
 - .3 Assembling frame, coated for casing mounted within coated wall or partition, or made from plaster plates.
 - .4 Hidden attach system.
- .3 Acceptable Products: E.H. Price; Titus; Nailor.
- .4 Characteristics: See note on drawing.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install in accordance with manufacturers instructions.
- .2 Install with flat head cadmium plated screws in countersunk holes, where fastenings are visible.
- .3 Install balancing dampers with each grid and diffuser.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Materials and installation for self-contained single zone, electric heat, mixing section, variable air volume supply and direct expansion cooling/heating section.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Air Conditioning and Refrigeration Institute (ARI).
 - .1 ANSI/ARI 210/240-08, Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
 - .2 ARI 270-08, Sound Rating of Outdoor Unitary Equipment.
- .2 CSA Group.
 - .1 CSA B149-05 - Natural Gas Code.
 - .2 CSA C22.1-F12, Canadian Electric Code, Part 1 (22nd Edition), Safety Standard for Electric Installations.
- .3 National Fire Protection Association.
 - .1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems.

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 datasheet for packaged rooftop HVAC units.
- .3 Shop Drawings:
 - .1 Submit shop drawings to indicate project layout and dimensions; indicate:
 - .1 Equipment, piping, and connections, together with valves, strainers, control assemblies, thermostatic controls, auxiliaries and hardware, and recommended ancillaries which are mounted, wired and piped ready for final

- connection to building system, its size and recommended bypass connections.
 - .2 Piping, valves, and fitting shipped loose showing final location in assembly.
 - .3 Control equipment shipped loose showing final location in assembly.
 - .4 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, mounting curb details, sizes and location of mounting bolt holes; include mass distribution drawings showing point loads.
 - .5 Detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices of ancillaries, accessories, and controllers.
 - .6 Fan performance curves.
 - .7 Details of vibration isolation.
 - .8 Estimate of sound levels to be expected across individual octave bands in dB referred to A rating.
- .4 Test Reports: Submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .5 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Instructions: Submit manufacturer's installation instructions.
- .7 Manufacturer's Field Reports: Manufacturer's field reports specified.
- .8 Closeout submittals: Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include data as follows:
- .1 Indicate: Brief description of unit, indexed, with details of function, operation, control, and service for components.
 - .2 Manufacturer's name, type, year, number of units, and capacity.

1.4 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 packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
 - .4 Handle and dispose of hazardous materials in accordance with Canadian Environmental Act and Regional and Municipal regulations.
 - .5 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Roof mounted, self-contained single zone unit with direct expansion cooling/heating section, electric heating coil, and bear label of CSA and ULC.
- .2 Units to consist of cabinet and frame, supply fan, constant volume supply for UTA-01, air filter, heating/gas burner and motorized outside air damper.
- .3 Prefabricated roof curb 450 mm complying with requirements of National Roofing Contractors Association (NRCA).

2.2 UNIT CASING

- .1 Unit Casing: Weatherproofing tested and certified to AGA rain test standards and soundproofing tested in dBA to AHRI 270.
- .2 Framing and Supports: 2 mm thick welded steel, galvanized after manufacture, with lifting lugs at top of unit.
- .3 Outer Casing: Weathertight 1.0 mm thick galvanized steel with baked enamel finish, complete with flashing.
- .4 Access: Gasketed hinged doors with locking door handle types.
- .5 Insulation: Neoprene coated glass fibre 50 mm thick, 32 kg/m³ density.

2.3 FANS

- .1 Centrifugal plenum type, forward curved impellers, statically and dynamically balanced. direct drive.

2.4 AIR FILTER(S)

- .1 50 mm thick, minimum efficiency MERV 11, throwaway.
- .2 To meet NFPA 90A, air filter requirements type Class 1.

2.5 HEATING GAS BURNER

- .1 Gas burner, 1:31 modulation.

2.6 CHARACTERISTICS

- .1 According to unit schedule.
- .2 Acceptables Products: Bousquet; Engineered-Air; Rosemex.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install as per manufacturer's instructions on roof curbs provided by manufacturer.
- .2 Manufacturer to certify installation, supervise start-up and commissioning of unit.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its product, and submit written reports, in acceptable format, to verify compliance of work with Contract.

- .2 Provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
- .3 Schedule site visits to review work at stages listed:
 - .1 Upon completion of work, after cleaning is carried out.
- .2 Obtain reports within 3 days of review and submit immediately to Departmental Representative.

3.4 CLEANING AND PERFORMANCE VERIFICATION

- .1 General:
 - .1 Verify that motorized dampers, filters, A batteries, fans, motors, actuators, sensors, and switches are accessible for maintenance.
 - .2 Performance Verification:
 - .1 Rooftop Air Handling Units:
 - .1 Set zone mixing dampers for full cooling, except that where diversity factor forms part of design set that % of zone dampers to full heating.
 - .2 Set outside air and return air dampers for minimum outside air.
 - .3 Set face and bypass dampers so face dampers are fully open and bypass dampers are fully closed.
 - .4 Check for smooth, vibration less correct rotation of supply fan impeller.
 - .5 Measure supply fan capacity.
 - .6 Adjust impeller speed as necessary and repeat measurement of fan capacity.
 - .7 Measure pressure drop each component of air handling unit.
 - .8 Set outside air and return air dampers for the % of outside air required by design and repeat measurements of fan capacity.
 - .9 Reduce differences between fan capacity at minimum and maximum outside air less than 5%.

- .10 Set face and bypass dampers to full bypass and repeat measurement of fan capacity.
- .11 OAD: Verify for proper stroking, interlock with RAD.
- .12 Measure DBT, WBT of SA, RA, EA.
- .13 Measure flow rates (minimum and maximum) of SA, RA, EA, relief air.
- .14 Use smoke test to verify no short-circuiting of EA, relief air to outside air intake or to condenser intake.
- .15 Measure radiated and discharge sound power levels under maximum heating demand and under maximum cooling demand with compressors running.
- .16 Verify operating control strategies, including:
 - .1 Freeze protection.
 - .2 Economizer cycle operation; temperature of change-over.
 - .3 Alarms.
- .17 Set zone mixing dampers for full heating and repeat measurements.
- .18 Measure return fan capacity.
- .19 Adjust impeller speed as necessary and repeat measurement of return fan capacity.
- .20 Check capacity of heating unit.
- .21 Refer to other sections of these specifications for PV procedures for other components.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 25 90 01 - EMCS: Site Requirements Applications and Systems Sequences of Operation.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/The Instrumentation, Systems and Automation Society (ISA).
 - .1 ANSI/ISA 5.5, Graphic Symbols for Process Displays.
- .2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE).
 - .1 ANSI/IEEE 260.1, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).
- .3 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).
 - .1 ASHRAE STD 135, BACNET - Data Communication Protocol for Building Automation and Control Network.
- .4 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-Z234.1-FM89(C1995), Canadian Metric Practice Guide.
- .5 Consumer Electronics Association (CEA).
 - .1 CEA-709.1, Control Network Protocol Specification.
- .6 Health Canada - Workplace Hazardous Materials Informations System (WHMIS).
 - .1 Data Sheet (DS).
- .7 Transport Canada (TC).
 - .1 Transportation of Dangerous Good Act, c. 34

1.3 CONTRACTOR

- .1 The EMCS Contractor and related experience in the installation of digital control systems. Three existing system is Delta Controls. Connect the new control points to the existing system. Supply new input-output modules as required.
- .2 Only the following contractors are allowed to submit a quote:
 - .1 Original equipment manufacturers or authorized distributors carrying the complete line of equipments required to do the job.
 - .2 Who have as main activity the installation and commissioning of numerical control systems.
 - .3 Who have qualified technicians able to answer to a service call 24 hours a day, 365 days a year.

