
Agriculture and Agri-Food Canada (AAFC) Elevator Upgrade Sherbrooke, QC

PUBLIC WORKS AND
GOVERNMENT SERVICES CANADA :

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Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 14 00 – Work Restrictions
- .2 Section 01 41 00 – Regulatory requirements
- .3 Section 01 56 00 – Temporary barriers and enclosures

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises modernisation of the existing hydraulic elevator as well as the related renovation works in architecture, mechanical and electrical that are required in order to make the elevator and its systems compliant and to ensure the safety of its users.

1.3 CONTRACT METHOD

- .1 Construct Work under stipulated price.
- .2 Relations and responsibilities between Contractor and subcontractors assigned by Owner are as defined in Conditions of Contract. Assigned Subcontractors must, in addition:
 - .1 furnish to Contractor bonds covering faithful performance of subcontracted work and payment of obligations thereunder
 - .2 purchase and maintain liability insurance to protect Contractor from claims for not less than limits of liability which Contractor is required to provide to Consultant.

1.4 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from 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 Departmental Representative, in writing, any defects which may interfere with proper execution of Work.

1.5 WORK SEQUENCE

- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction.
- .2 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
- .3 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.
- .4 Maintain fire access/control.

1.6 CONTRACTOR USE OF PREMISES

- .1 Unrestricted use of site until Substantial Performance.

- .2 Limit use of premises for Work to allow:
 - .1 Owner occupancy.
 - .2 Work by other contractors.
 - .3 Public usage.
- .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 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .6 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.
- .7 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.7 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.8 OWNER FURNISHED ITEMS

- .1 Owner Responsibilities:
 - .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
 - .2 Deliver supplier's bill of materials to Contractor.
 - .3 Arrange and pay for delivery to site in accordance with Progress Schedule.
 - .4 Inspect deliveries jointly with Contractor.
 - .5 Submit claims for transportation damage.
 - .6 Arrange for replacement of damaged, defective or missing items.
 - .7 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.
- .2 Contractor Responsibilities:
 - .1 Designate submittals and delivery date for each product in progress schedule.
 - .2 Review shop drawings, product data, samples, and other submittals. Submit to Consultant notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
 - .3 Receive and unload products at site.
 - .4 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
 - .5 Handle products at site, including uncrating and storage.
 - .6 Protect products from damage, and from exposure to elements.

- .7 Assemble, install, connect, adjust, and finish products.
- .8 Provide installation inspections required by public authorities.
- .9 Repair or replace items damaged by Contractor or subcontractor on site (under his control).

1.9 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations, occupants, and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
- .2 Use only elevator and stairs existing in building for moving workers and material.
 - .1 Protect installations against damage, provide means of safety and avoid overloading which could cause damage.

1.10 EXISTING SERVICES

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours 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 tenant operations.
- .3 Provide alternative routes for personnel, pedestrian and vehicular traffic.
- .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 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .8 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .10 Record locations of maintained, re-routed and abandoned service lines.
- .11 Construct barriers in accordance with Section 01 56 00- Temporary Barriers and Enclosures.

1.11 DOCUMENTS REQUIRED

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

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

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 35 29.06 – Health and Safety Requirements
- .2 Section 01 51 00 – Temporary Utilities
- .3 Section 01 56 00 – Temporary barriers and enclosures

1.2 ACCESS AND EGRESS

- .1 The work schedule is from Monday to Friday from 7:30 am to 5:00 pm inclusive. Any work outside these hours must be approved by the Facilities Manager.
- .2 All personnel assigned to this work must access the site according to the procedures established at the beginning of the project in coordination with the Departmental Representative.
- .3 The Contractor may use, without restriction, parking spaces used by the AAFC employees, or any other location designated by the Facilities Manager. No fees are demanded.
- .4 Work outside indicated work area: Coordinate this work with the Facilities Manager at least seven (7) days in advance.

1.3 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal day-to-day use of premises by AAFC. Coordination with the Facilities Manager, or anyone designated by the Facilities Manager, is to be expected.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
 - .1 Any interruption of services related to this work must be submitted to and approved by the Facilities Manager or his representative at least 48 hours before the interruption.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Use only elevator and stairs existing in building for moving workers and material.
 - .1 Protect installations against damage, provide means of safety and avoid overloading.
- .6 Closures: protect work temporarily until permanent enclosures are completed.
- .7 AAFC may provide the Contractor with space to allow the Contractor, its employees and subcontractors to leave their equipment on site. This space may represent an area of approximately 3m x 3m.
 - .1 AAFC is not responsible for materials left by the contractor on the job site. The contractor will be required to provide locked toolboxes to lock their tools;

- .2 AAFC reserves the right to restrict material left at the site if this material is deemed to be too cumbersome by the Facilities Manager.

1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.5 EXISTING SERVICES

- .1 All interruptions of services in the building must be planned with the Facilities Manager, at least 7 (seven) calendar days in advance. Obtain the required permissions before interrupting.
- .2 AAFC reserves the right to schedule service interruptions outside normal working hours.
- .3 Provide for personnel and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00- Temporary Barriers and Enclosures.

1.6 SPECIAL REQUIREMENTS

- .1 The work schedule is from Monday to Friday from 7:30 am to 5:00 pm inclusive. Any work outside these hours must be approved by the Facilities Manager.
- .2 Work involving noisy tools (eg cutting or drilling of concrete) must be planned with the Facilities Manager, and take place between 7:30 am and 8:30 am and after 4:30 pm.
- .3 The Contractor, its employees and subcontractors must apply to the Facilities Manager or the person designated by the Facility Manager - on a daily basis - for permission to perform welding work inside the CRDS premises.
- .4 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .5 Keep within limits of work and avenues of ingress and egress.

1.7 SECURITY

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 Security clearances:
 - .1 The Contractor is responsible for the health and safety of these employees and subcontractors and must put in place the necessary measures to ensure this.
 - .2 The Contractor must take reasonable measures to ensure the safety of the site while limiting the impact on operations during the work. Daily coordination should be done with the facility manager or any other person designated by the facility manager.
 - .3 Provide temporary means to maintain security if it has been reduced because of the work covered by this contract.
 - .4 The Contractor, its employees and subcontractors shall apply the owner's applicable lockout procedures;

.5 The contractor takes full responsibility for the management of construction sites with regard to the issue of health and safety of the premises, both for its staff (CNESST) and for CRDS staff, near the sites.

.3 Security clearances:

.1 The contractor shall obtain from the competent authorities of the Ministry a reliable certificate of security clearance for each of its employees authorized to carry out the work inside the CRDS buildings. At its discretion, AAFC reserves the right to have the contractor, its employees and subcontractors accompanied by one of their own employees or a commission agent, in which case the commissioner's expenses will be borne by AAFC.

1.8 BUILDING SMOKING ENVIRONMENT

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal procedures

1.2 DEFINITIONS

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

1.3 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately ten (10) working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Submit to the Departmental Representative, no later than 10 business days after contract award, a bar chart (GANTT chart) that will serve as a blueprint and will be used for the planning and monitoring of the work, and for the production of progress reports.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.5 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.6 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Excavation.
 - .6 Backfill.
 - .7 Building footings.
 - .8 Slab on grade.
 - .9 Structural Steel.
 - .10 Siding and Roofing.
 - .11 Interior Architecture (Walls, Floors and Ceiling).
 - .12 Plumbing.
 - .13 Lighting.
 - .14 Electrical.
 - .15 Piping.
 - .16 Elevator
 - .17 Controls.
 - .18 Heating, Ventilating, and Air Conditioning.
 - .19 Millwork.
 - .20 Fire Systems.

- .21 Testing and Commissioning.
- .22 Supplied equipment long delivery items.
- .23 Engineer supplied equipment required dates.

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 activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 45 00 – Submittal procedures

1.2 ADMINISTRATIVE

- .1 As soon as possible after contract award, Contractor will submit to the Departmental Representative a table of shop drawings to be produced under the project for all disciplines. This table must contain at least the following information: number of the Specifications section, the article number of the section, a description of the product, the type of documents provided (drawing, data sheets, samples, etc.), the dates of sending and revision and the status of the document. This table will need to be constantly updated by the contractor throughout the works and at each project meeting.
- .2 As soon as possible and in a predetermined order so as not to delay the execution of the work, submit the required documents and samples to the Departmental Representative for review. A delay in this respect can not constitute a sufficient reason to obtain an extension of the period of execution of the works and no request to that effect will be accepted.
- .3 Do not proceed with Work affected by submittal until review is complete.
- .4 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .5 Where items or information is not produced in SI Metric units converted values are acceptable.
- .6 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .7 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .8 Verify field measurements and affected adjacent Work are co-ordinated.
- .9 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .11 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Refer to CCDC 2 GC 3.11.
- .2 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.

- .3 Submit drawings stamped and signed by professional engineer registered or licensed in Quebec, Canada.
- .4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .5 Allow 15 days to Departmental Representative for review of each submission.
- .6 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.
- .7 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.
- .8 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .9 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.
- .10 After Departmental Representative's review, distribute copies.
- .11 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .12 Submit one (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.
- .13 Submit one (1) electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .14 Submit one (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.
- .15 Submit one (1) electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .16 Submit one (1) electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .18 Submit one (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.

1.4 SAMPLES

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

1.5 MOCK-UPS

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

1.6 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution with progress statement as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 4 locations.
 - .1 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: as directed by Departmental Representative.

1.7 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit the required documents by the CNESST.
- .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

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal procedures
- .2 Section 01 41 00 – Regulatory requirements

1.2 REFERENCE STANDARDS

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Quebec
 - .1 Safety Code for the construction industry, R.S.Q., c.S-2.1, r.4

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit Departmental Representative, at least once (1) per week, the health and safety inspection reports carried out on the site by the authorized representative of the Contractor.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS Safety Data Sheets (SDS). The contractor must also keep a copy of these sheets on site, at all times.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.4 FILING OF NOTICE

- .1 File Notice of Project with Quebec authorities (CNESST) prior to beginning of Work. Send to Departmental Representative notice of Project copy and the acknowledgment of receipt sent by the CNESST.
- .2 Following completion of the work, send CNESST closure notice with copy to the Departmental Representative.
- .3 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award. Contractor to submit written acknowledgement to CSST along with Ouverture de Chantier Notice.
- .4 Contractor shall agree to install proper site separation and identification, during the duration of the work, according to the areas identified in the architecture plans.

1.5 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

1.6 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.7 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with Section 01 41 00- Regulatory Requirements.
- .2 Comply with all laws, regulations and standards that are applicable to the execution of the work.
- .3 Observe standards and regulations prescribed to ensure normal progress of work on areas contaminated with hazardous or toxic materials.
- .4 Always use the most recent version of the standards cited in the Safety Code for the construction industry (c.S-2.1, r.4) notwithstanding the date indicated in this Code.

1.8 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Risk of oil leaking into the elevator shaft bottom floor

1.9 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.10 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Contractor shall be the Principal Contractor as described in the Quebec Act Respecting Health and Safety code for the Construction for only their scope and areas of work as defined and described this project specification.
- .4 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.11 COMPLIANCE REQUIREMENTS

- .1 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.12 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Quebec having jurisdiction and advise Departmental Representative verbally and in writing.
- .2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Quebec having jurisdiction and advise Departmental Representative verbally and in writing.

1.13 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with construction.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work.

1.14 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Quebec having jurisdiction, and in consultation with Departmental Representative.

1.15 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.16 BLASTING

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

1.17 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

1.18 WORK STOPPAGE

- .1 Give precedence to safety and health of public, building users and site personnel and protection of environment over cost and schedule considerations for Work.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 SUMMARY

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

1.2 REFERENCES TO REGULATORY REQUIREMENTS

- .1 Perform Work in accordance with National Building Code of Canada (2015) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
 - .1 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents:

- National Fire Code of Canada 2015
- Most recent standards of Public Services and Procurement Canada
- Accessible design for the built environment - CSA Standard B651:18 (2018-19)
- ASME A17.1-2010/CSA B44-10 – Safety code for elevators and escalators (including Annex E)

Mécanique :

- NFPA13-2013, Standards for the installation of sprinkler systems
- ASME A17.1-2010/CSA B44-10 – Safety code for elevators and escalators
- National Plumbing Code of Canada 2015

Électricité :

- National Building Code of Canada 2015
- Canadian Electrical Code 2018
- CAN/ULC S-524-14 Standard for Installation of Fire Alarm Systems (2014)

1.3 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

1.4 BUILDING SMOKING ENVIRONMENT

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

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: Except as otherwise specified, Constructor shall apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:
 - .1 Regulatory requirements and fees in force on date of Bid submission, and
 - .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

Part 2 Products

2.1 NOT USED

- .1 Not Used.

2.2 EASEMENTS AND NOTICES

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

2.3 PERMITS

- .1 Building Permit:
 - .1 Owner has applied for and will be paying for building permit. Constructor is responsible for obtaining or coordinating other permits required for Work and its various parts.
 - .2 Constructor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits.
 - .3 Constructor shall display building permit and other permits in a conspicuous location at Place of Work.
- .2 Occupancy Permits:
 - .1 Constructor shall apply for, obtain, and pay for occupancy permits, including partial occupancy permits where required by authority having jurisdiction.
 - .2 Departmental Representative will issue appropriate instructions to Constructor for correction to Work where Contract Document deficiencies are required to be corrected in order to obtain occupancy permits, including partial occupancy permits.
 - .3 Constructor shall correct deficiencies in accordance with Departmental Representative's instructions. Where deficiency is not corrected, Owner reserves the right to make correction and charge Constructor for costs incurred.
 - .4 Constructor shall turn occupancy permits over to Owner.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2 - 2008, Stipulated Price Contract.

1.2 INSPECTION

- .1 Refer to CCDC 2, GC 2.3.
- .2 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.
- .3 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.
- .4 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.
- .5 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative will pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

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

1.4 ACCESS TO WORK

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

1.5 PROCEDURES

- .1 Notify appropriate agency 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.

1.6 REJECTED WORK

- .1 Refer to CCDC, GC 2.4.
- .2 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.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.7 REPORTS

- .1 Submit 4 copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested.

1.8 TESTS AND MIX DESIGNS

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

1.9 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.
- .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 in preparing schedule fixing dates for preparation.

.6 Mock-ups may remain as part of Work.

1.10 MILL TESTS

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

1.11 EQUIPMENT AND SYSTEMS

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 14 00 – Work restrictions
- .2 Section 01 33 00 – Submittal procedures

1.2 REFERENCE STANDARDS

- .1 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities:
 Developing Pollution Prevention Plans and Best Management Practices.

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 Owner 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.
- .3 Owner will pay for utility charges at prevailing rates, based on General Conditions of Contract.

1.7 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be flameless (vent free) type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

- .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10 degrees Celsius 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 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.
- .8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.8 TEMPORARY POWER AND LIGHT

- .1 Owner will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
- .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor based on General Conditions of Contract.
- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .5 Connect to existing power supply in accordance with Canadian Electrical Code.
- .6 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected.
 - .1 Repair damage to electrical system caused by use under this Contract.

- .2 Replace lamps which have been used for more than 3 months.

1.9 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary telephone, data, fax hook up, line equipments necessary for own use.

1.10 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by 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 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 51 00 – Temporary Utilities

1.2 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
 - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 CSA Group (CSA)
 - .1 CSA-O121-M1978(R2003), Douglas Fir Plywood.
- .3 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as Of: May 14, 2004.

1.3 SECURITY CODES

- .1 Unless otherwise indicated, all work must be carried out in accordance with the prescriptions of the Quebec Construction Code - Chapter 1. Part 8: Safety measures around construction sites, the Canadian construction Safety Code; Section 5.6 of Division B of the National Fire Code of Canada (NFC) and Safety Regulations on CNESTT construction sites to be applied.

1.4 INSTALLATION AND REMOVAL

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

1.5 HOARDING

- .1 Erect – in order to respect the limits of building site as shown on the architecture drawings – a temporary enclosure, fully enclosed, solid construction and full height (floor to ceiling). Provide the necessary secured access in the fence for access to the work areas.
- .2 Paint public side of site enclosure in white colour with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.
- .3 Ensure that fence prevents any person or object from falling into the elevator shaft. Unless required by the works, keep landing doors in closed position at all times. Contractor remains responsible for safety around the site as well as in and around the elevator shaft.
- .4 Take all necessary measures to prevent the spread of dust and other construction debris in building areas off-site.

- .5 Provide the details of the enclosure and the means of protection planned for the site to the Owner and the Departmental Representative, for coordination and approval, before the start of the work.
- .6 Maintain free access to the corridors during the work and ensure that the minimum clearances are respected.

1.6 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open elevator shafts, open stair wells and open edges of floors and roofs.
- .2 Provide and install as required by governing authorities.

1.7 DUST TIGHT SCREENS

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

1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

1.9 PROTECTION OF BUILDING FINISHES

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

1.10 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 45 00 – Quality control
- .2 Section 01 73 00 – Execution

1.2 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-[2008] , Stipulated Price Contract.
- .2 Conform to reference standards, as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.3 QUALITY

- .1 Refer to CCDC 2.
- .2 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.
- .3 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.
- .4 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.
- .5 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .6 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .7 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.

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 on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 TRANSPORTATION

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

1.7 MANUFACTURER'S INSTRUCTIONS

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

- .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

- .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

- .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

- .1 Refer to Section 01 73 00- Execution Requirements.
- .2 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.
- .3 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, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.14 FASTENINGS - EQUIPMENT

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

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.

1.16 EXISTING UTILITIES

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal procedures
- .2 Section 01 74 19 – Waste management and Disposal
- .3 Relevant technical sections of the specifications, for the cutting and patching work related to the work concerned. It is important to inform the other trades concerned in advance.

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

1.3 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 Remove samples of installed Work for testing.
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 Provide firestopping to maintain the integrity of fire separations, including:
 - .1 Protecting penetrations at fire-resistance rated wall, ceiling or floor construction.
 - .2 Using construction joint fire stops and building perimeter fire stops to protect gaps at fire separations and between fire separations and other construction assemblies.
- .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 74 19 – Waste management and Disposal
- .2 Section 01 77 00 – Closeout Procedures

1.2 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.

1.3 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers.
- .5 Provide and use marked separate bins for recycling. Refer to Section 01 74 19- Waste Management and Disposal.
- .6 Dispose of waste materials and debris at dumping areas 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.

1.4 FINAL CLEANING

- .1 Refer to CCDC 2, GC 3.14.
- .2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 Remove waste products and debris including that caused by Owner or other Contractors.
- .6 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.
- .10 Clean lighting reflectors, lenses, and other lighting surfaces.
- .11 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .12 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .13 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Sweep and wash clean paved areas.
- .16 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .17 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT OBJECTIVES

- .1 Before start of the work, meet with Departmental Representative to review the PWGSC waste management plan and objectives.
- .2 PWGSC's waste management objective is to reduce the total flow of construction / demolition waste to landfills by 75 percent. Provide the Departmental Representative with documents certifying that comprehensive measures and procedures for waste management, recycling, reuse of recyclable and reusable materials have been implemented.
- .3 Exercise maximum control over solid construction waste.
- .4 Protect the environment and prevent pollution and environmental impacts.

1.2 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal procedures
- .2 Section 01 35 29.06 – Health and Safety
- .3 Section 01 73 00 - Execution
- .4 Section 01 74 00 – Cleaning
- .5 Section 02 41 00.08 – Demolition - Minor works

1.3 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM E1609 01, Standard Guide for Development and Implementation of a Pollution Prevention Program
- .2 Recycling Certification Institute (RCI):
 - .1 RCI Certification Construction and Demolition Materials Recycling

1.4 DEFINITIONS

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re modeling operations, repair and demolition
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .4 Non hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non toxic: Not poisonous to humans either immediately or after a long period of exposure.

- .6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on the project site.
- .11 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:
 - .1 Solvents in paints and other coatings;
 - .2 Wood preservatives; strippers and household cleaners;
 - .3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
 - .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.
- .18 Construction Waste Management Plan: A project related plan for the collection, transportation, and disposal of the waste generated at the construction site; the purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.5 DOCUMENTS

- .1 Keep a copy of each of the following documents on site :
 - .1 Waste audit;
 - .2 Waste management plan;
 - .3 Annexes established for the project.

1.6 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project, and ensure that requirements of the Construction Waste Management Plan are followed.

- .2 Preconstruction Meeting: Arrange a pre-construction meeting before starting any work of the contract attended by the Contractor, affected Subcontractors and Departmental Representative to discuss the Construction Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

1.7 SUBMITTALS

- .1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Draft Construction Waste Management Plan (Draft CWM Plan): Submit to Departmental Representative a preliminary analysis of anticipated site generated waste by listing a minimum of three (3) construction or demolition waste streams that have potential to generate the most volume of material indicating methods that will be used to divert construction waste from landfill and source reduction strategies; Departmental Representative will provide commentary before development of 's Construction Waste Management Plan.
 - .2 Construction Waste Management Plan (CWM Plan): Submit a CWM Plan for this project prior to any waste removal from site and that includes the following information:
 - .1 Material Streams: Analysis of the proposed jobsite waste being generated, including material types and quantities forming a part of identified material streams in the Draft CWM Plan; materials removed from site destined for alternative daily cover at landfill sites and land clearing debris cannot be considered as contributing to waste diversion and will be included as a component of the total waste generated for the site.
 - .2 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.
 - .3 Alternative Waste Disposal: Prepare a listing of each material proposed to be salvaged, reused, recycled or composted during the course of the project, and the proposed local market for each material.
 - .4 Landfill Materials: Identify materials that cannot be recycled, reused or composted and provide explanation or justification; energy will be considered as a viable alternative diversion strategy for these materials where facilities exist.
 - .5 Landfill Options: The name of the landfill where trash will be disposed of; landfill materials will form a part of the total waste generated by the project.
 - .6 Materials Handling Procedures: A description of the means by which any recycled waste materials will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
 - .7 Transportation: A description of the means of transportation of the recyclable materials, whether materials will be site separated and self

hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site, and destination of materials.

1.8 PROJECT CLOSEOUT SUBMISSIONS

- .1 Record Documentation: Submit as constructed information in accordance with Section 01 78 00 – Closeout Submittals as follows:
 - .1 Construction Waste Management Report (CWM Report) : Submit a CWM Report for this project that includes the following information:
 - .1 Accounting: Submit information indicating total waste produced by the project.
 - .2 Composition: Submit information indicating types of waste material and quantity of each material.
 - .3 Diversion Rate: Submit information indicating total waste diverted from landfill as a percentage of the total waste produced by the project.
 - .4 Transportation Documentation: Submit copies of transportation documents or shipping manifests indicating weights of materials, and other evidence of disposal indicating final location of waste diverted from landfill and waste sent to landfill.
 - .5 Alternative Daily Cover (ADC): Submit quantities of material that were used as ADC at landfill sites, and that form a part of the total waste generated by the project.
 - .6 Multiple Waste Hauling: Compile all information into a single CWM Report where multiple waste hauling and diversion strategies were used for the project.
 - .7 Photographs: Submit photographs of waste diversion facilities documenting location and signage describing usage of waste separation containers.

1.9 QUALITY ASSURANCE

- .1 Resources for Development of Construction Waste Management Report (CWM Report) : The following sources may be useful in developing the Draft Construction Waste Management Plan:
 - .1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.
 - .2 Waste-to-Energy Systems: Investigate local waste-to-energy incentives where systems for diverting materials from landfill for reuse or recycling are not available.
- .2 Certifications: Provide proof of the following during the course of the Work:
 - .1 Compliance Certification: Provide proof that recycling center is third party verified and is listed as a Certified Facility through the registration and certification requirements of the Recycling Certification Institute.

1.10 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 (CWM PLAN) IMPLEMENTATION

- .1 Management: Contractor is responsible for designating an on site party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the project.
- .2 Distribution: Distribute copies of the CWM Plan to the job site foreman, each Subcontractor, the Owner, the Departmental Representative and other site personnel as required.
- .3 Instruction: Provide on site instruction of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods being used for the project to Subcontractors at appropriate stages of the project.
- .4 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:
 - .1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
 - .2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.
- .5 Progressive Documentation: Submit a monthly summary of waste generated by the project to ensure that waste diversion goals are on track with project requirements:
 - .1 Submission of waste summary can coincide with application for progress payment, or similar milestone event as agreed upon between the Contractor and

- .2 Monthly waste summary shall contain the following information:
 - .1 The amount in tonnes or m³ and location of material landfilled,
 - .2 The amount in tonnes or m³ and location of materials diverted from landfill, and
 - .3 Indication of progress based on total waste generated by the project with materials diverted from landfill as a percentage.

3.2 SUBCONTRACTOR'S RESPONSIBILITY

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

3.3 SAMPLE CONSTRUCTION WASTE MANAGEMENT FORMS

- .1 Sample waste tracking form below can be used by the Contractor to establish their own forms for recording management of construction waste:

Material Stream	Diverted Waste by Report Date	Total	Units				
Sept	Oct	Nov	Dec				
Material Streams Contributing to Credit	Plastic	1.25	2.5	10	5	18.75	m ³
Carpet	2.5	2.5	2.5	0	7.5	m ³	
Paper/Cardboard	5	2.5	2.5	5	15	m ³	
Clean Wood	0	25	0	1.25	26.25	m ³	
Metal	1.25	2.5	5.5	7	16.25	m ³	
Gypsum Board	2.5	2.5	4	5	14	m ³	
Brick/Concrete	10.5	2.5	5.5	8.75	27.25	m ³	
Asphalt Shingles	10	0	0	0	10	m ³	
Total Diverted Waste	135	m ³					
Material Streams not Contributing to Credit	Landfill	10.75	7.5	15	10	43.25	m ³
Screen Fines (ADC)	5	1.25	0	2.5	8.75	m ³	
150 mm Minus (ADC)	1.25	1.25	5	5.5	13	m ³	
Total Landfill/ADC Waste	65	m ³					
Total Waste	200	m ³					
Percent Diverted	67.5	%					

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 74 00 – Cleaning
- .2 Section 01 74 19 – Waste management and Disposal

1.2 REFERENCE STANDARDS

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.
- .2 Canadian Environmental Protection Act (CEPA)
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor: 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's Inspection:
 - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English or French that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested, balanced, adjusted and fully operational.
 - .4 Certificates required: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .6 Commissioning of mechanical systems: completed in accordance with 01 91 13- General commissioning requirements and Departmental Representative.
 - .7 Work: 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 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
 - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 Refer to CCDC 2: when Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.4 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling or reuse in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCE STANDARDS

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

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one week prior to contract completion with Departmental Representative to:
 - .1 Verify Project requirements.
 - .2 Review warranty requirements and manufacturer's installation instructions.
 - .2 Departmental Representative to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Two 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.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.5 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 process flow under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format.

1.6 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 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 specified in Section 01 45 00- Quality Control.
- .6 Training: refer to Section 01 79 00- Demonstration and Training.

1.7 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.

1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .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 Referenced Standards 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 field test records, manufacturer's certifications, inspection certifications, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.9 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 Include test and balancing reports as specified in Section 01 91 13 - General commissioning requirements.
- .15 Additional requirements: as specified in individual specification sections.

1.10 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.

1.11 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site 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 site 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 site as directed; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.

1.12 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.

- .5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.13 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 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, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .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, motors, pumps, transformers, HVAC balancing, fire protection, alarm systems, commissioned 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 Procedure 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 timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.14 WARRANTY TAGS

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of interim completion.
- .2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure equipment has been inspected and put into operation in accordance with Section 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS.
 - .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment, at the equipment location.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system as follows:
 - .1 Section 23 81 40 – Heat Pumps
 - .2 Other elements could be added if needed.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

- .6 Provide complete copies of the operation and maintenance manuals prior to demonstration and training sessions for targeted systems and equipment, in order to allow reference.

1.3 QUALITY ASSURANCE

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 TRAINEES

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.2 INSTRUCTORS

- .1 Consultant will provide:
 - .1 Descriptions of systems.
 - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
 - .1 Start-Up, operation, shut-down of equipment, components and systems.
 - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
 - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
- .3 Contractor and equipment manufacturer to provide instruction on:
 - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.3 TRAINING OBJECTIVES

- .1 Training to be detailed and duration to ensure:
 - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
 - .2 Effective on-going inspection, measurements of system performance.
 - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
 - .4 Ability to update documentation.
 - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.4 TRAINING MATERIALS

- .1 Instructors to be responsible for content and quality.
- .2 Training materials to include:
 - .1 "As-Built", Contract Documents.
 - .2 Operating Manual.
 - .3 Maintenance Manual.

- .4 Management Manual.
- .5 TAB and PV Reports.
- .3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.
- .4 Training materials to be in a format that permits future training procedures to same degree of detail.
- .5 Supplement training materials (if required):
 - .1 Transparencies for overhead projectors.
 - .2 Multimedia presentations.
 - .3 Manufacturer's training videos.
 - .4 Equipment models.

1.5 SCHEDULING

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training during regular working hours, training sessions to be (3) hours in length.
- .3 Training to be completed prior to acceptance of facility.

1.6 RESPONSIBILITIES

- .1 Be responsible for:
 - .1 Implementation of training activities,
 - .2 Coordination among instructors,
 - .3 Quality of training, training materials,
- .2 Departmental Representative will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.

1.7 TRAINING CONTENT

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.
 - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
 - .7 Maintenance and servicing.

- .8 Trouble-shooting diagnosis.
- .9 Inter-Action among systems during integrated operation.
- .10 Review of O& M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

1.8 VIDEO-BASED TRAINING

- .1 Manufacturer's videotapes to be used as training tool with Departmental Representative's review and written approval (1) month prior to commencement of scheduled training.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Acronyms:
 - .1 BMM - Building Management Manual.
 - .2 Cx - Commissioning.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 O&M - Operation and Maintenance.
 - .5 PI - Product Information.
 - .6 PV - Performance Verification.
 - .7 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

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

1.3 COMMISSIONING OVERVIEW

- .1 For Cx responsibilities refer to the appendix 1 of the current Section (Cx Plan).
- .2 Cx to be a line item of Contractor's cost breakdown.
- .3 Cx activities supplement field quality and testing procedures described in relevant technical sections.

- .4 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .5 Consultant will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O& M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

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

1.5 PRE-CX REVIEW

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

- .10 Ensure "As-Built"; system schematics are available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

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

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit no later than (4) weeks after award of Contract:
 - .1 Name of Contractor's Cx representative.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
 - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least (3) weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least (3) weeks prior to start of Cx.
 - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.8 COMMISSIONING DOCUMENTATION

- .1 Refer to appendix 2 of the current Section for Installation Check Lists and Product Information (PI)/Performance Verification (PV) Forms.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

1.9 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with related applicable Section (Bar (GANTT) Chart or Critical Path Method (CPM)).
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Approval of Cx reports.
 - .2 Verification of reported results.
 - .3 Repairs, retesting, re-commissioning, re-verification.
 - .4 Training.

1.10 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
 - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60 % and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

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

1.12 WITNESSING OF STARTING AND TESTING

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

1.13 MANUFACTURER'S INVOLVEMENT

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by Consultant.
 - .3 Arrange for Departmental Representative to witness tests.
 - .4 Obtain written approval of test results and documentation from Consultant before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms. Refer to Appendix 2 of the current Section for models. If a sub-contractor wishes to use a manufacturer's typical sheet, submit the proposed model to the Consultant for conformity validation.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance. Refer to models provided in Appendix 2. If a sub-contractor wishes to use a manufacturer's typical check-sheet, submit the proposed model to the Consultant for conformity validation.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by Consultant.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Consultant.
 - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
 - .1 Rejected equipment to be remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

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

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

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

1.17 TEST RESULTS

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

1.18 START OF COMMISSIONING

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

1.19 INSTRUMENTS/EQUIPMENT

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

1.20 COMMISSIONING PERFORMANCE VERIFICATION

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

1.21 WITNESSING COMMISSIONING

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

1.22 AUTHORITIES HAVING JURISDICTION

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

1.23 COMMISSIONING CONSTRAINTS

- .1 Some equipment and systems covered by Cx are affected by occupancy, weather, and seasonal conditions that could be impossible to verify before the Interim Certificate. Departmental Representative has the authority to recommend a delayed testing procedure, within the guarantee period, in order to verify all modes.

1.24 EXTRAPOLATION OF RESULTS

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

1.25 EXTENT OF VERIFICATION

- .1 Targeted sector:
 - .1 Provide manpower and instrumentation to verify up to 30 % of reported results, unless specified otherwise in other sections.
- .2 Number and location to be at discretion of Departmental Representative.
- .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .4 Review and repeat commissioning of systems if inconsistencies found in more than 20 % of reported results.

- .5 Perform additional commissioning until results are acceptable to Departmental Representative.

1.26 REPEAT VERIFICATIONS

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

1.27 SUNDRY CHECKS AND ADJUSTMENTS

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

1.28 DEFICIENCIES, FAULTS, DEFECTS

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

1.29 COMPLETION OF COMMISSIONING

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

1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING

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

1.31 TRAINING

- .1 In accordance with Section 01 79 00 - Demonstration and Training and 01 79 00.13 - Demonstration and Training for Building Commissioning.