1.4 COMMISSIONING

- .1 Confirm with the Departmental Representative that Design Criteria and Design Intents are still applicable.
- .2 Do commissioning under the Departmental Representative's supervision.
 - .1 Inform the Departmental Representative in writing, at least 5 days before the start of commissioning or before each test, in order to get the approval.
- .3 Test each system independently and then in unison with other related systems.
- .4 Correct deficiencies, re-test in until satisfactory performance is obtained.
- .5 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.
- .6 Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intents.
- .7 Demonstrate to the Departmental Representative the operation of the systems, including control sequences in normal and emergency mode, and in normal and emergency modes, the start/stop, interlocks, and safeties resulting in system stops.
- .8 Provide a written commissioning report stating that each system operates as per Design Criteria.

1.5 SUBMITTALS

- .1 Submit for review:
 - .1 Equipment list and systems manufacturers.
 - .2 Controls schematics, materials lists, sequences of operation, and points lists.
- .2 Quality Control:
 - .1 Use equipment and apparatuses from manufacturer's regular production, CSA certified, manufactured to Standards quoted plus additional specified requirements.
 - .2 Where CSA certified equipment is not available, submit such equipment to inspection authorities for special inspection and approval before delivery to site.
 - .3 Submit proof of compliance to specified standards with shop drawings and product data. Label or listing of specified organization is acceptable evidence.
 - .4 In lieu of such evidence, submit certificate from testing organization, approved by Departmental Representative, certifying that item was tested in accordance with their test methods and that item conforms to their Standard/Code.
 - .5 For materials whose compliance with organizational standards/ codes/specifications is not regulated by organization using its own listing or label as proof of compliance, furnish certificate stating that material complies with applicable referenced standard or specification.
 - .6 Permits and fees: in accordance with general conditions of Contract.
 - .7 Submit an acceptance certificate provided by the competent authority to the Departmental Representative.
 - .8 Existing devices intended for re-use: Submit test report.

1.6 QUALITY ASSURANCE

- .1 Have access to local supplies of essential parts and provide 7-year guarantee of availability of spare parts after obsolescence.
- .2 Ensure qualified supervisory personnel continuously direct and monitor Work and attend site meetings.

1.7 IDENTIFICATIONS

- .1 Nameplates for panels:
 - .1 Identify by plastic laminate, 3 mm thick, matt white finish, black core, square corners, lettering accurately aligned, and engraved into core.
 - .2 Sizes: 25 x 67 mm minimum.
 - .3 Lettering: minimum 7 mm high, black.
 - .4 Inscriptions: Machine engraved to identify function.
- .2 Nameplates for field devices:
 - .1 Identify by plastic encased cards attached by chain or plastic tie.
 - .2 Sizes: 50 x 100 mm minimum.
 - .3 Lettering: Minimum 5 mm high, black, engraved and indelible.
 - .4 Companion cabinet: identify interior components using plastic enclosed cards with point name and point address.
 - .5 Data to include: point name and point address.
- .3 Conduits identification:
 - .1 All conduits, junction boxes and connections of the EMCS must be identified with a orange color paint or tag.
- .4 Existing panels:
 - .1 Correct existing identifications to show the changes made to the systems.

1.8 WARRANTY

- .1 All the softwares, equipment, and systems provided must be warranted against defects for one year from date of acceptance of the project.
- .2 Provide services, materials, and equipment to maintain EMCS for specified warranty period. Provide detailed preventative maintenance schedule for system components as described in Submittal article.
- .3 Emergency Service Calls:
 - .1 Initiate service calls when EMCS is not functioning correctly.

- .2 Qualified control personnel to be available during warranty period to provide service to "CRITICAL" components whenever required at no extra cost.
- .3 Perform work continuously until EMCS restored to reliable operating condition.
- .4 Work Requests: Record each service call request, when received separately on approved form and include:
 - .1 Location, date, and time call received.
 - .2 Nature of trouble.
 - .3 Names of personnel assigned.
 - .4 Amount and nature of materials used.
 - .5 Time and date work start and completion.

1.9 O & M MANUALS

- .1 Custom design O&M Manuals (both hard and soft copy) to contain material pertinent to this project only, and to provide full and complete coverage of subjects referred to in this Section.
- .2 Include complete coverage in concise language, readily understood by operating personnel using common terminology of functional and operational requirements of system. Do not presume knowledge of computers, electronics, or in-depth control theory.
- .3 The manuals must include:
 - .1 Controls schematics, including the existing equipments related to modified systems.
 - .2 Bills of material and points lists.
 - .3 Control sequences.
 - .4 Operation and Maintenance Manuals.
 - .5 Specific procedures: Restarting, alarms reception, printing, etc.
 - .6 Informations related to licences: Version, certificates, update procedures.

1.10 INTEGRATION OF DOCUMENTS TO THE WORKSTATIONS

- .1 All the information related in the system must be provided in electronic format and integrated by the supplier to the central station and the workstations. This information must include:
 - .1 Complete software used to create the datas;

- .2 Updated backup copy of the database;
- .3 Systems operation manuals;
- .4 Spec sheets of the material;
- .5 Control schematics in a format that can be viewed by the operator;
- .6 Project drawings in PDF format.

1.11 WORK IN EXISTING INSTALLATIONS

- .1 If the work is to be done in existing building, integrate the controls modifications to the Departmental Representative's documents, electronic and paper documents, in order to keep an up-to-date version.
- .2 Incorporate to the documents all the modifications to the control systems, while keeping the informations relative to the existing equipments.

1.12 EXISTING CONTROL EQUIPMENT

- .1 Collect the existing control elements that will not be reused. Store them in an approved storage area, in order to dispose of them following instructions.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- .1 Control network protocol and data communication protocol compliant with ASHRAE STD 135.
- .2 Complete list of equipment and materials to be used on project and forming part of tender documents by adding manufacturer's name, model number and details of materials, and submit for approval.

PART 3 - EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS

- .1 Installation: To manufacturer's recommendations.

3.2 PAINTING

- .1 Perform painting in accordance with the following requirements:
 - .1 Clean and retouch the surfaces that were scratched so that they have the same original finish.
 - .2 Where retouches are not sufficient, a complete reconditioning (primer coat and finishing coat) of the damaged surfaces is required.
 - .3 Clean and use a primer coating on visible elements like supports, equipment frames, and any other fixing devices.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 American National Standards Institute (ANSI).
 - .1 ANSI C2, National Electrical Safety Code.
- .2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .3 Canadian Standards Association (CSA)/CSA International.
 - .1 CSA C22.1-09, Canadian Electrical Code, Part 1.
 - .2 CSA C22.2-09, Canadian Electrical Code, Part 2.
 - .3 CSA 22.2 n° 45, Rigid Steel Conduits.