1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

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

1.33 OCCUPANCY

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

1.34 INSTALLED INSTRUMENTATION

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

1.35 PERFORMANCE VERIFICATION TOLERANCES

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

1.36 OWNER'S PERFORMANCE TESTING

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

APPENDIX
Commissioning Plan



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A SUSTAINABLE
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Abréviations

AAC	Agriculture et agroalimentaire Canada
CP	Contrôle de performance
CDR	Centre de recherche et développement
ERE	Essai, réglage et équilibrage
LI	Listes d'installation et démarrage
N/A	Non applicable
MES	Mise en service
RM	Représentant du Ministère
RMS	Responsable de la mise en service de l'entrepreneur
RMS	Responsable de la mise en service de l'entrepreneur
RP	Renseignements sur les produits
SPAC	Services publics et approvisionnement Canada (anciennement TPSGC)
TPSGC	Travaux publics et Services gouvernementaux Canada (voir SPAC)

Introduction

Le Centre de Recherche et de Développement (CRD) de Sherbrooke, spécialisé dans l'industrie porcine et laitière, fait partie du réseau national d'Agriculture et Agroalimentaire Canada (AAC). L'établissement est situé au 2000 rue College dans le secteur Lennoxville. Le présent projet vise à mettre aux normes l'ascenseur du bâtiment #1. L'appareil y est en fonction depuis la construction au début des années 1980.

Dans ce mandat, l'équipe d'experts-conseils est coordonnée par la firme d'architecture DFS inc. Pageau Morel et associés inc. (Pageau Morel) s'implique en tant que concepteur en électromécanique et exerce aussi la surveillance de chantier pour ces disciplines. L'ascenseur est quant à lui conçu par KJA.

Le présent plan de mise en service est mis à jour au moment de la production des plans et devis (SR4). En complément aux sections du devis, il précise notamment les activités associées à la mise en service durant la construction. Le plan décrit le processus, les rôles des différents intervenants ainsi que les documents associés à la mise en service du projet, de manière à l'intégrer efficacement à la construction. Le plan met aussi en la place la mise en service de l'installation en tant que telle, dont les phases clés se déroulent en fin de projet. La réalisation de la mise en service correspond à la partie SR8 du mandat de l'expert-conseil.

1 Objectif de la mise en service

La mise en service (MES) a été introduite depuis quelques décennies chez TPSGC. En fonction de leur importance, elle est requise dans tous les projets, tel que stipulé dans la Politique de mise en service datée de 2011.

La MES est un effort commun de l'ensemble des intervenants dont l'objectif est de s'assurer que le projet est conçu, construit et étalonné de façon à fonctionner tel que requis. Au terme du processus, le client a en mains tous les outils (documentation, formation) pour maintenir les performances de manière optimale.

La MES va plus loin qu'une surveillance traditionnelle. Elle implique un niveau accru de documentation et de démonstration et comprend notamment l'évaluation de la performance des systèmes sur une base individuelle et dans l'ensemble des interactions.

2 Portée de la mise en service

Les systèmes généralement visés peuvent être regroupés en quatre (4) catégories. Dans le cadre de la mise à niveau de l'ascenseur, les items suivants sont cités au devis de MES :

2.1 Systèmes architecturaux et structuraux :

- Modernisation de l'ascenseur.

2.2 Systèmes mécaniques et équipements connexes :

- Protection incendie (modifications mineures à l'existant) ;
- Plomberie et drainage (modifications mineures à l'existant) ;
- Ventilation (modification de l'existant et ajout d'unité) ;
- Contrôle et régulation (intégration à l'existant).

2.3 Systèmes électriques :

- Éclairages (nouveaux) ;
- Éléments de distribution électrique (nouveaux et modifiés) ;
- Systèmes d'alarme incendie (intégration à l'existant) ;
- Autres.

2.4 Systèmes de sécurité :

- Non inclus

3 Rôles et responsabilités

3.1 Principaux intervenants

Le présent plan de mise en service s'adresse avant tout aux membres de l'équipe de mise en service. Le rôle des membres de cette équipe est décrit dans cette section.

Le Représentant du Ministère (RM)

Le Gestionnaire de projet TPSGC détient la responsabilité générale de la gestion du projet. Il est la personne-ressource du client, des consultants et de tous les autres membres de l'équipe du projet. En tant que Représentant du Ministère, il peut déléguer une partie de ses responsabilités. Le RM coordonne les réunions de MES et en rédige le procès-verbal. Il approuve les documents de MES, incluant les manuels et plans de formation et assiste aux essais critiques.

Le consultant

Le consultant fait partie du groupe d'experts-conseil. Il conçoit l'installation en respectant les exigences fonctionnelles et opérationnelles et prépare les documents de construction. Ici, le consultant en électromécanique rédige le devis et le plan de MES. Chaque consultant réalise la surveillance de chantier et dans ce contexte, assiste comme témoin aux démonstrations et essais critiques, et une surveillance des activités de mise en service. Il vérifie et commente les divers rapports d'essai et le plan de formation. Le consultant participe à la résolution des problèmes relatifs à la MES, révisé les manuels et plans de formation et valide les plans « tel que construit », et transmet la documentation de fin de projet et la documentation de mise en service soumise par l'Entrepreneur afin de constituer le Manuel d'Exploitation et d'entretien.

L'équipe de construction

Elle est composée de l'entrepreneur, de ses fournisseurs et des divers corps de métier qui réalisent la construction conformément aux documents contractuels. Sous la coordination du responsable de la mise en service de l'entrepreneur (RMS) l'équipe accomplit aussi toutes les activités de la MES, notamment les essais et la documentation, à la satisfaction du Représentant du Ministère. L'équipe réalise la mise au point, dispense la formation et assemble les manuels et participe à la résolution des problèmes relatifs à la mise en service.

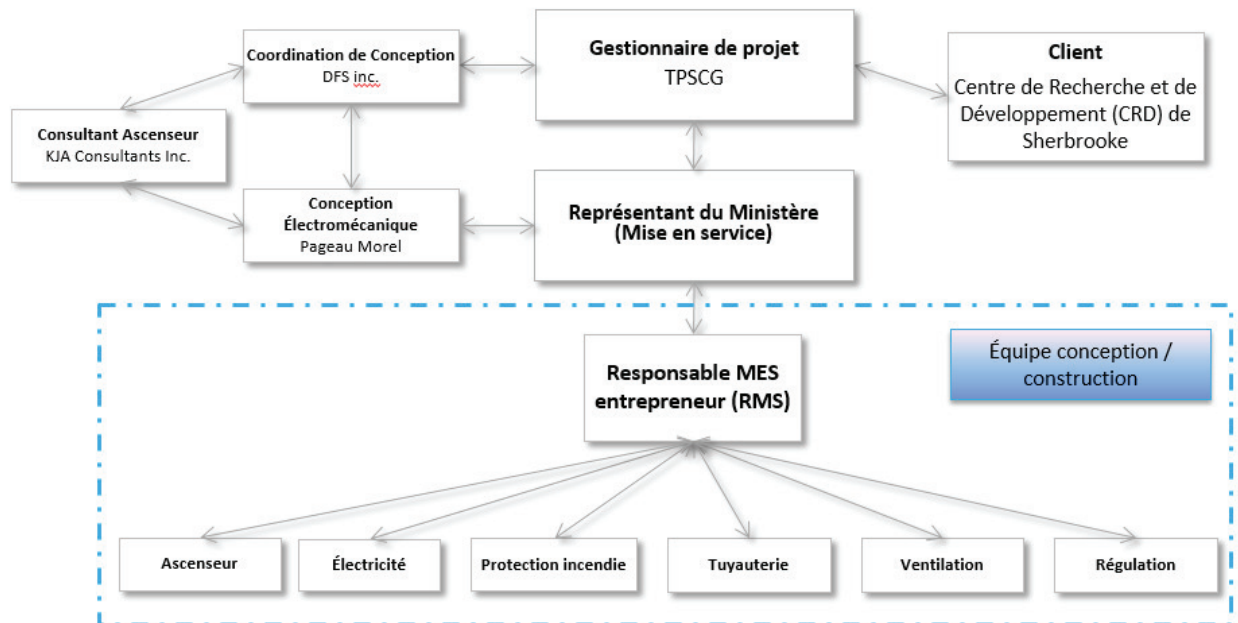
Le responsable de la mise en service de l'entrepreneur (RMS)

Il est désigné par l'entrepreneur en fonction de sa compréhension du processus de MES, dont il assure la planification et la coordination. Il révisé le plan de mise en service et les formulaires pour s'assurer de leur compréhension par les sous-traitants et de leur validité. Il fournit le calendrier de MES, et s'assure de l'exécution de toutes les activités de MES exigées. Il complète ou contresigne les fiches de mise en service pour tous les systèmes visés. Il reçoit et analyse les documents d'ERE avant de les transmettre au Consultant et au Représentant du Ministère. Il rassemble et vérifie les manuels et voit à la mise en œuvre du plan de formation. Le RMS se rend aussi disponible pour offrir un service d'urgence et de dépannage pendant la première

année d'occupation pour effectuer des réglages et des modifications qui ne font pas partie des responsabilités du personnel d'exploitation et d'entretien.

3.2 Organigramme des intervenants

L'organigramme ci-dessous est la représentation graphique des différents membres de l'équipe de mise en service énoncée au point 3.1.



Les flèches représentent les canaux de communications. En cours de projet, les moyens de communication seront principalement les comptes rendus de réunions, les rapports de visites, et le courrier électronique.

4 Phases de la mise en service

La mise en service fait idéalement partie de toutes les étapes d'un projet. La subdivision présentée ici résume les principales activités et livrables des diverses phases.

4.1 Préconception et conception

Le devis présente la MES aux sections suivantes

- 01 79 00 Démonstration et formation - MES de bâtiment
- 01 79 00.13 Démonstration et formation - MES de bâtiment
- 01 91 13 Mise en service, exigences générales
- 01 92 00 Exploitation d'installation

De plus, des procédures et critères MES sont inclus aux sections de devis des différentes disciplines par les concepteurs.

4.2 Construction

Une rencontre de démarrage de la mise en service est à prévoir lorsque les travaux atteignent 60% d'achèvement. Elle permet notamment aux membres de l'équipe de mise en service de valider leur interprétation des tâches, de confirmer la liste des documents attendus et de bâtir le calendrier de MES, dont la fourniture relève du RMS. Les réunions ultérieures pourront être combinées aux réunions de chantier.

Les documents de mise en service normalement applicables aux projets de TPSGC sont requis à l'achèvement des travaux (voir 01 78 00). Pour la mise en service, il s'agit de :

1. Les renseignements sur les produits sont consignés dans des fiches de RP. Il s'agit notamment des informations de la plaque signalétique. Les instructions d'installation, les vérifications pré-mise en route (liste d'installation LI si applicable), les pièces de remplacement et autres données nécessaires à l'opération appartiennent aussi à cette catégorie. Ce formulaire est fourni à l'étape statique (démarrage préliminaire).
2. L'atteinte des critères d'acceptabilité des équipements décrits dans les plans et devis est validée lors d'essais de performance. Pour un équipement visé, ceci est documenté dans les formulaires de contrôle de performance (CP). Les formulaires officiels de mise en route des manufacturiers pourraient être jugés acceptables à ce titre ; obtenir au préalable l'autorisation du Représentant du Ministère.
3. Finalement, les résultats des essais pour les systèmes intégrés sont documentés dans des formulaires de mise en service des systèmes intégrés. Ceux-ci sont produits par les concepteurs et utilisés par le RM lors des démonstrations de fonctionnalités. La forme générique est présentée en annexe du présent plan de MES.

4.2.1 Fourniture, installation et démarrage des composantes

L'objectif est de s'assurer que chaque système est complet et conforme, d'utilisation sûre et prêt pour son amorçage puisque toutes les vérifications prescrites sont complétées et que les résultats sont selon les bonnes pratiques. Cette phase est typiquement désignée comme l'étape « statique ». Au terme de cette étape, les formulaires RP sont produits.

4.2.2 Phase dynamique

Les mises en route sont réalisées après que la phase statique ait confirmé que les installations sont prêtes. Une partie des essais de performance (CP) des équipements sera souvent validée par les manufacturiers lorsqu'ils effectuent les vérifications officielles.

Après la mise en route, il est possible, pour les équipements et sous-systèmes qui en requièrent, de compléter et documenter les contrôles de performance (CP). C'est là que la mise en service à proprement parler s'amorce.

Il est à noter que les rapports d'essai, réglage et équilibrage (ERE) font partie des documents de performance puisqu'ils permettent de confirmer les débits et pressions spécifiés au devis.

4.2.3 Mise en service des systèmes intégrés

Cette étape vise les systèmes complexes, composés de plusieurs équipements. Avant de débiter cette phase, le RP, (LI si applicable) et CP doivent avoir été documentés, c'est-à-dire que les fiches sont complètes, transmises et approuvées. La complétion de l'équilibrage est aussi requise.

Les essais sur les systèmes intégrés sont réalisés par le responsable MES de l'Entrepreneur, en présence de l'Ingénieur et du RM, et documentés dans des formulaires de mise en service des systèmes intégrés. Dans le cadre du présent projet, les systèmes intégrés couverts par la mise en service correspondent aux éléments de CVCA opérant selon une séquence de régulation donnée. Voir à cet effet les sections 25 01 00 et 25 90 01 du devis.

L'ascenseur constitue lui aussi un système intégré ; le concepteur KJA sera responsable de produire le formulaire d'essai qui sera joint au présent plan.

4.3 Formation

Des séances de formation à l'intention de l'équipe d'exploitation sont à prévoir pour les items sélectionnés ; se référer à la section 01 79 00.13 pour les exigences en matière de formation. Elles comprennent, sans s'y limiter les éléments suivants

- Inclure les formations explicitement au calendrier du projet
- Transmettre pour approbation le matériel qui sera utilisé en formation. Les manuels des appareils doivent être disponibles pour consultation par le personnel lors des séances.

- Fournir un rapport de formation ; le contenu sera à clarifier auprès du RM, mais il devra au minimum comporter une liste des participants (signée et datée par toutes les personnes présentes)

4.4 Manuels

Le manuel d'opération et entretien est présenté au concepteur aux fins de révision et d'acceptation. Se référer à la section 01 78 00 pour les la structure générale du manuel. Si des clarifications sont souhaitables concernant les exigences de MES applicables au manuel, s'adresser au responsable de la mise en service chez le consultant en électromécanique.

Les sections du manuel devraient être utilisées lors des formations. De cette manière, elles pourront faire l'objet d'une mise au point en fonction des commentaires des personnes suivant ces formations.

4.5 Complétion significative et occupation

Le Représentant du Ministère est le destinataire final de l'ensemble des documents de MES durant la construction. L'approbation du matériel de MES par le RM est un des prérequis à l'achèvement substantiel. Le RM sera aussi responsable du suivi durant l'occupation et de la coordination d'essais saisonniers si requis, auquel cas l'Entrepreneur et le Consultant pourront être appelés à collaborer.

4.6 Fermeture de la mise en service

La dernière étape de la MES est la revue du projet à la fin de la première année d'opération sous garantie, au moment du suivi des déficiences et de leur correction.

Les rapports d'essais et les formulaires présentés plus haut constituent les principaux livrables du processus de MES ; ils seront à joindre aux documents de fin de projet. Il n'est pas prévu de produire un rapport final de mise en service.

5 Mise en service prévue

Les documents de mise en service pour les systèmes visés sont résumés dans le tableau suivant.

Tableau 1 : Résumé des livrables MES

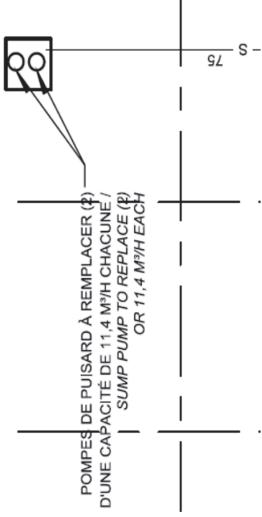
	Fiche de MES	Test au devis	MES intégrée
5.1 Systèmes architecturaux			
Ascenseur	oui	oui	OUI * voir note
5.2 Systèmes mécaniques			
Composants de protection incendie	non	selon NFPA	non
Composants de plomberie	Pompe puisard	non	non
Composants de réseaux hydroniques	non	Équilibrage hydraulique	oui
Unités de climatisation	thermopompe	Équilibrage aéraulique	
Composants de ventilation	non	Étanchéité équilibrage	
Autre			
5.3 Systèmes électriques			
Distribution basse tension	Oui	Équilibre des phases Fuites à la terre	N/A
Éclairages	Non	Intégration à la régulation Programmation	N/A
Alarme incendie	Non	Par firme spécialisée	N/A
5.4 Systèmes de sécurité			
Accès sécurisé	N/A	N/A	N/A
Autre	N/A	N/A	N/A

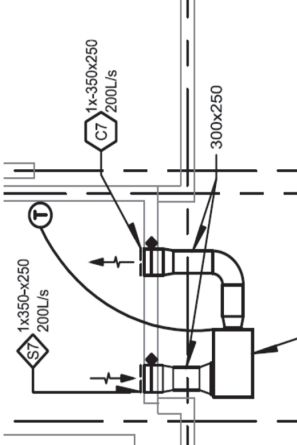
N/A : non applicable

Note sur l'essai intégré de l'ascenseur : Le protocole de mise en service et les formulaires à fournir pour cet appareil seront à coordonner avec le concepteur pour cette discipline.

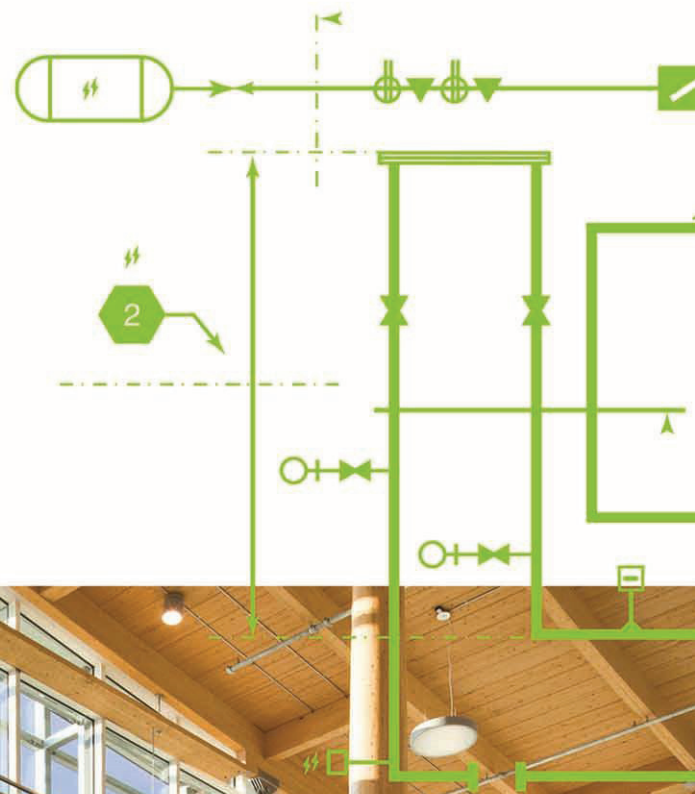
ANNEXE 1

MES des systèmes intégrés de CVCA

Pompes de puisard					
Vérifications préfunctionnelles complétées de manière adéquate		Installation documentée	Performance des composantes	ERE Documenté	Contrôles validés (point à point)
Notes		Programmation complétée	Simulation / Essai réel	Résultat adéquat	Vérifié par
	 <p>POMPES DE PUISARD À REMPLACER (P) D'UNE CAPACITÉ DE 11,4 M³/H CHACUNE / SUMP PUMP TO REPLACE (P) OR 11,4 M³/H EACH</p>	<p>Programation complétée</p> <p>N/A</p>			
Séquence					Note #
Normal	Le duplex est opéré par son contrôleur interne				
Alarme	Centraliser les points au contrôleur du bâtiment. .1 Alarmes .2 Point de consigne .3 État de marche				
Notes					

Thermopompe horizontale						
Vérifications préfunctionnelles complétées de manière adéquate		Installation documentée	Performance des composants	ERE Documenté	Contrôles validés (point à point)	
Notes		Programmation complétée	Simulation / Essai réel	Résultat adéquat	Vérifié par	Note #
		N/A				
Séquence	La thermopompe est opérée par son contrôleur interne Centraliser les points au contrôleur du bâtiment. .1 Alarmes .2 Point de consigne .3 État de marche					
Normal						
Alarme						
Notes						

Points divers								
Des points seront ajoutés au besoin								
Prélabes complétés et documentés de manière satisfaisante :	Installation documentée		Performance des composantes		ERE Documenté		Contrôles validés (point à point)	
	Programation complétée		Simulation / Essai réel		Résultat adéquat		Accepté par	
Séquence	Programation complétée		Simulation / Essai réel		Résultat adéquat		Note #	
Notes								
Communication								
Notes								



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Appendix 2
Commissioning Forms

TABLE DES MATIÈRES

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Fiche de renseignement de produit (RP) 2

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Transformateur sec basse tension..... 5

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Panneau électrique de distribution 7

FICHES DE MISE EN SERVICE

Fiche de renseignement de produit (RP)

PROJET/ PROJECT	Nom : <i>Name:</i>			
	Bâtiment : <i>Building:</i>			
	Numéro de Projet : <i>Project number:</i>			
IDENTIFICATION	Équipement : <i>Equipment:</i>			
	Description sommaire : <i>Summary:</i>			
	Identification aux plans : <i>No. On Drawings:</i>		Identification système de contrôle du bâtiment : <i>MSS Identifier:</i>	
	Équipement relié au système : <i>Equipment linked to system:</i>			
RENSEIGNEMENT	Fabriquant : <i>Man'fr:</i>			
	Modèle : <i>Model:</i>			
	No série <i>Serial no.:</i>			
	Capacité : <i>Capacity:</i>		Taille : <i>Size:</i>	
	Efficacité : <i>Efficiency:</i>			
	Tension : <i>Voltage:</i>	Volt / #Ø / Fréquence		
	Courant : <i>Current:</i>	FLA/LRA		
	Autres : <i>Other:</i>			
ACHAT/ PURCHASE	Fournisseur : <i>Contractor:</i>		Nom/adresse <i>Name/address</i>	
	Distributeur : <i>Distributor:</i>		Nom/adresse <i>Name/address</i>	
	Garantie : <i>Guarantee:</i>			
	Date d'achat : <i>Purchase date:</i>			
	Garantie spécifique : <i>Specific guarantee:</i>			
	Date de démarrage : <i>Date of start-up:</i>			
	Remplacé le : <i>Replaced:</i>			

Essais de tuyauterie ou de conduits

IDENTIFICATION	Service :	Localisation :	Fluide :
	CARACTÉRISTIQUES SPÉCIFIÉES		

Préalables (cocher pour confirmer que le préalable est documenté)

DOCUMENTATION	<input type="checkbox"/> Dessin d'ateliers reçus	<input type="checkbox"/> Installation complétée et documenté (fiche jointe)
	Commentaires:	

MESURES	PROPRIÉTÉS	INSTRUMENT (Portable/BAS/Local)	PRESCRIT	MESURÉ 1	MESURÉ 2
	Pression initiale (kPa - PSI)				
	Pression après 30 minutes (kPa - PSI)				
	<ul style="list-style-type: none"> Pression rétablie à la pression initiale (kPa - PSI) 				
	Pression après 1 heure (kPa - PSI)				
	<ul style="list-style-type: none"> Pression rétablie à la pression initiale (kPa - PSI) 				
	Pression stabilisée à _____ (kPa - PSI)				
	<ul style="list-style-type: none"> Heure de début Heure de fin Durée, heures/minutes 				
Commentaires Essai concluant ou non, avec description					

Participants à la réalisation (R), la validation (V) et l'approbation (A) des essais :

Autorité/Compagnie	Nom	Activité	Signature	Date
Plomberie				
Ventilation				
Contrôles				
Balancement				
Témoin (entrepreneur général)		V		
Agent de mise en service				

Thermopompe

IDENTIFICATION	N° au plan :	Service :	Localisation :
	Manufacturier :	Modèle :	No de série :
	Caractéristiques spécifiées		
	Capacité	Type	Réfrigérant
	Efficacité chauffage	Refroidissement	Volume de Réfrigérant :

Préalables (cocher pour confirmer que le préalable est documenté)

DOCUMENTATION	<input type="checkbox"/> Dessin d'ateliers reçus	<input type="checkbox"/> Liste d'installation complétée	<input type="checkbox"/> Rapport de test en usine (si applicable)
	<input type="checkbox"/> Installation conforme documentée	<input type="checkbox"/> ERE hydronique complété	<input type="checkbox"/> ERE hydronique approuvé (Date___)
	<input type="checkbox"/> Séquence de régulation active	<input type="checkbox"/> ERE aéraulique complété	<input type="checkbox"/> ERE aéraulique approuvé (Date___)
	Commentaires:		

PERFORMANCES	Élément de performance	Valeur Prescrite	Valeur mesurée
	Côté source : (fluide : _____c)		
	- Débit, l/s		
	- Température à l'entrée, °C		
	- Température à la sortie, °C		
	- Perte de pression, kPa		
	Côté charge (fluide: _____) :		
	Débit, l/s		
	- Température à l'entrée, °C		
	- Température à la sortie, °C		
	- Perte de pression, kPa		
	Ampérage moteur compresseur (T ₁ /T ₂ /T ₃)		
	Voltage moteur compresseur (T ₁ -T ₂ /T ₂ - T ₃ /T ₃ -T ₁)		
	Commentaires		

Participants à la réalisation (R), la validation (V) et l'approbation (A) des essais :

Autorité/Compagnie	Nom	Activité	Signature	Date
Plomberie				
Ventilation				
Contrôles				
Balancement				
Témoin (entrepreneur général)		V		
Agent de mise en service				

Transformateur sec basse tension

IDENTIFICATION	N° au plan :	Service et localisation	Section de devis applicable
	Manufacturier :	Modèle :	No de série :
	Source :	Vers :	<input type="checkbox"/> Urgence / <input type="checkbox"/> Normal
	Caractéristiques spécifiées		
	Tension primaire	Tension secondaire	Facteur K : ___ / NA

INSTALLATION	Vérification	Conforme	Non conforme	Non applicable	Commentaires
	1. Conforme aux dessins d'atelier vérifiés	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	2. Absence d'humidité et de poussière	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	3. Ancrages adéquats, incluant protection sismique	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	4. Façonnage des câbles adéquat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Commentaires:					

VERIFICATIONS DE DEMARCHE	Propriétés	Prescrit	Mesuré
	Alimentation primaire :		
	• Sectionneur (A)		
	• Disjoncteur		
	• Fusible (A)		
	• No CCM		
	• Calibre du câble (AWG/kcmil)		
	• Identification		
	Prise haute tension :		
	• 630 V H-1, H-2, H-3		
	• 615 V H-4, H-5, H-6		
	• 600 V H-7, H-8, H-9		
	• 585 V H-10, H-11, H-12		
	• 570 V H-13, H-14, H-15		
	Secondaire :		
• Calibre du câble			
Mégohmmètre :			
• (600 V) h-1 – Terre, H-2 – Terre, H-3 – Terre, Mise à la terre adéquate			

Participants à la réalisation (R), la validation (V) et l'approbation (A) des essais :

Autorité/Compagnie	Nom	Activité	Signature	Date
Plomberie				
Ventilation				
Contrôles				
Balancement				
Témoin (entrepreneur général)		V		
Agent de mise en service				

Panneau électrique d'utilisation

IDENTIFICATION	N° au plan :	Usage : <input type="checkbox"/> Urgence / <input type="checkbox"/> Normal	Localisation :
	Source :	Voltage :	Ampérage :
	Manufacturier :	Modèle :	No de série :
	Filtre <input type="checkbox"/> Oui / <input type="checkbox"/> Non	Type de filtre :	Modèle du filtre :
	Caractéristiques spécifiées		
	<input type="checkbox"/> Nouveau / <input type="checkbox"/> Existant	Matériau des barres : <input type="checkbox"/> Al / <input type="checkbox"/> Cu	Disjoncteurs : <input type="checkbox"/> Boulonnés / <input type="checkbox"/> Enfichables / <input type="checkbox"/> Disjoncteur principal cloisonné
	Si existant, recertifié <input type="checkbox"/> CSA	Boitier : <input type="checkbox"/> Serrure / NEMA : _____	Courant de court-circuit mini aux disj : _____
<input type="checkbox"/> MALT / <input type="checkbox"/> MALT _i	Montage : <input type="checkbox"/> Encastré / <input type="checkbox"/> Surface	Mesurage ou compteur <input type="checkbox"/> oui / <input type="checkbox"/> non	

Préalables (cocher pour confirmer que le préalable est documenté)

INSTALLATION	<input type="checkbox"/> Dessin d'ateliers reçus	<input type="checkbox"/> Liste des disjoncteurs affichée	<input type="checkbox"/> Identification adéquate des barres
	Installation adéquate :		
	<input type="checkbox"/> Absence d'humidité	<input type="checkbox"/> Absence de poussière	<input type="checkbox"/> Ancrages, dégagement, porte
	<input type="checkbox"/> Façonnage des câbles	<input type="checkbox"/> Manœuvrabilité des disjoncteurs	<input type="checkbox"/> Connecteurs étanches (conduits et câbles)
	Commentaires:		

MESURES	Points de mesure	Tension mesurée (Volt)	Essai de résistance de l'isolant (Ohm)
	A – B		
	B – C		
	C – A		
	A – Neutre		
	B – Neutre		
	C – Neutre		
	A – MALT		
	B – MALT		
	C – MALT		

Participants à la réalisation (R), la validation (V) et l'approbation (A) des essais :

Autorité/Compagnie	Nom	Activité	Signature	Date
Plomberie				
Ventilation				
Contrôles				
Balancement				
Témoin (entrepreneur général)		V		
Agent de mise en service				

Panneau électrique de distribution

(Panneau page 1/2)

IDENTIFICATION	N° au plan :	Service et localisation	Section de devis applicable
	Manufacturier :	Modèle :	No de série :
	Source :	<input type="checkbox"/> Urgence / <input type="checkbox"/> Normal	<input type="checkbox"/> Nouveau / <input type="checkbox"/> Existant
	Caractéristiques spécifiées		
	Matériau des barres : <input type="checkbox"/> Al / <input type="checkbox"/> Cu	Voltage :	Ampérage :
	Montage : <input type="checkbox"/> Encastré / <input type="checkbox"/> Surface	Boîtier : <input type="checkbox"/> Serrure / NEMA : _____	Si existant, re-certification : Oui / Non / NA
	Filtre : <input type="checkbox"/> Oui / <input type="checkbox"/> Non	Type de filtre :	Modèle du filtre :
	<input type="checkbox"/> MALT / <input type="checkbox"/> MALTi	Disj : <input type="checkbox"/> Boulonnés / <input type="checkbox"/> Enfichables <input type="checkbox"/>	Disjoncteur principal cloisonné <input type="checkbox"/> Oui / N/A
	Mesurage : <input type="checkbox"/> oui / <input type="checkbox"/> non	Disj ajustables : <input type="checkbox"/> oui / <input type="checkbox"/> non	Courant de court-circuit mini aux disj : _____

INSTALLATION	Vérification	Conforme	Non conforme	Non applicable	Commentaires
	1. Conforme aux dessins d'atelier vérifiés	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	2. Absence d'humidité et de poussière	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	3. Dégagement suffisant et porte manœuvrable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	4. Ancrages adéquats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	5. Façonnage des câbles adéquat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	6. Coupe de serrage (à indiquer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	__Lb-pi
	7. Connecteurs étanches (conduits et câbles)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	8. Identification adéquate du panneau et des barres	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	9. Liste des disjoncteurs affichée (reproduite ici)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Commentaires: _____					

Disjoncteurs ajustables	Identification	Capacité	Modèle (Chassis, unité de déclenchement)	Ajustements						
				LT PICKUP	LT BAND	ST PICKUP	ST BAND	INST PICKUP	G PICKUP	G BAND

(Panneau de distribution _____, page 2/2)

Les disjoncteurs de modèle et de capacité identique peuvent être inscrits une seule fois au tableau.

Disjoncteurs non ajustables	Identification	Capacité	Modèle	Quantité

VERIFICATIONS DE DEMARRAGE (Essais)	Points de mesure	Tension mesurée (Volt)	Essai de résistance de l'isolant (MegOhm)
	A – B		
	B – C		
	C – A		
	A – Neutre		
	B – Neutre		
	C – Neutre		
	A – MALT		
	B – MALT		
	C – MALT		
ESSAI	Mesure de courant sous charge	Courant mesuré (Ampère)	
	I _A		
	I _B		
	I _C		

Participants

	Nom	Activité	Signature	Date
Contrôles				
Electricien				
Témoin (entrepreneur général)		V		
Agent de mise en service				

Part 1 General

1.1 GENERAL

- .1 Acronyms:
 - .1 BMM - Building Management Manual.
 - .2 Cx - Commissioning.
 - .3 HVAC - Heating, Ventilation and Air Conditioning.
 - .4 PI - Product Information.
 - .5 PV - Performance Verification.
 - .6 TAB - Testing, Adjusting and Balancing.
 - .7 WHMIS - Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

- .1 Standard letter size paper 216 mm x 279 mm.
- .2 Methodology used to facilitate updating.
- .3 Drawings, diagrams and schematics to be professionally developed.
- .4 Electronic copy of data to be in a format accepted and approved by Departmental Representative.

1.3 APPROVALS

- .1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Departmental Representative.
- .2 Departmental Representative to approve the format for the Manual within 12 weeks following assignment of the contract.