1.2 SYSTEM DESCRIPTION

- .1 Electrical:
 - .1 Contractor to provide power wiring from existing power and emergency panels to EMCS field panels. Circuits to be for exclusive use of EMCS equipment. Panel breakers to be identified on panel legends tagged and locks applied to breaker switches.
 - .2 Hard wiring between field control devices and EMCS field panels.
 - .3 Communication wiring between EMCS field panels and OWS, including main control centre.
 - .4 Modify existing starters to provide for EMCS as indicated in I/O Summaries and as indicated.
 - .5 Refer to wiring diagrams included as part of flow diagrams. Trace existing control wiring installation and provide updated wiring schematics including additions and/or deletions to control circuits for approval by Departmental Representative before commencing work.

1.3 PERSONNEL QUALIFICATIONS

- .1 Qualified supervisory personnel to:
 - .1 Continuously direct and monitor all work.
 - .2 Attend site meetings.

1.4 EXISTING CONDITIONS

- .1 Repair all surfaces damaged during execution of work.
- .2 Turn over to Departmental Representative existing materials removed from work not identified for re-use.

PART 2 - PRODUCTS

2.1 SPECIAL SUPPORTS

- .1 Structural grade steel, primed and painted after construction, but before installation.

2.2 WIRING

- .1 As per requirements of Division 26 - Electricity.
- .2 For 70 V and above copper conductor with chemically cross-linked thermosetting polyethylene insulation rated RW90 and 600 V. Colour code to CSA 22.1.
- .3 For wiring under 70 V, use FT6 is not routed in conduit, use FT4 rated wiring in any other cases.
- .4 Sizes:
 - .1 120V power supply: To match or exceed breaker, size #12 minimum.
 - .2 Wiring for safeties/interlocks for starters, motor control centres, to be stranded, #14 minimum.
 - .3 Field wiring to digital device: At least 20AWG stranded twisted pair, and as per application.
 - .4 Analog input and output: Shielded #20 minimum stranded twisted pair. Wiring must be continuous without joints.

- .5 Terminations:
 - .1 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

2.3 CONDUIT

- .1 As per requirements of Division 26 - Electricity.
- .2 Conduits must have a minimum of 20 mm diameter.
- .3 Electrical metallic tubing to CSA C22.2. Flexible and liquid tight flexible metal conduit to CSA C22.2. Rigid steel threaded conduit to CSA C22.2 45.
- .4 Junction and pull boxes: Welded steel.
 - .1 Surface mounting cast FS: Screw-on flat covers.
 - .2 Flush mounting: Covers with 25 mm minimum extension all round.
- .5 Cabinets: Sheet steel, for surface mounting, with hinged door, latch lock, 2 keys, complete with perforated metal mounting backboard. Panels to be keyed alike for similar functions and or entire contract as approved.
- .6 Outlet boxes: 100 mm minimum, square.
- .7 Conduit boxes, fittings:
 - .1 Bushings and connectors: With nylon insulated throats.
 - .2 With push pennies to prevent entry of foreign materials.
- .8 Fittings for rigid conduit:
 - .1 Couplings and fittings: Threaded type steel.
 - .2 Double locknuts and insulated bushings: Use on sheet metal boxes.
 - .3 Use factory "ells" where 90 degree bends required for 25 mm and larger conduits.
- .9 Fittings for thin wall conduit:
 - .1 Connectors and couplings: Steel, set screw type.

2.4 WIRING DEVICES, COVER PLATES

- .1 Complying with CSA.

- .2 Receptacles:
 - .1 Duplex: CSA type 5-15R.
 - .2 Single: CSA type 5-15R.
 - .3 Cover plates and blank plates: Finish to match other plates in area.

2.5 SUPPORTS FOR CONDUIT, FASTENINGS, EQUIPMENT

- .1 Solid masonry, tile and, plastic surfaces: Lead anchors or nylon shields.
 - .1 Hollow masonry walls, suspended drywall ceilings: Toggle bolts.
- .2 Exposed conduits or cables:
 - .1 50 mm diameter and smaller: one-hole steel straps.
 - .2 Larger than 50 mm diameter: two-hole steel straps.
- .3 Suspended support systems:
 - .1 Individual cable or conduit runs: Support with 6 mm diameter threaded rods and support clips.
 - .2 Two or more suspended cables or conduits: Support channels supported by 6 mm diameter threaded rod hangers.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install equipment and components so that manufacturer's and CSA labels are visible and legible after commissioning is completed.
- .2 Conduits for wiring.
 - .1 All wiring must be installed in EMT conduits:
 - .1 In exposed areas, mechanical and electrical rooms.
 - .2 In gypsum ceilings and other non accessible ceilings.
 - .3 Masonry walls.

- .2 In suspended ceilings, protected wires can be installed without conduit if they are properly affixed to the structure.
- .3 Use rigid conduits and weatherproof joints for conduits installed outside the building.

3.2 SUPPORTS

- .1 Install special supports as required, as indicated.

3.3 ELECTRICAL GENERAL

- .1 Do complete installation in accordance with requirements of:
 - .1 Division 26 - Electricity and this specification.
 - .2 CSA 22.1 Canadian Electrical Code.
 - .3 ANSI/NFPA 70.
 - .4 ANSI C2.
- .2 Fully enclose or properly guard electrical wiring, terminal blocks, high voltage above 70 V contacts and mark to prevent accidental injury.
- .3 Do underground installation to CAN/CSA C22.3 No. 7, except where otherwise specified.
- .4 Complying with manufacturer's recommendations for storage, handling, and installation.
- .5 Check factory connections and joints. Tighten where necessary to ensure continuity.
- .6 Install electrical equipment between 1,000 and 2,000 mm above finished floor wherever possible and adjacent to related equipment.
- .7 Protect exposed live equipment such as panel, mains, outlet wiring during construction for personnel safety.
- .8 Shield and mark live parts "LIVE 120 VOLTS" or other appropriate voltage.
- .9 Install conduits, and sleeves prior to pouring of concrete.
- .10 Holes through exterior wall and roofs: Flash and make weatherproof.
- .11 Make necessary arrangements for cutting of chases, drilling holes, and other structural work required to install electrical conduit, cable, pull boxes, outlet boxes.
- .12 Install cables, conduits and fittings which are to be embedded or plastered over, neatly and closely to building structure to minimize furring.

3.4 CONDUIT SYSTEM

- .1 Install telecommunication cables in conduits.
- .2 Communication wiring shall be installed in conduit. Provide complete conduit system to link Building Controllers to BECC. Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems. Maximum conduit fill not to exceed 40%. Design drawings do not show conduit layout.
- .3 Install conduits parallel or perpendicular to building lines, to conserve headroom and to minimize interference.
- .4 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Obtain approval from Departmental Representative before starting such work. Provide complete conduit system to link field panels and devices with main control centre. Conduit size to match conductors plus future expansion capabilities as specified in specs.
- .5 Locate conduits at least 150 mm from parallel steam or hot water pipes and at least 50 mm at crossovers.
- .6 Bend conduit so that diameter is reduced by less than 1/10th original diameter.
- .7 Field thread on rigid conduit to be of sufficient length to draw conduits uptight.
- .8 Limit conduit length between pull boxes to less than 30 m.
- .9 Use conduit outlet boxes for conduit up to 32 mm diameter and pull boxes for larger sizes.
- .10 Use flexible conduits to make the transition between control elements and the EMT conduits. Flexible conduits must not exceed 500 mm in length.
- .11 Fastenings and supports for conduits, cables, and apparatuses:
 - .1 Provide metal brackets, frames, hangers, clamps and related types of support structures as indicated, and as required to support cable and conduit runs.
 - .2 Provide adequate support for raceways and cables, sloped vertically to equipment.
 - .3 Use supports or equipment installed by other trades for conduit, cable, and raceway supports only after written approval from Departmental Representative.
- .12 Install polypropylene fish cord in empty conduits for future use.
- .13 Where conduits become blocked, remove and replace blocked sections.
- .14 Pass conduits through structural members only after receipt of Departmental Representative written approval.

- .15 Conduits may be run in flanged portion of structural steel.
- .16 Group conduits wherever possible on suspended or surface channels.
- .17 Pull boxes:
 - .1 Install in inconspicuous, but accessible locations.
 - .2 Support boxes independently of connecting conduits.
 - .3 Fill boxes with paper or foam to prevent entry of construction material.
 - .4 Provide correct size of openings. Reducing washers not permitted.
 - .5 Mark location of pull boxes on record drawings.
 - .6 Identify AC power junction boxes, by panel and circuit breaker.
- .18 Install terminal blocks or strips indicated in cabinets to Division 26 - Electricity
- .19 Install bonding conductor for 120 V and above in conduit.

3.5 WIRING

- .1 Install multiple wiring in ducts simultaneously.
- .2 Do not pull spliced wiring inside conduits or ducts.
- .3 Use CSA certified lubricants of type compatible with insulation to reduce pulling tension.
- .4 Tests: Use only qualified personnel. Demonstrate that:
 - .1 Circuits are continuous, free from shorts, unspecified grounds.
 - .2 Resistance to ground of all circuits is greater than 50 Megohms.
- .5 Provide Departmental Representative with test results showing locations, circuits, and results of tests.
- .6 Remove insulation carefully from ends of conductors and install to manufacturer's recommendations. Accommodate all strands in lugs. Where insulation is stripped in excess, neatly tape so that only lug remains exposed.
- .7 Wiring in main junction boxes and pull boxes to terminate on terminal blocks only, clearly and permanently identified. Junctions or splices not permitted for sensing or control signal covering wiring.
- .8 Do not allow wiring to come into direct physical contact with compression screw.

- .9 Install all strands of conductor in lugs of components. Strip insulation only to extent necessary for installation.

3.6 WIRING DEVICES, COVER PLATES

- .1 Receptacles:
 - .1 Install vertically in gang type outlet box when more than one receptacle is required in one location.
- .2 Cover plates:
 - .1 Install suitable common cover plate where wiring devices are grouped.
 - .2 Use flush type cover plates only on flush type outlet boxes.

3.7 GROUNDING

- .1 Install complete, permanent, continuous grounding system for equipment, including conductors, connectors, and accessories.
- .2 Install separate grounding conductors in conduit within building.
- .3 Install ground wire in all PVC ducts and in tunnel conduit systems.
- .4 Tests: Perform ground continuity and resistance tests, using approved method appropriate to site conditions.

3.8 TESTS

- .1 Perform following tests:
 - .1 Preliminary tests:
 - .1 Conduct as directed to verify compliance with specified requirements.
 - .2 Make needed changes, adjustments, and replacements.
 - .3 Insulation resistance tests:
 - .1 Measure all circuits, feeders, equipment for 120 - 600 V with 1,000 V instrument. Resistance to ground to be more than required by Code before energizing.

- .2 Test insulation between conductors and ground, efficiency of grounding system to satisfaction of Departmental Representative and authority having jurisdiction.
- .2 Give 14 days written notice of intention to test.
- .3 Conduct in presence of Departmental Representative and authority having jurisdiction.
- .4 Conceal work only after tests satisfactorily completed.
- .5 Report results of tests to Departmental Representative in writing.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 25 01 01 - EMCS: General Requirements.
- .2 Section 25 05 60 - EMCS: Field Installation.
- .3 Section 25 90 01 - EMCS: Site Requirements Applications and Systems Sequences of Operation.
- .4 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Air Movement and Control Association, Inc. (AMCA).
 - .1 AMCA Standard 500D, Laboratory Method of Testing Dampers for Rating.
- .2 American National Standards Institute (ANSI).
 - .1 ANSI C12.7, Requirements for Watthour Meter Sockets.
 - .2 ANSI/IEEE C57.13, Standard Requirements for Instrument Transformers.
- .3 American Society for Testing and Materials International (ASTM).
 - .1 ASTM B148, Standard Specification for Aluminum-Bronze Sand Castings.
- .4 Canadian Standards Association (CSA).
 - .1 CSA-C22.1SB, Canadian Electrical Code, Part 1 (19th Edition) Safety Standard for Electrical Installations.
- .5 National Electrical Manufacturer's Association (NEMA).
 - .1 NEMA 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).

1.3 DEFINITIONS

- .1 Acronyms and Definitions: Refer to Section 25 01 01.

1.4 SUBMITTALS

- .1 Submit shop drawings and manufacturer's installation instructions in accordance with Section 25 01 01.
- .2 Testing prior to installation:
 - .1 Submit samples taken at random from equipment delivered, as required by the Departmental Representative, to be tested prior to commencement of installation. Replace appliances or components whose performance and accuracy do not meet the prescribed requirements.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions for specified equipment and devices.

1.5 EXISTING CONDITIONS

- .1 If needed, repair surfaces that were damaged during work execution.
- .2 Hand over to the Departmental Representative all removed material that cannot be reused.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Control devices of each category to be of same type and manufacturer.
- .2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, vibration-proof assembly.
- .3 Operating Conditions: 0 - 32°C with 10 - 90% relative humidity (RH) (non-condensing), unless otherwise specified.
- .4 Terminations: Use standard conduit box with slot screwdriver compression connector block, unless otherwise specified.
- .5 Transmitters and sensors to be unaffected by external transmitters including walkie-talkies.
- .6 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.
- .7 Outdoor Installations: Use weatherproof construction in NEMA 4 enclosures.
- .8 Installed measuring instruments ranges must be such that normal reading should be between the first third and second third of the total measuring range of the instrument.

- .9 Devices installed in user occupied space not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

2.2 TEMPERATURE SENSORS

- .1 General - except in the case of ambient temperature sensors, the sensors type must be of the resistance or thermistance and have the following characteristics.
 - .1 Resistance: platinum, valued at 100 or 1,000 ohms at 0°C (± 0.2 ohms) and designed to help minimize the effect of constraints, including three conductor wiring integrated with a coefficient of resistivity of 0.00385 ohm / ohm °C.
 - .2 Sensing Element: Fully sealed.
 - .3 Rod and tip: copper or stainless steel grade 304.
 - .4 Response time: Less than three seconds for a temperature variation of 10°C.
- .2 Air Duct Temperature Sensors:
 - .1 General purpose air duct type: Suitable for insertion into air ducts at various orientations.
 - .2 Averaging air duct type: Incorporates numerous sensors inside assembly which are averaged to provide one reading. Minimum insertion length 6,000 mm. Bend probe at field installation time to 100 mm radius at point along probe without degradation of performance.

2.3 ELECTROMECHANICAL RELAYS

- .1 Characteristics:
 - .1 Dual-voltage relays, inverters, bipolar, plug-in, with connection base.
 - .2 Coils suitable for rated voltage of 120 VAC or 24 VDC (provide transformer for other voltages).
 - .3 Contacts suitable for a current with a current of 5 A at a voltage of 120 VAC.
 - .4 Status light.