1.4 GENERAL INFORMATION

- .1 For detailed requirements refer to Section 01 78 00 - Closeout Submittals.
- .2 Provide the General Contractor Cx Representative with the following for insertion into appropriate Part and Section of BMM:
 - .1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project – Tab A.
 - .2 Guarantee Letters – Tab B
 - .3 Approved cut sheets – Tab C
 - .4 Completed Test reports, including TAB, completed Cx sheets including Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Cx Responsible and of Consultant. Tab D
 - .5 Sequence of operation as finalized after commissioning is complete- Tab E
 - .1 For this purpose, the Consultant will provide Cx sheets for integrated systems completed upon site verification.

- .6 Information on operation and maintenance for the installed and commissioned systems, including preventative and corrective maintenance and schedule –Tab F
 - .1 Manual to include manufacturer's data and recommendations, including spare parts list, for the installed systems – Tab F1.
 - .2 Consultant to provide, upon requested, brief descriptions of the systems (mechanical, electrical, fire protection) Tab F2
- .7 As-built drawings – Tab G
- .8 Site visit reports – Tab H

1.5 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

- .1 Provide Departmental Representative supporting documentation relating to installed equipment and system, including:
 - .1 General:
 - .1 WHMIS information manual.
 - .2 Fire prevention, suppression and protection:
 - .1 Test reports.
 - .3 Mechanical:
 - .1 Piping pressure test certificates.
 - .2 Ducting leakage test reports.
 - .3 TAB and PV reports.
 - .4 Charts of valves and steam traps.
 - .5 Copies of posted instructions.
 - .4 Electrical:
 - .1 PV reports.
 - .2 Electrical work log book.
 - .3 Charts and schedules.
 - .4 Locations of cables and components.
 - .5 Copies of posted instructions.

1.6 LANGUAGE

- .1 Manual to be published in the language applicable to the contract.

1.7 IDENTIFICATION OF FACILITY

- .1 When submitting information to Departmental Representative for incorporation into BMM, use applicable system for identification of documentation, coherent with drawings for the current, or, if different, with the existing strategy
 - .1 Refer to 23 05 53 - Identification

1.8 USE OF CURRENT TECHNOLOGY

- .1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.
- .2 Obtain Departmental Representative's approval before starting Work.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes the following:
 - .1 Demolition and removal of buildings and structures
 - .2 Demolition and removal of site improvements adjacent to a building or structure being demolished
 - .3 Demolition and removal of concrete foundations
 - .4 Removing below grade construction
 - .5 Disconnecting, capping or sealing, and removing site utilities

1.2 RELATED REQUIREMENTS

- .1 Section 01 35 29.06 – Health and Safety Requirements
- .2 Section 01 56 00 – Temporary Barriers and Enclosures
- .3 Section 01 74 00 – Cleaning
- .4 Section 01 74 19 – Waste management and Disposal

1.3 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 2012
 - .2 Canadian Environmental Protection Act (CEPA), 2012
 - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
 - .2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34
 - .4 Motor Vehicle Safety Act (MVSA), 1995
 - .5 Hazardous Materials Information Review Act, 1985
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 241 - 96, Standard for Safeguarding Construction, Alteration, and Demolition Operations
- .4 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
 - .2 National Fire Code of Canada 2015 (NFC).
- .5 Underwriters' Laboratories of Canada (ULC)

- .1 CAN/ULC-S660-08, Standard for Nonmetallic Underground Piping for Flammable and Combustible Liquids
- .2 ULC/ORD-C58.15-1992, Overfill Protection Devices for Flammable Liquid Storage Tanks
- .3 ULC/ORD-C58.19-1992, Spill Containment Devices for Underground Flammable Liquid Storage Tanks

1.4 DEFINITIONS

- .1 Demolition: rapid destruction of building following removal of hazardous materials.
- .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly.
- .3 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .4 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19- Construction Waste Management and Disposal.
- .5 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19- Construction Waste Management and Disposal

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Departmental Representative for the material ownership including but not limited to:
 - .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain on Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
 - .2 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during demolition remain Owner's property.
- .2 Pre-Demolition Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section, with Departmental Representative.
- .3 Scheduling:
 - .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
 - .2 In event of unforeseen delay notify Departmental Representative.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Shop Drawings: Submit drawings stamped and signed by professional engineer registered or licensed in Quebec as follows:
 - .2 Submit in accordance with Section 01 33 00 - Submittal Procedures.
 - .3 Schedule of Demolition Activities: Coordinate with Section 01 32 16.16- Construction Progress Schedule.
- .2 Informational Submittals: Provide the following submittals when requested by the Consultant:
 - .1 Qualification Data: Submit information for companies and personnel indicating their capabilities and experience to perform work of this Section including; but not limited to, lists of completed projects with project names and addresses, names and addresses of Consultants, for work of similar complexity and extent.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: Ensure Work is performed in compliance with applicable Provincial regulations.
- .2 Comply with hauling and disposal regulations of Authority Having Jurisdiction.
- .3 Standards: Comply with ANSI A10.6 and NFPA 241.

1.8 SITE CONDITIONS

- .1 Review "Designated Substance Report" and take precautions to protect environment.
- .2 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
 - .1 Proceed only after receipt of written instructions have been received from Departmental Representative.
- .3 Notify Departmental Representative before disrupting building access or services.

1.9 EXISTING CONDITIONS

- .1 Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - .1 Hazardous materials will be as defined in the Hazardous Materials Act.

Part 2 Products

2.1 EQUIPMENT

- .1 Equipment and heavy machinery:
- .2 On-road vehicles to: CEPA-SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations and CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
- .3 Off-road vehicles to: EPA CFR 86.098-10 and EPA CFR 86.098-11.
- .4 Machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Part 3 Execution

3.1 EXAMINATION

- .1 Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- .2 Review Project Record Documents of existing construction provided by Consultant and Departmental Representative.
- .3 Consultant and Departmental Representative do not guaranty that existing conditions are the same as those indicated in Project Record Documents.
- .4 Inventory and record the condition of items being removed and salvaged.
- .5 When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element.
- .6 Promptly submit a written report to Consultant.
- .7 Verify that hazardous materials have been remediated before proceeding with demolition operations.

3.2 PREPARATION

- .1 Protection of In-Place Conditions:
 - .1 Prevent movement, settlement, or damage to adjacent parts of building and utilities to remain in place. Provide bracing and shoring required.
 - .2 Keep noise, dust, and inconvenience to occupants to minimum.
 - .3 Protect building systems, services and equipment.
 - .4 Provide temporary dust screens, walls, covers, railings, supports and other protection as required and in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.
 - .5 Do Work in accordance with Section 01 35 29.06- Health and Safety Requirements.
- .2 Demolition/Removal:
 - .1 Demolish parts of structure as indicated in construction documents.
 - .2 Removal of Pavements, Curbs and Gutters:

- .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
- .2 Protect adjacent joints and load transfer devices.
- .3 Remove parts of existing building to permit new construction, as indicated on plans.
- .4 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.
- .5 At end of each day's work, leave Work in safe and stable condition.
- .6 Protect interiors of parts not to be demolished from exterior elements at all times.
- .7 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.
- .8 Only dispose of material specified by selected alternative disposal option as directed by Departmental Representative.

3.3 SITE RESTORATION & REPAIRS

- .1 Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes.
- .2 Provide a smooth transition between adjacent existing grades and new grades.
- .3 General: Promptly repair damage to adjacent construction caused by demolition operations.
- .4 Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- .5 Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

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 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .4 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility/location (to be coordinated with Departmental Representative).

END OF SECTION

Part 1 General

1.1 CONTENT

- .1 This section describes the requirements for, but not limited to, the supply and installation of the ladder extension servicing the bottom of the elevator pit as well as the fasteners and anchors related to it.

1.2 RELATED REQUIREMENTS

- .1 Section 09 91 23 – Interior painting

1.3 REFERENCE STANDARDS

- .1 American National Standards Institute/National Association of Architectural Metal Manufacturers (ANSI/NAAMM)
 - .1 ANSI/NAAMM MBG 531-15, Metal Bar Grating Manual.
- .2 ASTM International
 - .1 ASTM A 53/A5 3M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A 307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM F3125/F3125M-15A, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- .3 CSA Group
 - .1 CSA G40.20–13 /G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- .4 Green Seal Environmental Standards (GS)
 - .1 GS-11-2011, 3rd Edition, Paints and Coatings.
- .5 National Association of Architectural Metal Manufacturers (NAAMM)
 - .1 AMP 510-92, Metal Stair Manual.
- .6 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
- .7 The Society for Protective Coatings (SSPC)
 - .1 Systems and Specifications Manual, Volume 2, 2014 Edition.
- .8 ULC Standards
 - .1 UL 2768-2011, Architectural Surface Coatings.
 - .2 UL 2760-2011, Surface Coatings - Recycled Water-borne.

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 metal ladder components and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06- Health and Safety Requirements.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Quebec, Canada.
 - .2 Indicate construction details, assemblies, joints, reinforcement elements, welding details, sizes of steel sections and thickness of steel components.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating 50% of construction wastes recycled or salvaged.
 - .2 Low-Emitting Materials:
 - .1 Submit listing of paints and coatings, adhesives and sealants used in building, showing compliance with VOC and chemical component limits or restrictions requirements.

1.5 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 DELIVERY, STORAGE AND HANDLING

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

- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 SYSTEM DESCRIPTION

- .1 Design metal ladder and all its connections to National Building Code of Canada (NBC) vertical and horizontal live load requirements.
- .2 Detail and fabricate ladder to NAAMM Metal Stairs Manual.
- .3 Ensure that the elements on which the components in this section are fixed are strong enough to accept the additional stress imposed. Never compromise the structural integrity or the watertightness of an existing element. Plan, if necessary, any necessary reinforcement.

2.2 MATERIALS

- .1 Steel sections: to CSA G40.20/G40.21 Grade 300 W.
- .2 Steel plate: to CSA G40.20/G40.21, Grade 260 W.
- .3 Steel tubing: to CSA G40.20/G40.21, Grade 300 W., rectangular, at least 3 mm thick, of dimensions fitting with the indications on the architectural drawings and adaptable to the conditions measured and observed on site.
- .4 Welding materials: to CSA W59.
- .5 Bolts and steel anchor bolts:
 - .1 Suitable for earthquake-resistant structures and cracked concrete; suitable for elements to be anchored in concrete, in the required format for the elements to be supported depending on the loads and in accordance with standard ASTM A307.
 - .2 Other bolts (threaded or not with or without nut) of required format for the elements to be supported depending on the loads and in accordance with ASTM A307 and ASTM A325M for high strength bolts.

2.3 FABRICATION

- .1 Fabricate in accordance with NAAMM, Metal Stair Manual.
- .2 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.
- .3 Accurately form connections with exposed faces flush:
 - .1 Make mitres and joints tight.
 - .2 Make interval of the bars (steps) regular
 - .3 New sections of vertical uprights must be parallel to each other.
- .4 Grind or file exposed welds and steel sections smooth.

2.4 STEEL TUBING UPRIGHTS

- .1 Construct ladder uprights from steel tubing to match existing steel uprights.
- .2 Cap and weld exposed ends of balusters and handrails.
- .3 Steel fixing brackets should be used to attach the studs to existing concrete walls.

2.5 FINISHES

- .1 Steps (horizontal steel bars) must have a non-slip surface.

2.6 PAINTING

- .1 Clean surfaces in accordance with Steel Structures Painting Council Manual Volume 2.
- .2 Apply one coat of primer on all surfaces of ladder.
- .3 Apply one coat of anti-rust paint, “Safety Yellow” color (#EED202), on all surfaces of ladder.
- .4 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, grease. Min. temperature for painting 7 degrees C.
- .5 Surfaces to be field welded to be treated and painted as well.

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION OF LADDERS

- .1 Install in accordance with NAAMM, Metal Stair Manual.
- .2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting ladder to existing concrete walls.
- .3 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .4 Do welding work in accordance with CSA W59 unless specified otherwise.
- .5 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.

3.3 CLEANING

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .4 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .5 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 CONTENT

- .1 This section applies to fire and smoke protection assemblies that are not prescribed in any other section, in particular the sealing of walls needed in the elevator mechanical room and the sealing required behind the new surface elevator hall stations.
- .2 The fire and smoke protection assemblies used in the various assemblies must be coordinated with those prescribed in the other sections. Preferably, only one product, from the same manufacturer, should be used for all joints of the same kind throughout the structure.

1.2 RELATED REQUIREMENTS

- .1 Section 07 92 00 – Joint sealants
- .2 Section 09 91 23 – Interior Painting

1.3 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .2 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-05, Fire Tests of Fire stop Systems.

1.4 DEFINITIONS

- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Tightly Fitted; (ref: NBC Part 3.1.9.1(1) and 9.10.9.6(1)): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
 - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.5 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.
 - .2 Submit two copies of WHMIS SDS - Material Safety Data Sheets in accordance with Section 02 81 01- Hazardous Materials.
- .3 Quality assurance submittals: submit following in accordance with Section 01 45 00- Quality Control.
 - .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
 - .4 Guarantee:
 - .1 In accordance with the prescriptions of Division 1, submit a written warranty for the work covered by this section, for a period of three (3) years from the interim completion date.

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: person specializing in fire stopping installations.
- .2 Pre-Installation Meeting: convene pre-installation meeting one week prior to beginning work with Departmental Representative in accordance with Section 01 32 16.07- Construction Progress Schedule - Bar (GANTT) Chart to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle 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 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer and ULC markings.
- .2 Storage and Protection:
 - .1 Store materials in accordance with manufacturer's recommendations or in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended.
 - .2 Fire stop system rating:
 - .1 Reference product: Primerless single component silicone sealant for 1 and 2 hrs systems, ULC and FM certified.
 - .2 Reference product: non-combustible fiber reinforced, foamed cement mortar for 1 and 2 hrs systems, ULC and FM certified.
- .2 Fire stopping and smoke seal systems for surface hall stations: in accordance with CAN-ULC-S115.
 - .1 Polyurethane foam adaptable for small-sized openings.
 - .1 Reference product: Firestop and smoke-resistant two component spray polyurethane foam. In accordance with CAN-ULC-S115.
- .3 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .4 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .5 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .6 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .7 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .8 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .9 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .10 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

- .11 Sealants for vertical joints: non-sagging.

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 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
 - .1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

3.4 SEQUENCES OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Departmental Representative.
- .2 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.
- .3 Mechanical pipe insulation: certified fire stop system component.
 - .1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

3.6 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 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Top of fire-resistance rated masonry and gypsum board partitions.
 - .3 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .4 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .5 Openings and sleeves installed for future use through fire separations.
 - .6 Around mechanical and electrical assemblies penetrating fire separations.

END OF SECTION

Part 1 General

1.1 CONTENT

- .1 Materials, preparatory work and implementation methods associated with sealants and caulking.
- .2 Paragraphs intended to supplement other sections containing requirements relating to the sealing or caulking of structures.

1.2 RELATED REQUIREMENTS

- .1 Section 08 11 00 – Stainless-steel Doors and Frames
- .2 Section 09 58 00 – Integrated ceiling Assemblies

1.3 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C919-08, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
 - .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
 - .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .5 Underwriters' Laboratories of Canada
 - .1 ULC-S115-05, Standard Method of Fire Tests of Firestop Systems

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 joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
- .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 2 copies of WHMIS SDS in accordance with Section 01 35 29.06- Health and Safety Requirements.
- .3 Manufacturer's Instructions:
 - .1 Submit instructions to include installation instructions for each product used.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.

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 incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations or in clean, dry, well-ventilated area.
 - .2 Store and protect joint sealants from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19- Waste Management and Disposal.

1.7 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Proceed with installation of joint sealants only when:
 - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
 - .2 Joint substrates are dry.
 - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
 - .2 Joint-Width Conditions:
 - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
 - .3 Joint-Substrate Conditions:
 - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 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 (SDS) acceptable to Health Canada.
- .2 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans. Departmental Representative will arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of caulking and sealants.

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.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Acoustical sealant: to ULC-S115, ITS (STC) 52 minimum.
 - .1 Accepted products: Acrylic Latex Firestop Sealant
 - .2 Color: White
- .2 Preformed compressible and non-compressible back-up materials:

- .1 Extruded closed cell foam backer rod.
 - .1 Size: oversize 30 to 50%.
- .2 Bond breaker tape:
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT LOCATION

- .1 Perimeters of interior frames, as detailed and itemized on drawings.
- .2 Exposed interior control and expansion joints around suspended ceiling, as detailed and itemized on drawings. :

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

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 joint sealants 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 SURFACE PREPARATION

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

3.3 PRIMING

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

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

3.5 MIXING

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

3.6 APPLICATION

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

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Clean adjacent surfaces immediately.
 - .3 Remove excess and droppings, using recommended cleaners as work progresses.
 - .4 Remove masking tape after initial set of sealant.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

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 CONTENT

- .1 This section describes the requirements for, but not limited to, the supply and installation of metal edge protectors to double the landing door frames currently in place and to close existing side openings.

1.2 RELATED REQUIREMENTS

- .1 Section 07 92 00 – Joint Sealants

1.3 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 CSA Group (CSA)
 - .1 CSA-G40.20-04 /G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80-99, Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252-03, Standard Methods of Fire Tests of Door Assemblies.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .4 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
 - .5 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

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 metal framing and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.
 - .2 Low-Emitting Materials:
 - .1 Provide listing of adhesives and sealants, paints and coatings used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.5 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 19- Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Landing doors: framing of the existing metal frame, as shown on the drawings
 - .1 Stainless steel metal edge protector in accordance with CSA-G40.20 /G40.21 standards, similar in size and finish to the stainless steel of the existing landing door frame and of sufficient size in order to close the existing opening measured on the spot.

2.2 ADHESIVES

- .1 Metal edge protector:
 - .1 Adhesive according to the manufacturer's recommendations and so as to ensure long-term adhesion of the stainless steel edge protector.

2.3 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to face sizes as measured on the spot.
- .3 Manufacturer's nameplates on frames are not permitted.
- .4 Conceal fastenings except where exposed fastenings are indicated.

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 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.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Maintain continuity of system.

3.4 FINISH REPAIRS

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

END OF SECTION

Part 1 General

1.1 CONTENT

- .1 This section describes the requirements for, but not limited to, the supply and installation of the suspended ceiling section on Level C as well as the fasteners and anchors related to it.

1.2 RELATED REQUIREMENTS

- .1 Section 07 84 00 – Fire Stopping
- .2 Section 09 91 23 – Interior painting

1.3 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C635/C635M-07, Standard Specifications for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 - .2 ASTM C636/C636M-08, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.
- .3 CSA Group (CSA)
 - .1 CSA C22.2 No.9.0-96(R2011), General Requirements for Luminaires.
 - .2 CAN/CSA-C22.2 No.74-96(R2010), Equipment for Use with Electric Discharge Lamps.
- .4 Ceiling Systems Installation Handbook (CISCA)
- .5 American National Standard Institute (ANSI)/Illuminating Engineering Society of North America (IESNA)
 - .1 ANSI/IESNA RP-1-04, American National Standard Practice for Office Lighting.

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 ceiling assemblies and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Construction Waste Management:

- .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
- .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Submit maintenance materials in accordance with Section 01 78 00- Closeout Submittals.
 - .2 Supply maintenance materials of same production run as installed materials.
 - .3 Store maintenance materials where directed. Identify contents of cartons.

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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect ceiling assembly materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19- Waste Management and Disposal.

1.7 WARRANTY

- .1 Provide 5 year warranty for manufacturer's defects, chalking, peeling, and fading.

Part 2 Products

2.1 DESCRIPTION

- .1 Suspended ceiling system incorporating acoustical, lighting, air distribution, partition supporting elements, sprinkler, smoke detectors and fire protection rating as integral part of system.

2.2 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 Design integrated ceiling system to provide:

- .1 Type X gypsum board: Fire resistance rating of 1hour when used in a ULC design rated assembly.
- .2 Metal studs: galvanized steel material
- .2 Ensure suspension system is capable of withstanding seismic zone 4 acceleration and velocity forces in locations subject to seismic events.

2.3 MATERIALS

- .1 Suspension system:
 - .1 Metal suspension cable: intermediate duty system to ASTM C635
 - .2 Metal studs (92 mm)
- .2 Gypsum board:
 - .1 Type X (15.9 mm)
- .3 Bolts and steel anchor bolts:
 - .1 Suitable for earthquake-resistant structures and cracked concrete; suitable for elements to be anchored in concrete, in the required format for the elements to be supported depending on the loads and in accordance with standard ASTM A307.
 - .2 Other bolts (threaded or not with or without nut) of required format for the elements to be supported depending on the loads and in accordance with ASTM A307 and ASTM A325M for high strength bolts.

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 ceiling assemblies installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install integrated ceiling suspension system to ASTM C636 with hangers supported from building structural members at indicated heights.
- .2 Do not erect ceiling suspension system until anchors, blocking, sound or fire barriers, electrical and mechanical work above ceiling are inspected and approved by Departmental Representative.
- .3 Layout system according to architecture plans.
- .4 Ensure suspended system is co-ordinated with location of related components.

- .5 Establish ceiling elevation using laser. Install wall mould to provide correct ceiling height.
- .6 Install suspension assembly to manufacturer's instructions.
- .7 Install electrical light fixtures, air diffusers, smoke detectors and other required ceiling components to manufacturer's instructions. Provide stabilizing reinforcement, if necessary, as per manufacturer's instructions.
- .8 Install ceiling units in suspension system as per details.
- .9 In fire rated ceiling systems, secure lay-in panels with hold-down clips and protect over light fixtures, diffusers, air return grilles and other appurtenances according to ULC requirements.
- .10 Ensure ceiling is free of finger marks and touch-up scratched surfaces

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 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 92 00 – Joint sealants
- .2 Division 14 – Conveying Equipment

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM F1066-04(2010)e1, Standard Specification for Vinyl Composition Floor Tile.
 - .2 ASTM F1344-12e1, Standard Specification for Rubber Floor Tile.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
 - .2 CAN/CGSB-25.21-95, Detergent-Resistant Floor Polish.
- .3 South Coast Air Quality Management District (SCAQMD)
 - .1 SCAQMD Rule 1168-A2011, Adhesive and Sealant Applications.

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 resilient tile flooring and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit one (1) sample of floor tile in size specified in drawings.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Provide maintenance materials of resilient tile flooring, base and adhesive in accordance with Section 01 78 00- Closeout Submittals.
 - .2 Extra materials from same production run as installed materials.
 - .3 Identify each container of floor tile and each container of adhesive.
 - .4 Deliver to Departmental Representative, upon completion of the work of this section.

- .5 Store where directed by Departmental Representative.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations or in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: sort and recycle waste, when possible.

1.6 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Maintain air temperature and structural base temperature at flooring installation area above 20 degrees C for 48 hours before, during and for 48 hours after installation.

Part 2 Products

2.1 MATERIALS

- .1 Luxury Vinyl Tile (RS1): complying with ASTM F1700, class III.
 - .1 Acceptable product: High performance Luxury Vinyl Tile LVT, 500mm x 500mm x 4.5mm thickness, Color left to the Departmental Representative's choice, Resistant to scratches and scuffs.
- .2 Static load limit: 1500 psi (ASTM F970)
- .3 Factory finish
- .4 Slip resistance: (ASTM D2047) > 0.55 wet/dry, ADA compliant
- .5 Primer and adhesive: following manufacturer's recommendations
- .6 Polishes: following manufacturer's recommendations
- .7 Adhesive: VOC content of at most 150 g/L and complying to SCAQMD Rule no.1168.
- .8 Filler and smoothing plaster for support: according to the recommendations of the flooring manufacturer.
- .9 Sealer: if necessary and following manufacturer's recommendations.

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 resilient tile flooring 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 INSPECTION

- .1 Ensure concrete floors are dry, by using test methods recommended by tile manufacturer.

3.3 SUB-FLOOR TREATMENT

- .1 Remove existing resilient flooring.
- .2 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.
- .3 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .4 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .5 Seal or prime flooring following manufacturers printed instructions.

3.4 TILE APPLICATION

- .1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system. Maintain extra ventilation for at least one month following building occupation.
- .2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring with joints parallel to elevator cabin lines to produce symmetrical tile pattern. Start pattern of solid tiles from the middle of the sidewall adjacent to the doors, as seen on the new cabin plan.
- .4 Install flooring tiles in a square, non-directional grid pattern, with aligned and tight joints.
- .5 As installation progresses and in accordance with flooring manufacturer's instructions, and after installation, roll flooring in 2 directions on resilient tile flooring with 45 kg minimum roller to ensure full adhesion.
- .6 Cut tile and fit neatly around fixed objects.

- .7 Install feature strips and floor markings where indicated. Fit joints tightly.
- .8 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
 - .1 Clean resilient tile flooring surfaces to flooring manufacturer's printed instructions.
- .3 Remove excess adhesive from floor, base and wall surfaces without damage.
- .4 Do not seal or wax the newly coated floor, as specified by the manufacturer's instructions.
- .5 Waste Management: separate waste materials for recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

- .1 Protect new floors from time of final set of adhesive until final inspection.
- .2 Prohibit traffic on floor for 48 hours after installation.

END OF SECTION

Part 1 General

1.1 CONTENT

- .1 This section describes the requirements relating to, but not limited to, the supply and installation of epoxy floor coating, the preparation and leveling of surfaces, as well as all related accessories.

1.2 RELATED REQUIREMENTS

- .1 Section 07 92 00 – Joint sealants

1.3 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C307-03(2012), Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
 - .2 ASTM C413-01(2012), Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing.
 - .3 ASTM C579-01(2012), Standard Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concretes.
 - .4 ASTM C580-02(2012), Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - .5 ASTM C882/C882M-13a, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
 - .6 ASTM C883-89, Standard Test Method for Effective Shrinkage of Epoxy-Resin Systems Used with Concrete.
 - .7 ASTM D638-10, Standard Test Method for Tensile Properties of Plastics.
 - .8 ASTM D1044-13, Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.
 - .9 ASTM D1308-02(2013), Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
 - .10 ASTM D2047-11, Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
- .2 American Concrete Institute (ACI)
 - .1 ACI 503R-93 (R1998), Use of Epoxy Compounds with Concrete
- .3 Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety data Sheet (SDS).

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 epoxy floor coatings and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06- Health and Safety Requirements. Indicate VOC's during application and curing.
- .3 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: company or person experienced in performing work of this section with documented experience.

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 in accordance with manufacturer's recommendations or in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19- Waste Management and Disposal.

1.7 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Moisture: ensure substrate is within moisture limits prescribed by manufacturer.
 - .2 Temperature: maintain ambient temperature in accordance with manufacturer's written instructions.

- .3 Relative humidity: maintain relative humidity [in accordance with manufacturer's written instructions.
- .4 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

1.8 WARRANTY

- .1 Warranty: five (5) years against delamination of epoxy flooring system from substrate, and other failure of system to provide complete, integral, seamless floor covering meeting specified performance requirements.

Part 2 Products

2.1 MANUFACTURER

- .1 Epoxy flooring materials from same manufacturer.
- .2 Ensure compatibility for epoxy flooring materials including primers, resins, hardening agents, finish coats and sealer coats.

2.2 MATERIALS

- .1 Materials: as required to achieve specified performance criteria; functionally compatible with adjacent materials and components.
- .2 Seamless epoxy floor coating (**EP01**)
 - .1 Two-part, water-based, solvent-free, coloured, epoxy resin coating for interior concrete.

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 epoxy floor coating applications in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Prepare substrate surfaces in accordance with epoxy floor coating material manufacturer's instructions.

3.3 PREPARATION OF CONCRETE FLOOR SUBSTRATES

- .1 Ensure work penetrating substrate has been completed before preparing substrate and applying coating.
- .2 Protect coated surfaces, equipment, fixtures and fittings.
- .3 Clean and prepare surfaces in accordance with the manufacturer's instructions.
 - .1 The concrete must be clean, dry and free of contaminants such as oil or grease, laitance, dirt, wax or any other foreign matter
 - .2 Before applying the coating, remove any dust and loose material from the surfaces to be coated.
 - .3 If the concrete has previously been painted, it is important to remove the old paint using mechanical means, such as water blast, grinding or sanding.
- .4 Existing cracks in concrete must be filled prior to the work.
 - .1 Comply with manufacturer's instructions regarding the sealing products to be applied. The choice of product will depend on the extent of the crack.

3.4 INSTALLATION

- .1 Comply with manufacturer's instructions.
- .2 Prime clean concrete subfloor as recommended by manufacturer.
- .3 Apply epoxy sub-floor filler to cracks, depressions and low spots to achieve floor level to a tolerance of 1:500; allow to cure.
- .4 Install epoxy floor coating material at the rate and to thickness required to achieve complete conformance with the specified performance requirements.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

- .1 Protection: protect installed product and finish surfaces from damage during construction.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 05 51 00 – Metal stairs and Ladders
- .2 Section 07 92 00 – Joint sealants
- .3 Section 08 11 00 – Stainless-steel Doors and Frames
- .4 Section 09 58 00 – Integrated ceiling Assemblies
- .5 Divison 21 – Fire Suppression
- .6 Divison 22 – Plumbing
- .7 Divison 23 – HVAC
- .8 Division 26 – Electricity

1.2 REFERENCE STANDARDS

- .1 Environmental Protection Agency (EPA)
 - .1 Canadian Environmental Protection Act, 1999 and related Documents, ch.33
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .3 Master Painters Institute (MPI)
 - .1 The Master Painters Institute (MPI)/Architectural Painting Specification Manual (ASM) - current edition.
- .4 National Research Council Canada (NRC)
 - .1 National Fire Code of Canada 2015 (NFC).
- .5 Society for Protective Coatings (SSPC)
 - .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Submit work schedule for various stages of painting to Departmental Representative for review. Provide schedule minimum of 24 hours in advance of proposed operations.
 - .2 Obtain written authorization from Departmental Representative for changes in work schedule.
 - .3 Establish schedule so as to disturb the occupants of the building as little as possible.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06- Health and Safety Requirements.
 - .3 Confirm products to be used are in MPI's approved product list.
- .3 Upon completion, provide records of products used. List products in relation to finish system and include the following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour number(s).
 - .4 MPI Environmentally Friendly classification system rating.
 - .5 Manufacturer's Material Safety Data Sheets (SDS).
 - .6 MPI # (_____)
- .4 Test reports: if applicable, provide 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: Provide certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties. MPI Gateway #.
- .6 Manufacturer's Instructions:
 - .1 Provide manufacturer's installation and application instructions.
- .7 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Provide project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Provide calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.
 - .2 Low-Emitting Materials:
 - .1 Provide listing of adhesives and sealants, paints and coatings used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into manual.
- .3 Include:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1.7 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor: to have a minimum of 5 years proven satisfactory experience. When requested, provide list of last 2 comparable jobs including, job name and location, specifying authority, and project manager.
 - .2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work.
 - .3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.
 - .4 Conform to latest MPI requirements for exterior painting work including preparation and priming.
 - .5 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.
 - .6 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by Departmental Representative.
 - .7 Standard of Acceptance:
 - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
 - .2 Soffits: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
- .2 Mock-Ups:
 - .1 When requested by Departmental Representative, prepare and paint designated surface, area, room or item to requirements specified herein, with specified paint or coating showing selected colours, number of coats, gloss/sheen, textures and

quality of work to MPI Painting Specification Manual standards for review and approval.

- .2 Construct required mock-ups in accordance with Section 01 45 00- Quality Control.
 - .1 Required mock-ups will be used:
 - .1 To judge quality of work, substrate preparation, operation of equipment and material application and skill to MPI Architectural Painting Specification Manual standards.
 - .2 Locate where directed by Departmental Representative.
 - .3 Allow 24 hours for inspection of mock-up before proceeding with Work.
 - .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.8 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.
 - .1 Labels: to indicate:
 - .1 Type of paint or coating.
 - .2 Compliance with applicable standard.
 - .3 Colour number in accordance with established colour schedule.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Observe manufacturer's recommendations for storage and handling.
 - .3 Store materials and supplies away from heat generating devices.
 - .4 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
 - .5 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative.
 - .6 Remove paint materials from storage only in quantities required for same day use.
 - .7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
 - .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 the National Fire Code of Canada (NFC).
- .4 Develop Construction Waste Management Plan related to Work of this section.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19- Waste Management and Disposal.

1.9 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces in accordance.
 - .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 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .5 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.
 - .6 Provide minimum lighting level of 323 Lux on surfaces to be painted.
 - .7 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless pre-approved written approval by Departmental Representative or 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 manufacturer's 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 12 % for concrete and masonry (clay and concrete brick/block). Allow new concrete and masonry to cure minimum of 28 days.
 - .2 15 % for hard wood.
 - .3 17 % for soft wood.
 - .4 12 % for plaster and gypsum board.
- .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.
- .8 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.
- .9 Additional interior application requirements:
 - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

- .1 Environmental Performance Requirements:
 - .1 Provide paint products meeting MPI "Environmentally Friendly" ratings based on VOC (EPA Method 24) content levels.
 - .2 Green Performance in accordance with MPI Standard.

2.2 MATERIALS

- .1 Only 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 "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 Provide paint products meeting MPI "Environmentally Friendly" ratings based on VOC (EPA Method 24) content levels.
- .6 Use MPI listed materials where indoor air quality (odour) requirements exist.

2.3 COLOURS

- .1 Submit proposed Colour Schedule for review to Departmental Representative.
- .2 Selection of colours will be from manufacturers full range of colours.
- .3 Where specific products are available in restricted range of colours, selection based on limited range.
- .4 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats, if requested by Departmental Representative.
- .5 For deep and ultra deep colours; 4 coats may be required.