2.4 CURRENT TRANSDUCER

- .1 Requirements:
 - .1 Purpose: combined sensor/transducer, to measure line current and produce proportional signal in one of following ranges:
 - .1 4-20 mA DC.
 - .2 0-1 volt DC.
 - .3 0-10 volts DC.
 - .4 0-20 volts DC.
 - .2 Frequency insensitive from 10 - 80 Hz.
 - .3 Accuracy to 0.5% full scale.
 - .4 Zero and span adjustments. Field adjustable range to suit motor applications.
 - .5 Adjustable mounting bracket to allow for secure/safe mounting inside MCC.
- .2 Adjust detectors to detect a belt loss (fan application for exemple).
- .3 Acceptable products: Veris H923; Greystone SC-550.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.
- .2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.
- .3 Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, controllers, relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in cases when dissimilar metals make contact.
- .4 Support field-mounted panels, transmitters and sensors on pipe stands or channel brackets.
- .5 Electrical system:
 - .1 Complete installation in accordance with Section 26 05 00.

- .2 Modify existing starters to provide for EMCS as indicated in I/O Summaries and as indicated.
- .3 Refer to electrical control schematics included as part of control design schematics on drawings mentioned in section 25 90 01 EMCS: Site Requirements, Applications and Systems Sequences of Operation. Trace existing control wiring installation and provide updated wiring schematics including additions, deletions to control circuits for review by the Departmental Representative before beginning Work.
- .4 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.
- .5 Install communication wiring in conduit.
 - .1 Provide complete conduit system to link Building Controllers, field panels and OWS(s).
 - .2 Conduct sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.
 - .3 Conduct filling should not exceed 40% of their capacity.
 - .4 Design drawings do not show conduit layout.
- .6 Do not run exposed conduits in normally occupied spaces, unless otherwise indicated or unless impossible to do otherwise. Departmental Representative review before beginning work. Wiring in mechanical rooms, wiring in service rooms and exposed wiring must be in conduit.

3.2 TEMPERATURE SENSORS

- .1 Install to ensure minimum field adjustments or calibrations.
- .2 Readily accessible and adaptable to each type of application to allow for quick easy replacement and servicing without special tools or skills.
- .3 Duct Installations:
 - .1 Do not mount in dead air space.
 - .2 Locate within sensor vibration and velocity limits.
 - .3 Securely mount extended surface sensor.
 - .4 Thermally isolate elements from brackets and supports to respond to air temperature only.

- .5 Support sensor element separately from coils and filter racks.

3.3 IDENTIFICATION

- .1 Identify field devices in accordance with Section 25 01 01.

3.4 TESTING AND COMMISSIONING

- .1 Calibrate and test field devices for accuracy and performance in accordance with Section 25 01 01.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

- .1 Following sequences apply for all the mechanical systems, when it is necessary.
- .2 When there is an input of information for proof of operation, a total of hours of operation of mechanical equipments (compressors, water tower, ventilators, pumps, air conditioning devices, etc.) will automatically be made, complete with operator control resetting.
- .3 Program alarms for all the following situations:
 - .1 Discrepancy between command and state signals.
 - .2 System temperature at more than 2°C from the setpoint for longer than 30 minutes.
- .4 The following sequences must be read together with drawings and list of points. Supply all the control points necessary for the control sequences performing, listed or implicit.
- .5 Program trend log points for all the input and output analog points and variables that change in the time.

1.2 SYSTEM UCV-A43 (EXISTING AND REPLACED)

- .1 Controls sequence.
 - .1 The control system starts the ventilation system in occupied mode.
 - .2 100% gaz heated ventilation system is controlled by its own controls to maintain supply air temperature.
 - .3 Install the remote control panel and connect all required wires. Assist the manufacturer for the start-up.
- .2 Alarms.
 - .1 Supply air temperature too high or too low.
 - .2 System fault.

PART 2 - PRODUCTS

- .1 Not Used.

PART 3 - EXECUTION

.1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA C22.10-10, Canadian Electrical Code, Part 1 (21st Edition) and modifications of Quebec.
 - .2 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 for control items in English and French.
- .4 Use one nameplate for both languages.

1.4 ACTION AND INFORMATIONAL 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 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 or material is not available, submit such equipment or material to authority having jurisdiction for 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 certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .4 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.

- .3 Site Meetings:
 - .1 In accordance with 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, 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/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.7 DEMOLITION

- .1 Remove all existing electrical equipment as indicated. Equipment shall be removed at the appropriate time.
- .2 All existing equipment to remove:
 - .1 Shall be removed with all wiring and mounting accessories from its supply point to its point of use;
 - .2 Becomes the property of the Contractor who shall dispose it promptly.

1.8 SYSTEM START-UP

- .1 Instruct 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 with aspects of its care and operation.

1.9 OPERATING INSTRUCTIONS

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment;
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures;
 - .3 Safety precautions;
 - .4 Procedures to be followed in event of equipment failure;
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.10 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

PART 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 or equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory assembled control panels and component assemblies.

2.2 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.
- .2 All wire lugs shall be "compression" type to the appropriate size.

2.3 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates:
 - .1 Lamicoid 3 mm thick plastic engraving sheet, with melamine, black face, white core, lettering accurately aligned and engraved into core, mechanically attached with self-tapping screws.
 - .1 For devices connected to emergency network, plates shall be red with white letterings.

NAMEPLATE SIZE

Format	Dimensions (mm)	Number of Lines	Letter Height (mm)
1	10 mm x 50 mm	1	3 mm
2	12 mm x 70 mm	1	5 mm
3	12 mm x 70 mm	2	3 mm
4	20 mm x 90 mm	1	8 mm
5	20 mm x 90 mm	2	5 mm
6	25 mm x 100 mm	1	12 mm
7	25 mm x 100 mm	2	6 mm

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .2 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .3 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .4 Wording to be in French and in English.
- .5 Disconnects, Starters, and Contactors: indicate equipment being controlled and voltage.
- .6 Terminal, Cabinets, and Pull Boxes: indicate system and voltage.
- .7 Transformers: indicate capacity, primary, and secondary voltages.
- .8 Receptacles and switches to be identified with self-adhesive plastic labels (Brother "P-Touch"), black lettering on white background, indicating panelboard name, and circuit number.

2.4 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered 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.

2.5 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime Colour	Auxiliary Colour
Up to 250 V	Yellow	
Up to 600 V	Yellow	Green
Up to 5 kV	Yellow	Blue
Up to 25 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue

	Prime Colour	Auxiliary Colour
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow
Control	Orange	

2.6 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

2.7 FIRE-PROOFING

- .1 When conduits or cables cross fire-rated walls or slabs, ensure fire and smoke tightness by using approved products. Installation shall be executed according to CAN/CGSB 19.13-M87 Standard and to manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 Install cables, conduits, and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 DRILLING, OPENINGS, AND SLEEVES

- .1 Execute all openings required in floor, ceiling, and walls, and supply and install all required sleeves in concrete slabs, unless specified otherwise. All existing walls, floors, ceilings, and other, damaged by the passage of wiring or installation of equipment, shall be repaired in accordance with existing finishes.

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: 1,200 mm.
 - .2 Thermostat: 1,200 mm.