2.4 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Departmental Representative for tinting of painting materials.
- .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.
- .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. Strain as necessary.

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.

2.6 INTERIOR PAINTING SYSTEMS

- .1 Plaster and plasterboard: in particular plasterboard wall coverings on elevator landings, drywall and plasterboard coverings for suspended ceilings on Lvl. C and in Elevator Mechanical Room on Lvl. A: **System n°. P1:**
 - .1 Apply one (1) coat of commercial Zero VOC interior latex primer, mat 0-5 units @85°, VOC <50g / l
 - .2 Apply two (2) coats of Zero VOC interior Low gloss Eg-Shel 100% acrylic (5-7 units @60°), VOC <50g / l
- .2 Vertical concrete wall surfaces: in particular wall surfaces in the Mechanical Elevator Room on Lvl. A. **System n°. P2:**
 - .1 Apply one (1) coat of interior / exterior commercial high-strength block filler formulated for masonry, mat 0-5 units @85 °, VOC <50g / l
 - .2 Apply two (2) coats of fast-drying acrylic Eg-shel coating (20-30 units @85 °) 100% acrylic Int / ext, VOC <50g / l.
- .3 Metal surfaces: service ladder leading to the bottom of the elevator pit. **System n°. P3:**
 - .1 Apply one (1) coat of primer for the entire steel ladder.
 - .2 Apply one (1) coat of "yellow safety" anti-rust paint on the entire steel ladder.

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 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.
- .3 Paint walls and ceilings before installing new mechanical and electrical equipment; touch up painted surfaces after installation.

3.3 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted 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.
- .2 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.
 - .3 Maximum moisture content as follows:
 - .1 Stucco, plaster and gypsum board: 12%.
 - .2 Concrete: 12%.
 - .3 Clay and Concrete Block/Brick: 12%.
 - .4 Hard Wood: 15%.
 - .5 Soft Wood: 17%.

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 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.
- .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, wiping with dry, clean cloths or compressed air.
 - .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 pretreatment as soon as possible after cleaning and before deterioration occurs.
 - .5 Clean metallic supports (surfaces) to be painted or repainted, in accordance with standard SSPC-SP-3, with an electric tool in order to remove traces of rust, flaking scales, welding slag, and deteriorated paint layers.
 - .6 Touch up of shop primers with primer as specified.
 - .7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible

3.5 EXISTING CONDITIONS

- .1 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" and report findings to Departmental Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .2 Maximum moisture content as follows:
 - .1 Stucco: 12 %.
 - .2 Concrete: 12 %.
 - .3 Clay and Concrete Block/Brick: 12 %.
 - .4 Hard Wood: 15 %.
 - .5 Soft Wood: 17%.

3.6 APPLICATION

- .1 Method of application to be as approved by Departmental Representative. 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.
 - .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.
- .3 Spray application:
 - .1 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.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
 - .4 Brush out immediately all runs and sags.
 - .5 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 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .10 Finish closets and alcoves as specified for adjoining rooms.
- .11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.
- .12 Wood, drywall, plaster, stucco, concrete, concrete masonry units and brick; if sprayed, must be back rolled.

3.7 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Except where indicated in the plans and specifications of other disciplines (elevator; mechanics; electricity), leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .2 Do not paint over nameplates.
- .3 Keep sprinkler heads free of paint.
- .4 Do not paint interior transformers and substation equipment.

3.8 SITE TOLERANCES

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.9 FIELD QUALITY CONTROL

- .1 Field inspection of painting operations to be carried out, if deemed necessary, by independent inspection firm designated by Departmental Representative.
- .2 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .3 Cooperate with inspection firm and provide access to areas of work.
- .4 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19- Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.11 RESTORATION

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings 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.

END OF SECTION

The original of this technological document has been issued and authenticated by Patrick Rainville, Eng (OIQ 139485) on January 13, 2020.

SECTION 14 20 00: GENERAL

PART 1 - GENERAL REQUIREMENTS

1.1 BASE REQUIREMENT

- .1 Conform to requirements of division 01.

1.2 SCOPE

- .1 This specification is for the modernization and maintenance of the elevator of the Research and Development Centre in Sherbrooke (QC).
- .2 Provide labour, materials, products, equipment and services necessary to:
 - .1 modernize an hydraulic elevator as specified in section 14 24 23 of this specification;
 - .2 maintain this elevator as specified in section 14 90 00 of this specification for a period of one year after the elevator has been put back in service following its modernization.

1.3 DEFINITION OF TERMS

- .1 The term "Owner", as used herein, refers to Public Services and Procurement Canada (PSPC).
- .2 The term "Architect", as used herein, refers to DFS Inc. Architecture & Design.
- .3 The term "Engineer", as used herein, refers to KJA Consultants Inc.
- .4 The term "vertical transportation contractor", "elevator contractor" or "Contractor", as used herein, refers to any person, partners, firm or corporation having a contract with the Owner or general contractor to supply materials and labour for the execution of the work herein described.
- .5 The term "sub-contractor", as used herein, refers to any person, partners, firm or corporation having a contract with the contractor to furnish labour and materials for the execution of the work herein described.
- .6 The terms "inspecting authorities" and "regulatory authorities", as used herein, refers to authorized agents of governments and of insurance groups which are charged with the responsibility of carrying out periodic inspections and tests on vertical transportation equipment.
- .7 The term "provide" means to supply and install the equipment.
- .8 The term "arrange" means to provide the features as indicated.

- .9 The term "unit" means any elevator mentioned in this specification.
- .10 Unless otherwise indicated, the term "Code" refers to the version in effect in Québec of the CAN/CSA-B44 Safety Code for Elevators and Escalators with addendum and updates and including Nonmandatory Appendices (which are deemed mandatory herein) and to the CSA B44.2 code for Maintenance requirements and intervals for elevators, dumbwaiters, escalators, and moving walks.
- .11 Terms in this specification that are not otherwise defined shall have the definitions as given in the Code.

1.4 SINGULAR AND PLURAL

- .1 In all cases singular and plural shall be interchangeable and shall be applied as required to meet the sense and intent of the Specifications.
- .2 Where the singular is employed it shall be interpreted as necessary, unless otherwise indicated, to apply to all equipment and devices required to produce a complete installation.

1.5 MEASUREMENT UNITS

- .1 In these Specifications, measurements in Imperial units are provided for reference purpose only.
- .2 In the event of contradictions between values in ISO and Imperial units, values in ISO units prevail.

1.6 SUBMISSION OF PROPOSAL

- .1 Submission of a proposal will be considered presumptive evidence that the proposer is conversant with local facilities and conditions, requirements of the Contract Documents and of pertinent provincial and local codes, state of labour and material markets, and in the proposal has made due allowance for all contingencies.

1.7 TAXES

- .1 Include all local, provincial (except applicable provincial sales tax) and federal taxes (except applicable GST) or assessments in effect at the time of the signing of the contract.
- .2 Show on the proposal form the amount of each tax included.
- .3 The Contractor is liable for the above mentioned taxes or assessments whether or not specifically mentioned in his proposal or in the final contract document.
- .4 In the event new taxes or assessments, to become due on completion of the contract, are imposed after the signing of the contract these are to be paid, in addition to the original contract amount, by the Owner to the Contractor, who in

turn is to pay them to the proper authorities. Reciprocally if any of the above mentioned taxes or assessments in effect at the signing of the contract should be revoked before consummation of the contract, rebate to the Owner the amount included in the original contract.

1.8 ACKNOWLEDGMENTS

- .1 The proposer acknowledges that the proposer has found no discrepancies nor any ambiguities in the specifications.
- .2 The proposer acknowledges that the related work by other trades as set out in the specifications is adequate for the proposer's equipment.

1.9 SUBCONTRACTORS

- .1 Bind subcontractors to all applicable portions of the Specifications.
- .2 The contractor shall be responsible for all actions and all work performed by its subcontractors to the same extent as the contractor is itself responsible under the Specifications.

1.10 WITHDRAWAL OR REJECTION OF PROPOSALS

- .1 The Owner reserves the right to reject any or all proposals or to waive any conditions.
- .2 Proposals may not be withdrawn until sixty days after the scheduled date for the receipt of the proposals.

1.11 INFORMATION WITH PROPOSAL

- .1 Provide the following information, where relevant, with the proposal:
 - .1 The model and manufacturer of such items as solid state drives, fixtures, control systems, door operators and other purchased material (with the exception of miscellaneous minor items);
 - .2 The current rating of the solid state drives;
 - .3 The kVA rating of the transformers feeding the solid state drives;
 - .4 Certification from an independent testing laboratory detailing the line pollution generated by the solid state drives;
 - .5 Certification from an independent testing laboratory detailing the extent to which the control systems are protected against external electromagnetic radiation;
 - .6 Brochures, descriptions and manuals for the major items;
 - .7 Renderings or samples of the fixtures and exposed materials;

- .8 Detailed completion schedule for the work;
- .9 A copy of your safety policy as issued to your employees;
- .10 Mechanic and team regular and overtime hourly rates.

1.12 COMPLETION SCHEDULE: MODERNIZATION

- .1 Submit with the proposal, a detailed schedule including specific dates for equipment delivery times, start of site work, completion of each unit and resolution of all noted deficiencies.
- .2 During the modernization period give the following information to the engineer:
 - .1 Revisions, if necessary, to the completion schedule;
 - .2 A progress report every month showing the progress being made and the percentage of the job completed;
 - .3 Two weeks advance notice for inspection by the engineer.
- .3 Schedule a job site meeting with the Owner every two weeks during the modernization period.

1.13 ASSIGNMENTS

- .1 Do not assign nor sublet the contract without the written consent of the Owner.
- .2 Do not assign any payment due or to become due as a result of this contract without the written consent of the Owner.

1.14 CODES AND ORDINANCES

- .1 Supply equipment and do work in accordance with building codes, by-laws, regulations and requirements of the local, provincial and federal authorities in effect at the time of the execution of the work.
- .2 Supply equipment and do work in accordance with the Code, and any other code which may govern the requirements of the installation.
- .3 Comply with the requirements of the Occupational Health and Safety Act and Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .4 Prior to submission of the proposal and throughout the duration of work, give prompt notification in writing of any regulations or requirements known to be in process which might affect the acceptability of the work.

- .5 If changes in codes or regulations result in extra costs, those taking effect subsequent to the date of proposal submission shall be treated as an extra to the contract.

1.15 PERSONNEL

- .1 Supervise your personnel so that they present a neat appearance and their movement in the building is within the requirements of their work.
- .2 Provide uniforms or other obvious means of identification for personnel.

1.16 LIABILITY INSURANCE

- .1 Provide, during the period this contract is in force, premises liability, including public liability insurance and property damage insurance in the amount of \$5,000,000 inclusive, to be covered against any claims for damage to property or for personal injury, including death, which may arise from operation under this contract, whether such operation is by yourself or by any subcontractor or anyone directly or indirectly employed by you.
- .2 Upon completion of the contract, have in force a completed operations and products liability insurance, in the amount of \$5,000,000 inclusive, to be covered against any claims for damages to property or for personal injury, including death, which may arise after the premises liability is terminated. This insurance shall remain in force for a minimum period of two years after completion of the contract.
- .3 Submit certificates of such insurance with the Owner before work is begun.
- .4 The certificates shall state that the insurance will not become ineffective without sufficient written notice to the Owner.

1.17 EQUIPMENT INSURANCE

- .1 The Owner's insurance policy covers equipment actually in place in the building and accepted by the Owner.
- .2 All other material and equipment is not included in the Owner's policy and such material and equipment is stored at the Contractor's own risk.

1.18 LABOUR LAWS

- .1 Comply with applicable provisions of federal, provincial and local labour laws and with applicable union regulations.
- .2 Perform all field labour with members of the appropriate certified union.

1.19 PATENTS

- .1 Hold and save the Owner and its officers, agents, servants and employees harmless from liability due to patent or copyright infringement arising from the use

of, in the performance of the work or in the completed installation, any invention, process, article, or appliance.

1.20 CHANGES IN WORK

- .1 The Owner, without invalidating the contract, may order extra work or make changes by altering, adding to, or deducting from the work, the contract sum being adjusted as agreed.
- .2 Execute all such work under the conditions of the original contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.
- .3 The Engineer shall have authority to make minor changes in the work, not involving extra cost and not inconsistent with the purpose of the contract.
- .4 Otherwise do no extra work nor make any change unless in pursuance of written order from the Owner.

1.21 CLAIMS FOR EXTRA COST

- .1 Give any claims for extra cost due to instructions or otherwise, to the Owner in writing within a reasonable time after the instructions and in any event before proceeding with the work.
- .2 No such claim shall be valid unless so made, and authorized in writing by the Owner.

1.22 OVERTIME PREMIUM

- .1 In the event that the Owner, for whatever reason, pays for overtime worked to complete the work as set out in the Specifications, he shall pay the added cost of the overtime plus twenty-one percent for all miscellaneous charges such as overhead, inefficiency, et cetera.
- .2 The added cost shall be the difference between the actual overtime cost and actual straight time cost.
- .3 The actual cost shall be that amount that the Contractor is required to pay to his employees on the job site together with any amounts that he is required to pay on their behalf in contributions to various fringe benefits.
- .4 Obtain from the Owner prior written authorization for overtime to be worked and chargeable, as described above, to the Owner. This authorization shall be for specific amounts and for specific times.
- .5 Submit time sheets for all such overtime worked for approval to the Owner or his designated representative within 48 hours of the time that such overtime is worked.

- .6 If the procedures as set out above are not followed, assume all costs of the time worked.
- .7 Do not charge the premium for work already required in overtime as set out in the Specifications.

1.23 OVERTIME PROVISIONS

- .1 Include overtime labour for work necessary to complete the job, such as emergency power testing, fire alarm testing and work that will cause a major disruption of service to the building.

1.24 REQUEST FOR PAYMENT

- .1 Submit monthly applications for payment with the necessary data, information, waivers and affidavits.

1.25 PROGRESS PAYMENTS: MODERNIZATION WORK

- .1 Progress payments will be based upon the percentage of the work complete for each item listed in the table below multiplied by that item's contribution to the total contract price:

	Contribution (%)
Material	60
Pumping unit	6
Jack	10
Controller	10
Hall entrances	2
Door operator	2
Cab	10
Car and hall fixtures	5
Electrical wiring	5
Operation manual	5
Electrical schematics	5
Labour	40
Pumping unit	5
Jack	7
Controller	5
Hall entrances	3
Door operator	2
Cab	5
Car and hall fixtures	3
Electrical wiring	5
Adjusting and testing	5
Total	100

- .2 No payment shall be made prior to commencement of work on site.
- .3 Payments due to material on site shall be based on the material that is installed or may normally be installed within 30 days.

- .4 Payments will be subject to the hold-back indicated in Division 01 to be released within 30 days after final acceptance.

1.26 LIENS AND AFFIDAVITS

- .1 The final payment and any part of the retained percentage shall not become due until the contractor has delivered to the Owner a complete release of liens arising out of this contract or receipts in full in lieu thereof.
- .2 Furnish an affidavit to the Owner that the release or receipts include labour and materials for which a lien could be filed.
- .3 If any lien remains unsatisfied after all payments are made, refund to the Owner monies that the latter may be compelled to pay in discharging such a lien, including costs and reasonable legal fees.

1.27 PAYMENT WITHHELD

- .1 Approval for payment may be withheld to such extent as may be necessary on account of:
 - .1 Defective work not remedied;
 - .2 Claims filed or reasonable evidence indicating probable filing of claims;
 - .3 Failure of contractor to make payments properly to subcontractors or for material and labour;
 - .4 Failure to work to schedule;
 - .5 A reasonable doubt that the contract can be completed for the balance then unpaid;
 - .6 Damage to the building or another contractor.
- .2 When the above grounds are removed, payment will be made for amount withheld.

1.28 FAILURE TO PERFORM

- .1 If the contractor shall neglect to prosecute the work properly or fail to perform any provision of the contract, the Owner after ten days written notice to the contractor may, without prejudice to any other remedy he may have, make good such deficiencies and may deduct the cost therefrom from payment due to the contractor.

1.29 DEFECTIVE WORK AND NON-PERFORMANCE

- .1 The Owner reserves the right to correct any defective work and to charge the cost to the contractor.

- .2 Should the contractor fail to execute any of the work set out in the contract the Owner reserves the right to do this work and to charge the cost to the contractor.
- .3 The Owner reserves the right to withhold payment in the event of non-performance or to pay only for that portion of the work that has been executed.
- .4 The Owner will give reasonable notice in writing prior to taking such action unless the defective work or non-performance prejudices the safety of the installation.

1.30 ACCELERATION OF WORK

- .1 If the work falls behind the schedule, take action as necessary to meet the schedule, including, but not limited to, extra personnel and overtime work.
- .2 Pay any costs associated with this action unless the delay is caused by acts of government, riot, civil commotion, war, malicious mischief, act of God or any cause beyond the control of the contractor.