3.6 FIELD QUALITY CONTROL

- .1 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power distribution system including phasing, voltage and grounding.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Grounding continuity check.
 - .5 Motors, heaters, and associated control equipment, including sequenced operation of systems where applicable.
- .2 Carry out tests in presence of Departmental Representative.
- .3 Provide instruments, meters, equipment, and personnel required to conduct tests during and at conclusion of project.
- .4 Submit test results to Departmental Representative.

.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.

3.7 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.5 DELIVERY, STORAGE, AND HANDLING

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

- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to NEMA to consist of:
 - .1 Connector body and stud clamp for round copper conductors.
 - .2 Clamp for stranded copper conductors.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper conductors.
 - .5 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, TECK cable, mineral insulated cable, flexible conduit, as required to: CAN/CSA-C22.2 No. 18.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.

- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

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

3.3 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 05 20 - Wire and Box Connectors (0-1,000 V).
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .4 Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA C22.2 n° 0.3-09, Test Methods for Electrical Wires and Cables.
 - .2 CAN/CSA-C22.2 n° 131 R2012, Type TECK 90 Cable.
- .2 Underwriters Laboratories of Canada (ULC).
 - .1 ULC-S139-00, Method of Fire Test for Evaluation of Integrity of Electrical Cables.

1.3 PRODUCT DATA

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.5 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

- .2 Copper Conductors: size as indicated, with 600 or 1,000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE or RWU90 XLPE, as indicated.
- .3 For lighting circuits, conductor size No. 12 AWG minimum, unless specified otherwise.
- .4 For receptacle outlets, conductor size No. 10 AWG minimum, unless specified otherwise.

2.2 TECK 90 CABLE

- .1 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper, size as indicated.
- .2 Insulation:
 - .1 Cross-linked polyethylene XLPE.
 - .2 Rating: 1,000 V.
- .3 Inner jacket: polyvinyl chloride material.
- .4 Armour: galvanized steel.
- .5 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .6 Fastenings:
 - .1 One-hole galvanized steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two or more cables at 1,500 mm centers.
 - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .7 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 Connectors: anti-short connectors.

2.4 CONTROL CABLES

- .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket, and armour of closely wound aluminum wire.
- .2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: polyethylene.
 - .2 Overall covering: PVC jackets type FT-4 or protected with interlocked armour of flat galvanized steel.

2.5 ACCEPTABLE PRODUCTS

- .1 Prysmian.
- .2 Alcatel.
- .3 Southwire.
- .4 General Cable.
- .5 Replacement materials or products: approved by addendum according to Instructions to bidders.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of 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 - (0-1,000 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.
- .6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

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 TECK 90 CABLE (0 -1,000 V)

- .1 Group cables wherever possible on channels.
- .2 Install cable exposed, securely supported by straps.

3.5 INSTALLATION OF ARMoured CABLES

- .1 In general, all electrical wiring to be done in conduits. However, the following options are acceptable in the following special cases:
 - .1 Where false ceilings are accessible (removable tiles), the main lighting circuit shall be in conduit with junction boxes anchored to the building structure and homogeneously distributed over the entire surface of the installation. From these junction boxes, it is allowed to connect each fixture individually with AC-90 armoured cable. However, there must be no more than four fixtures individually connected to each junction box and the maximum allowable length of armoured cable is 3 m.

- .2 The AC-90 armoured cable can also be used in the same way and under the same conditions for lighting for receptacle outlets and unit heaters in drywall partitions. The maximum allowable length of armoured cables is 3 m.
- .2 Group cables wherever possible on channels.
- .3 Unless specified otherwise, all wiring is to be concealed within architectural elements. Unless specified otherwise, no exposed installation is permitted without the prior approval of the Departmental Representative.

3.6 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

3.7 INSTALLATION OF NON-METALLIC SHEATHED CABLE

- .1 Install cables provided with equipment, instruments, or components in conduits, flexible or rigid, metallic or non-metallic, depending on the application.
- .2 Use appropriate connectors.
- .3 Gland-type connectors are not accepted for connecting the wiring directly to an equipment, instrument or component.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

- .1 "U" shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended, or set in poured concrete walls and ceilings.
- .2 Supports: galvanized steel.
- .3 Fixing accessories: galvanized steel.

2.2 ACCEPTABLE PRODUCTS

- .1 Thomas & Betts.
- .2 Electrovert.
- .3 B-Line.
- .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 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 galvanized steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole galvanized steel straps for conduits and cables larger than 50 mm.
- .7 Use beam clamps to secure conduit to exposed steel work.
- .8 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .9 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .10 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .11 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .12 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .13 Do not use supports or equipment installed for other trades for conduit or cable support.

- .14 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .15 Install lattice supports for vertical conductors in risers independently of terminal connections and at intervals not exceeding those listed in Table 21 of the Canadian Electrical Code. These supports shall maintain continuity of the cable way without damaging the conductors or their envelope. Anchor brackets inside boxes.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA C22.1-10, Canadian Electrical Code, Part 1 and Modifications of Quebec, 21st Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.

1.4 DELIVERY, STORAGE AND HANDLING

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

1.5 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

PART 2 - PRODUCTS

2.1 SPLITTERS

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs or connection blocks to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

- .1 Construction: welded steel enclosure.
- .2 Covers Surface Mounted: screw-on flat covers.

2.3 CABINETS

- .1 Construction: welded sheet steel or aluminum as indicated, type NEMA 1 for indoor installation, hinged door, handle, lock 2 keys and catch.
 - .1 Type E Empty: surface return flange mounting.
 - .2 Aluminum cabinets for duct bank termination inside building.

2.4 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name, rated current, voltage and phase.

2.5 ACCEPTABLE PRODUCTS

- .1 Iberville (Thomas & Betts).
- .2 Bel Products.
- .3 Eurobex (EXM).
- .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

PART 3 - EXECUTION

3.1 SPLITTER INSTALLATION

- .1 Mount plumb, true and square to building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 Only main junction and pull boxes are indicated. Install pull boxes in sufficient number in order that conduits installed between two boxes have no more than 30 m in length and have no more than three right angle bends or equivalent between the boxes for distribution and two right angle bends or equivalent for other networks and for empty conduits.
- .4 All junction and pull boxes shall be of appropriate size according to the number of conductors and the diameter of connected conduits.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA C22.1, Canadian Electrical Code, latest edition.
 - .2 CSA C22.2 No. 40-M1989 (R2009) - Cutout, Junction and Pull Boxes.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.5 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

PART 2 - PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required, for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.

- .5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

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

2.3 MASONRY BOXES

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

2.4 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.
 - .1 Outlet boxes for surface-mounted luminaires shall be totally hidden by the luminaires.

2.5 FLOOR BOXES

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with gasketed stainless steel faceplate. Device mounting plate to accommodate short or long ear duplex receptacles and telecommunication receptacles. Depth: 70 mm.

2.6 CONDUIT BOXES

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

2.7 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.

2.8 ACCEPTABLE PRODUCTS

- .1 Boxes and fittings:
 - .1 Iberville (Thomas & Betts).
 - .2 Wiremold (Legrand).
 - .3 Hubbell.
 - .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

PART 3 - EXECUTION

3.1 INSTALLATION

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .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).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.

1.4 QUALITY ASSURANCE

- .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.

1.5 GENERAL

- .1 Routing of conduits and does not appear entirely on drawings. Those indicated are represented in schematic form.
- .2 Fire alarm and communication/telephone conduits must be factory painted over the entire length of the color specified in the table in Section 26 05 00 - Common Work Results for Electrical.

1.6 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

PART 2 - PRODUCTS

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel, threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal, steel.
- .6 Conduit and tubing diameter size: minimum 21 mm, unless indicated otherwise.

2.2 CONDUIT FASTENINGS

- .1 One-hole galvanized steel straps to secure surface conduits 53 mm and smaller.
 - .1 Two-hole galvanized steel straps for conduits larger than 53 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.
- .5 Attachments: metal type. Plastic fasteners are not accepted.

2.3 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.
 - .1 Coating: same as conduit.
- .2 Ensure factory "L" where 90 degrees bends for 27 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

- .1 Polypropylene, single length, in each duct and 3 m beyond each end.

2.6 ACCEPTABLE PRODUCTS

- .1 Conduits:
 - .1 Columbia/MBF.
 - .2 Wheatland.
 - .3 B-Line (Cooper Industries/Eaton).
 - .4 Replacement materials or products: approved by addendum according to Instructions to bidders.
- .2 Fastenings, Connectors, and Accessories:
 - .1 Thomas & Betts.
 - .2 Cooper Industries.
 - .3 Hubbell (Raco).

- .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in unfinished areas.
- .3 Use rigid galvanized steel threaded conduit where exposed to weather conditions, in explosion-proof installations and/or where subject to mechanical damage.
- .4 Use epoxy coated conduit in corrosive areas.
- .5 Use electrical metallic tubing (EMT), except in cast concrete and not subject to mechanical injury.
- .6 Metal armored cables can be used instead of electric metal tubings between junction box accessible in suspended ceilings and lighting or wiring devices in the gypsum walls, when the circuits have 2, 3 or 4 wires up to #10 for a maximum length of 5 m.
- .7 Do not use electrical metallic tubing (EMT) in hazardous areas and where there are corrosive fumes.
- .8 Use rigid PVC conduit where concealed in concrete or underground outside building foundations' limits.
- .9 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, and work in movable metal partitions.
 - .1 Unless otherwise indicated, maximum length of such circuit shall be 1 000 mm.
- .10 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .11 Use explosion proof flexible connection for connection to explosion proof motors.

- .12 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
- .13 Minimum conduit size for lighting and power circuits: 21 mm.
- .14 Bend Conduit Cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .15 Mechanically bend steel conduit over 21 mm diameter.
- .16 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .17 Install fish cord in empty conduits.
- .18 Run 2-27 mm spare conduits up to ceiling space and 2-27 mm spare conduits down to ceiling space from each flush panel.
 - .1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.
- .19 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .20 Dry conduits out before installing wire.
- .21 Install metal brackets that are installed on the "T" ceiling for the installation of exit signs and fire detectors.
- .22 Install an expansion connector on all conduits through construction expansion joints.

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 Group conduits wherever possible on suspended or surface channels.
- .4 Do not pass conduits through structural members except as indicated.
- .5 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, unless indicated otherwise.
- .3 Do not install conduits in terrazzo or concrete toppings, unless indicated otherwise.
- .4 Secure all concealed conduits and tubings, including those above suspended ceilings.

3.5 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

- .1 Insulated Cable Engineers Association, Inc. (ICEA).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

- .1 Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 CABLE INSTALLATION IN DUCTS

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using qualified personnel.
 - .1 Include necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.

- .4 Check each feeder for continuity, short circuits and grounds.
 - .1 Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests:
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1,000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Provide Departmental Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.4 CLEANING

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

3.5 PROTECTION

- .1 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

- .1 CSA International.
 - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55-M1986(R2008), Special Use Switches.
 - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Details for integration in architectural elements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

PART 2 - PRODUCTS

2.1 SWITCHES

- .1 15 A, 120 V, single pole, three-way, switches, specification grade "Industrial".
- .2 Manually-operated general purpose AC switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Color: white for normal circuit and red for emergency circuit.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.

- .5 Acceptable products:

	Pass & Seymour	Hubbell	Leviton
120 V - 15 A - 1 P	15AC1	HBL-1201	1201-2
120 V - 15 A - 3-way	15AC3	HBL-1203	1203-2

- .1 Or replacement materials or products: approved by addendum according to Instructions to bidders.

2.2 RECEPTACLES

- .1 Duplex receptacles, specification grade "Industrial", CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
- .1 Urea moulded housing, unless indicated otherwise.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and riveted grounding contacts.
 - .6 Color: white for normal circuit, red for emergency circuit, blue for UPS circuits, and orange for isolated ground receptacles.
- .2 Duplex receptacles for maintenance, specification grade "Industrial", designed for 15 A and 20 A plugs, CSA type 5-20R, 125 V, 20 A.
- .3 Single receptacles, specification grade "Industrial", type L5-30R, 125 V, 30 A.
- .4 Twist-lock single receptacles, specification grade "Industrial", CSA type L5-20R, 125 V, 20 A.
- .5 3-phase receptacle, type pin-and-sleeve, cast aluminum enclosure, with weatherproof cover, 250 V, 60 A, 3-pole, 4-wire.
- .6 Other receptacles with ampacity and voltage as indicated.
- .7 Receptacles of one manufacturer throughout project.
- .8 Acceptable products:

	Pass & Seymour	Hubbell	Leviton
Duplex receptacle 15 A - 125 V (5-15R)	5262	HBL-5262	5262
Duplex receptacle for maintenance 20 A - 125 V (5-20R)	5362	HBL-5362	5362

	Pass & Seymour	Hubbell	Leviton
Single receptacle twist-lock 20 A - 125 V (L5-20R)	2316	HBL-2316	2316

- .1 Or replacement materials or products: approved by addendum according to Instructions to bidders.

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .4 Cast aluminum cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.4 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

.1 Switches:

- .1 Install single throw switches with handle in "UP" position when switch closed.
- .2 Install switches in gang type outlet box when more than one switch is required in one location.
- .3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Receptacles:

- .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
- .2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.3 Cover plates:

- .1 Install suitable common cover plates where wiring devices are grouped.
- .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

.4 Identification:

- .1 On each cover plate, identify receptacles and switches with a self-adhesive plastic label ("Brother P-Touch") size 1, indicating the number of the panelboard and circuit. Label media shall be transparent mat with white lettering on black background for normal network and white lettering on a red background for emergency network.

.5 Perform tests in accordance with current standards and provide a test report.

.6 All outlets installed in less than 1,500 mm of a washbasin, sink or tub shall be protected at the panelboard by a differential circuit breaker or they shall be of the differential type (GFCI).

.7 It is forbidden to install outlets back to back against the wall. Leave a minimum horizontal clearance of 150 mm between the boxes.

3.3 CLEANING

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

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI).
 - .1 ANSI C78.377-2008, Specifications for the Chromacity of Solid State Lighting Products.
 - .2 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE).
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International).
 - .1 CSA C22.2 n° 74, Equipment for Use with Electric Discharge Lamps.
- .5 ICES-005-07, Radio Frequency Lighting Devices.
- .6 Underwriters' Laboratories of Canada (ULC).
- .7 United States of America, Federal Communications Commission (FCC).
 - .1 FCC (CFR47), EM and RF Interference Suppression.
- .8 National Electrical Manufacturers Association (NEMA).
 - .1 NEMA SSL 1-2010, Electronic Drivers for Led Devices, Arrays, or Systems.
 - .2 NEMA SSL 3-2011, High-Power White LED Binning for General Illumination.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative.
 - .3 Photometric data to include:
 - .1 Polar diagram of light intensity distribution;
 - .2 Luminaire efficiency;
 - .3 Utilization factor;
 - .4 Type and finishes of lenses and louvers;
 - .5 Spacing criterion;
 - .6 Photometric Calculation by software.
- .3 Quality Assurance Submittals: provide following in accordance with Section 01 45 00 - Quality Control.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for recycling of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4 Divert unused metal materials from landfill to metal recycling facility.

- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts.

1.5 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.
- .2 Proposition of other luminaires as replacement products to include technical sheets for the proposed products and lighting level calculation by software.

PART 2 - PRODUCTS

2.1 LAMPS

- .1 Fluorescent lamps:
 - .1 T8, 32 Watt, medium bi-pin.
 - .2 rapid-start.
 - .3 4,100 K.
 - .4 2,950 initial lumens.
 - .5 CRI 80.
 - .6 30,000 hour lamp life.
 - .7 Acceptable products:
 - .1 GE.
 - .2 Philips.
 - .3 Osram.
 - .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

2.2 BALLAST

- .1 Ballast for fluorescent lamp:
 - .1 CBM and CSA certified, low power consumption.

- .2 Rating: 120 V, 60 Hz, for use with 2-32W, rapid start lamps.
- .3 Totally encased and designed for 40°C ambient temperature.
- .4 Power factor: minimum 95% with 95% of rated lamp lumens.
- .5 Harmonics: 10% maximum THD.
- .6 Operating frequency of electronic ballast: 20 kHz minimum.
- .7 Total circuit power: 62 Watts.
- .8 Ballast factor: greater than 0.90.
- .9 Sound rated: Class A.
- .10 Mounting: integral with luminaire.

2.3 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.5 LUMINAIRES

- .1 As indicated in luminaire schedule.

2.6 MOUNTING ACCESSORIES

- .1 Provide mounting accessories required to install lighting fixtures, including hooks, chains, rods, poles, and other appropriate materials for the specified mounting method. Pendant fixtures to be equipped with seismic supports.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 WIRING

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

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling in accordance with local inspection requirements.
- .2 For the installation of surface-mounted luminaires on suspended ceiling tile, provide a metal bar specially designed for the purpose, to place over the suspension to attach the fixture with screws with appropriate length.
- .3 In mechanical rooms, suspended luminaires to done with suspension chains and exact location to be determined on site.

3.4 LUMINAIRE ALIGNMENT

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

3.5 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 05 21 - Wires and Cables (0-1,000 V).
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

- .1 CSA International.
 - .1 CSA C22.2 No.141-10, Emergency Lighting Equipment.
- .2 American National Standards Institute (ANSI).
 - .1 ANSI C78.377-2008, Specifications for the Chromacity of Solid State Lighting Products.
- .3 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE).
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .4 National Electrical Manufacturers Association (NEMA).
 - .1 NEMA SSL 1-2010, Electronic Drivers for Led Devices, Arrays, or Systems.
 - .2 NEMA SSL 3-2011, High-Power White LED Binning for General Illumination.
- .5 Illuminating Engineering Society (IES).
 - .1 IES LM 79-2008, Approved Method: Electrical and Photometric Measurement of Solid State Lighting Products.
 - .2 IES LM 80-2008, Approved Method: Measuring Lumen Maintenance of LED Light Sources.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for emergency lighting and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

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

1.6 WARRANTY

- .1 For batteries in this Section 26 52 00 - Emergency Lighting, 12 months warranty period is extended to 120 months.
 - .1 Replacement to be done at no charge during the first 5 years, and with costs prorated for the remaining term of the subsequent five years.

1.7 VOLTAGE DROP

- .1 Supply wires shall be copper and properly sized so that the voltage drop does not exceed 5% of the nominal voltage, in accordance with manufacturer's recommendations.

1.8 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- .1 Emergency Lighting Equipment: to CSA C22.2 No.141.
- .2 Supply Voltage: 120 VAC.
- .3 Output Voltage: 12 or 24 VDC.
- .4 Operating Time: 2 hours minimum.
- .5 Minimum capacity: 244 W.
- .6 Battery: sealed, maintenance-free, 10 years life span.
- .7 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of ± 0.01 V for $\pm 10\%$ input variations.
- .8 Solid state transfer circuit.
- .9 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .10 Signal Lights: solid state, for "AC Power ON" and "High Charge".
- .11 Lamp Heads: integral on unit or remote, 345° horizontal and 180° vertical adjustment. Lamp type: LED, imbedded in a polycarbonate case.
- .12 LED Lighting:
 - .1 LED lighting components to ANSI C78-377, NEMA SSL 3, IES LM 79, and LM 80.
 - .2 Power: as indicated.
 - .3 Initial light output: as indicated.
 - .4 Color rendering index: 86.
 - .5 Color temperature: 4,000 K.

- .6 Lifespan: 50,000 h.
- .1 Light output after 50,000 hours: 70% of initial light output.
- .13 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .14 Finish: beige, steel gage 18.
- .15 Auxiliary Equipment:
 - .1 Ammeter.
 - .2 Voltmeter.
 - .3 Test switch.
 - .4 Time delay relay.
 - .5 Battery disconnect device.
 - .6 AC input and DC output terminal blocks inside cabinet.
 - .7 Shelf.
 - .8 Cord and single twist-lock plug connection for AC.
 - .9 RFI suppressors.
 - .10 Two fused circuits.

2.2 WIRING OF REMOTE HEADS

- .1 Conduit: type EMT, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Conductors: RW90 type in accordance with Section 26 05 21 - Wires and Cables (0-1000 V), sized in accordance with manufacturer's recommendations.

2.3 ACCEPTABLE PRODUCTS

- .1 Model ESL of Emergi-Lite.
- .2 Model RGS of Lumacell.
- .3 Model REL LED of AtLite/Cooper Lighting (Eaton).

- .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads to maximize lighting distribution uniformity.
- .3 Connect exit lights to unit equipment.

3.3 CLEANING

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

3.4 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 05 21 - Wires and Cables (0-1,000 V).
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA C22.2 No.141-10, Emergency Lighting Equipment.
 - .2 CSA C860-01(December 2002), Performance of Internally-Lighted Exit Signs.
- .2 National Fire Protection Association (NFPA).
 - .1 NFPA 101-2006, Life Safety Code.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

1.5 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

PART 2 - PRODUCTS

2.1 ILLUMINATED EXIT SIGNS

- .1 Housing: extruded aluminum housing.
- .2 Lamps: LED with 25 years lifetime.
- .3 Panel with "SORTIE" lettering, red.
- .4 Mounting: suitable for universal mounting: recessed, wall, overhanged, or ceiling, as indicated.
 - .1 Pressure-injected aluminum plate, for recess mounting.
 - .2 Fixing accessories as needed.
- .5 Protection grid as indicated.
- .6 Exit lights: to CSA C22.2 No.141 and CSA C860.

2.2 ACCEPTABLE PRODUCTS

- .1 C8SR10 Series of Emergi-Lite (Thomas & Betts).
- .2 LSRLMCSU Series of Lumacell (Thomas & Betts).
- .3 Replacement materials or products: approved by addendum according to Instructions to bidders.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits.
- .3 Connect emergency lamp sockets to emergency circuits.
- .4 Ensure that exit light circuit breaker is locked in on position.

3.3 CLEANING

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

END OF SECTION