1.31 INABILITY TO COMPLETE CONTRACT

- .1 Should there be a reasonable doubt that the work can be completed within the scheduled time because of labour disputes or any other cause, the Owner reserves the right, at the Owner's option, to cancel the contract.
- .2 In the event this option is exercised, the payments for the work shall be made on a pro rata basis for materials and labour supplied to the time of cancellation and such material and work performed shall become the property of the Owner.
- .3 Prior to exercising this option, the Owner shall give two weeks notice in writing of intention to cancel.

1.32 MEASUREMENTS

- .1 In the execution of the work, verify all dimensions with the actual conditions in order to do a perfect job.

1.33 OPERATING ENVIRONMENT

- .1 Arrange that the equipment be capable of operating normally and within the requirements of the specifications when the ambient temperature is between 3°C (38°F) and 36°C (97°F).
- .2 Arrange that the equipment be capable of operating normally and within the requirements of the specifications when the supply voltage is within minus 15% and plus 10% of the nominal voltage and the frequency is within 5% of the nominal frequency.
- .3 Provide the equipment necessary to meet the applicable seismic requirements.

1.34 EXISTING EQUIPMENT: CHECKING

- .1 If, prior to, or during the course of carrying out the work items are discovered which are unsafe, or which may cause unsatisfactory operation following the completion of the work being done under the contract, bring such matters to the attention of the Engineer without delay.

1.35 MATERIALS VALIDITY CHECK

- .1 Perform a general materials validity check of components and fastenings that under failure might create a dangerous situation, including, but not limited to, sheave bolts, welds, car slings, gears, worm shafts, sheave shafts, brakes, safeties, guide rails, car platform and any other retained component.

1.36 EXISTING DRAWINGS

- .1 The Owner will provide, if available, existing elevator layout drawings.

1.37 EXISTING CONDITIONS

- .1 Provide additional material and labour necessary to modify the elevator equipment to suit the existing site conditions, in order to complete the work as set out herein and to obtain elevator licences and approvals.

1.38 OCCUPIED BUILDING

- .1 This is an occupied building and normal building routine will have to carry on while this work is being done.
- .2 Take proper care to avoid unnecessary noise, clutter or obstruction in pedestrian areas, and arrange for storage of materials and tools where they will cause minimum inconvenience.
- .3 Where excessive noise or obstruction is in certain cases unavoidable, advise the Owner ahead of time and make suitable arrangements.
- .4 The Owner will allow access to the building and to the work site at times designated by the Owner.
- .5 The Owner will assign storage space for materials and tools but the Contractor shall provide its own locked tool chests.
- .6 The Owner will allow the contractor's personnel to use designated washrooms.
- .7 Perform work which interferes with tenant comfort at the times specified by the Owner.
- .8 Interruptions in building services shall be coordinated with the Owner and shall be planned minimum five working days before the start of the planned interruption.

1.39 PLANS AND SPECIFICATIONS

- .1 Keep on site the following documents:

- .1 These specifications;
- .2 Layouts and electrical diagrams both sealed and signed by the engineer of the manufacturer.

1.40 ACCESS FOR CAB WORK

- .1 The Owner will arrange for access to the elevator for cab work, at a floor selected by the Owner.
- .2 The selected floor will not be the main floor.
- .3 It will be necessary to allow passage through the elevator lobby at the selected floor at all times; the corridor cannot be completely obstructed.

1.41 REMOVAL OF EXISTING EQUIPMENT

- .1 Remove and take possession of any existing equipment that is replaced in the course of the execution of the work.
- .2 Remove equipment with prior permission of, and only at times specified by, the Owner.
- .3 Remove and transfer to the Owner equipment that the Owner elects to retain for the Owner's use.

1.42 WORK SITE PROTECTION

- .1 Provide, maintain and, after the work is complete, remove protective hoarding around the work site.
- .2 Arrange the protective hoarding so as to prevent public access to the work site.

1.43 PROTECTION OF WORK AND PROPERTY

- .1 Maintain protection of work and protect the Owner's property from injury or loss arising out of the execution of this contract.
- .2 Make good any injury or loss caused by your agents or employees.
- .3 Take all necessary precautions to ensure that the work is done in a manner that does not endanger any person.

1.44 EQUIPMENT MOVING

- .1 Provide floor protection and bracing so that equipment moving causes no damage to the building.

1.45 HOISTWAY PROTECTION

- .1 Provide, maintain and, after the work is complete, remove any partitions required in the hoistway.

- .2 Provide, maintain and, after the work is complete, remove protective hoarding required at openings into the hoistway.
- .3 Submit the design and finish of the protective hoarding for review.

1.46 REMOVAL OF RUBBISH

- .1 Remove all rubbish, keep the building and premises clean during the progress of the work, and leave the premises at completion in perfect condition as far as the work under the specifications is concerned.

1.47 ENVIRONMENTAL CONSIDERATIONS

- .1 Where practicable recycle material replaced in the course of the work.
- .2 Provide a list of materials to be removed from site and their proposed recycling or disposal location for approval prior to commencing work.
- .3 Where practicable provide new materials manufactured by methods that do not adversely affect the environment by, for example, generating residual deposits of heavy elements and greenhouse gases.
- .4 Use materials on site, such as low VOC (Volatile Organic Compound) adhesives, that will not negatively affect the in-building environment.
- .5 Use only adhesives that comply with the requirements of SCAQMD Rule #1168.

1.48 MATERIALS AND WORKMANSHIP

- .1 Provide all new materials and equipment.
- .2 Install equipment in a neat, accurate, workmanlike manner.

1.49 GENERIC EQUIPMENT

- .1 Provide generic equipment that can be purchased, installed and maintained by any competent vertical transportation contractor.
- .2 Provide equipment that has been installed within the province by at least four different vertical transportation contractors.
- .3 Provide generic controls from MCE, GAL, Automatisation JRT or an approved equivalent.
- .4 Provide proven components that have been used during the last two years as a minimum.
- .5 Provide a written guarantee from the control manufacturer that over the life of the installation software and firmware updates will be provided at no charge to the Owner.

1.50 FIXTURE TYPE: GENERIC

- .1 Provide, unless otherwise indicated in the Specifications or Drawings, signal fixtures manufactured by MAD, including "BS Classic" buttons with red illumination and "Julius - Flush Mount" black tactile plates.
- .2 Provide push buttons with metal targets.
- .3 Provide, unless otherwise indicated in the Specifications or Drawings, signal fixtures in an illumination colour selected by the Owner.
- .4 Submit illustrations of those types available and provide at least one physical button sample of the type selected by the Owner for final approval.

1.51 LANGUAGES: FRENCH AND ENGLISH

- .1 Provide messages, text of signage and markings visible to the public in French first, then in English.
- .2 Where allowed by Code, provide only pictograms.
- .3 Provide documentation including manuals in French - it is however acceptable to provide in English technical information intended to be used only by elevator personnel if this documentation has never been published in French.

1.52 GENERIC MAINTENANCE

- .1 Arrange that the equipment can be maintained and adjusted by any competent elevator company without the use of proprietary tools, information or equipment or, if such tools, information or equipment are required, provide them (these shall become the property of the Owner).
- .2 Provide a customer tool or such similar device if necessary to carry out full load overspeed safety tests or other similar tests (for temporarily bypassing the appropriate circuits).
- .3 Offer to the Owner updates to the system software, from time to time as may be required to keep it current.
- .4 Offer these updates to the Owner at standard market prices such as those charged to government agencies.
- .5 Do not incorporate any running time, cycle counters or trip counters that would cause the equipment to shut down or alter its operation in any way.

1.53 OPERATION BY HANDICAPPED PERSONS

- .1 Arrange all controls and fixtures so that they can be readily operated by handicapped persons as described in Appendix E of the Code.

1.54 PAINTING

- .1 Ensure that machine room and hoistway equipment, except for machined surfaces and non-rusting surfaces, is protected with rust inhibiting primer of a neutral colour.
- .2 Where rust has developed on the existing equipment, brush the surface to the bare metal and re-paint.

1.55 FINISHES: STAINLESS STEEL

- .1 Provide, unless otherwise indicated in the Specifications or on the Architect's plans, stainless steel number four finish for visible natural metal finishes such as those used on fixtures.
- .2 Arrange, unless otherwise indicated in the Specifications or on the Architect's plans, that the brush or grain direction of finishes of visible natural metals be vertical.

1.56 RETAINED EQUIPMENT

- .1 In the event that retained equipment is in conflict with or incompatible with the new equipment, or is in conflict with alteration Code requirements, note this on the proposal form.
- .2 If no conflicts are noted on the proposal form, pay for any changes or necessary equipment that may be required to complete the work.

1.57 EXISTING EQUIPMENT: REFURBISHING

- .1 Refurbish the retained existing equipment; cleaning, reworking or replacing worn parts, refinishing and adjusting so that the appearance and performance of the equipment are as new and so that the completed modernization is the equivalent of a new installation.

1.58 TRADE MARKS

- .1 Do not apply trade marks visible to the general public on any piece of equipment.

1.59 ORGANIZATION CHART

- .1 Provide to the Owner an organization chart from the local supervisory level up.
- .2 Provide to the Owner the names, positions and experience of the field and supervisory personnel associated with this project.
- .3 During the course of the work when organization changes are made, provide the Owner with updated information.

1.60 PRELIMINARY INFORMATION

- .1 Submit, within 30 working days after awarding of contract, the information and details, including reactions, power requirements, disconnect means, ventilation

requirements, cutouts, access requirements, light and outlet locations, quantity, location and size of external wires required to inter-connect the equipment, and all other information required to complete the work to be performed by others in conjunction with the installation of the equipment.

1.61 DRAWING AND SAMPLE SUBMITTALS: MODERNIZATION

- .1 Drawing and sample submittals are required for exposed finishes and fixtures.
- .2 Submit for review samples of metals, glass, plastic laminates and finishes, of 200 mm (8") by 300 mm (12") approximate size, properly identified as to project, location and material.
- .3 Submit for review, when related to the scope of work, the following:
 - .1 General arrangements;
 - .2 Details of areas where the work joins the work of other trades;
 - .3 Machine room layouts showing the location of the equipment;
 - .4 Hoistway layouts showing the location of the equipment, car platform dimensions, cab interior dimensions and net inside cab area;
 - .5 Hoistway sections showing overhead, pit equipment, car and frame and entrances;
 - .6 Cab details including the cab shell, platform, interior panels, ceiling, entrance, lighting and finishes;
 - .7 Details of control panels such as central control consoles or fire control panels showing the layout and detailing the design of switches and indicator lights;
 - .8 Details of intercom system station types detailing the controls;
 - .9 Details of any display devices complete with examples of proposed displays, symbols and layout.
- .4 Submit fixture brochures for review.
- .5 Show on the general arrangement or separately, details of frames, doors, sills and supports, lanterns and gongs, including views showing the relationship of hall stations, lanterns and entrances.
- .6 Submit a soft copy of the drawings in PDF (*Portable Document Format*) format
- .7 Provide as built information at job completion prior to substantial performance.
- .8 Reviews do not include the checking of measurements and do not imply approval of variations from the specifications.

1.62 CERTIFICATES OF INSPECTION

- .1 Obtain and pay for certificates of approval and all other necessary permits and inspections.
- .2 Prior to Total Performance, arrange for and pay for a safety inspection of the equipment by the regulatory authority or, if that is not available, by a recognized independent private professional inspection organization.
- .3 As a minimum, ensure that this inspection includes:
 - .1 Full load overspeed car safety tests if car safeties are provided;
 - .2 Empty car overspeed counterweight safety tests if counterweight safeties are provided;
 - .3 Pressure tests for hydraulic elevators;
 - .4 Full load full speed car buffer tests if oil buffers are provided;
 - .5 Empty car full speed counterweight buffer tests if counterweight oil buffers are provided;
 - .6 Full load full speed down direction brake tests if a traction machine is provided;
 - .7 Electrical safety circuit check;
 - .8 Door pressure tests;
 - .9 Tests of any other safety devices.
- .4 Submit, prior to Total Performance inspection, the approved safety inspection report.
- .5 Should more than one inspection for a licence or approval be required due to deficient work by others give sufficient advance notice of such deficient work to allow the work to be completed prior to the time of the subsequent inspection.
- .6 If sufficient advance notice of such deficient work has not been given, assume the cost of the additional inspections.
- .7 If the regulatory authority is not available or if the regulatory authority did not designate a private inspection organization, proceed as follows:
 - .1 Perform the safety inspection;
 - .2 Provide a certificate of conformance that covers, as a minimum, the items required under the regulations and includes a checklist of items listed in clause 8.10 of the Code;

- .3 Provide the Owner and engineer with a soft copy of the certificate in PDF (*Portable Document Format*) format at the time the certificate is submitted to the regulatory authority.

1.63 PRE-INSPECTION CHECK LIST

- .1 Upon completion review each page of the specifications and initial each page at the bottom left to indicate that the work has been completed in compliance with the Specifications.
- .2 Submit this initialed copy Specifications to the Engineer prior to asking for an inspection by the Engineer.

1.64 TEST DATA FORM: HYDRAULIC

- .1 After completion of the work, and prior to substantial performance, submit a test data form certifying that the unit is complete and ready for inspection.
- .2 Arrange that this form be signed by the person responsible for the performance of the work.
- .3 Include a check list of the items in the specifications as well as other performance data such as door times, operating times, starting and running currents and voltages, operating pressures, slowdown distances, valve settings, and, in general, settings of any adjustable devices.
- .4 List on this form safety devices, together with their settings and indicate as to whether they have been checked and adjusted.
- .5 Submit a soft copy of the data form in PDF (*Portable Document Format*) format.

1.65 ELECTRICAL DIAGRAMS

- .1 Supply wiring diagrams and data as required for the execution of the work herein described including schematics for speed control, dispatching system, interfaces, printed circuit boards.
- .2 Incorporate, as part of the schematic diagrams, a reference index ('road map') giving the location of electrical components and wiring interconnections for relay coils, relay contacts, field equipment, integrated circuits and other such devices, so that the position on the schematics of any of these items can be readily determined.
- .3 Supply, prior to the substantial performance inspection, three prints and a soft copy in PDF (*Portable Document Format*) format of the wiring and schematic diagrams revised to show changes that have been made.
- .4 If changes are subsequently made to the wiring or control, supply additional hard and soft copies of the schematics and field wiring diagrams incorporating the changes.

- .5 Submit diagrams signed and sealed by a professional engineer.

1.66 OPERATION MANUAL

- .1 Supply to the Owner prior to the substantial performance inspection, a manual describing in detail the operation of the equipment including special features, dispatching sequences, and such items as intercom systems and security systems.
- .2 Supply, as part of the manual, as built diagrams and drawings of operating panels (e.g. car panels, central control console) with descriptions of the function of switches and indicators.
- .3 Supply the manual in PDF (*Portable Document Format*) format on digital media acceptable to the Owner.

1.67 MAINTENANCE MANUAL

- .1 Supply to the Owner prior to the substantial performance inspection, a maintenance manual as set out in the maintenance section of the specifications.
- .2 Incorporate in the manual a description of the controller user interface, fault and error codes, troubleshooting and diagnostic procedures, methods of use and the adjustment of programmable parameters together with their settings at the time of final adjustment.
- .3 Supply the manual in PDF (*Portable Document Format*) format on digital media acceptable to the Owner.

1.68 SYSTEM LOG ERROR CODES

- .1 At the time of substantial completion, provide to the Owner a PDF document listing system error codes complete with a full description of the meaning of each code.
- .2 Incorporate as part of the document a description of the procedure for accessing and resetting the codes.
- .3 Demonstrate this procedure to the Engineer.

1.69 SPECIAL TOOLS AND ACCESS CODES

- .1 If any special tools (i.e. tools that are not readily purchased from a hardware supplier) are used to maintain or adjust the equipment or are required for any aspect of the work on the equipment, list these tools with details on the proposal form and provide such tools to the Owner prior to Substantial Performance.
- .2 If any access codes are used to maintain or adjust the equipment or are required for any aspect of the work on the equipment (including the reading and resetting of error codes and logs) list these access codes with details on the proposal form and provide such access codes to the Owner prior to Substantial Performance.

- .3 Do not change the access codes without the written consent of the Owner and, when changed, provide to the Owner the new access codes.

1.70 KEY SWITCHES

- .1 Where key switches are specified supply switches and keys compatible with the vertical transportation equipment portfolio of the Owner, where possible, unless otherwise noted herein.
- .2 Provide to the Owner, five copies of each key-switch key type defined in the Code as being Security Group 2, 3 and 4.
- .3 Provide keys with engraved labels and group the keys by Security Group and key type.

1.71 INSPECTION AND ACCEPTANCE

- .1 Advise the Engineer when the equipment is prepared for an inspection and the Engineer will then set an inspection date.
- .2 Provide a team to assist the engineer in making the tests and inspections.
- .3 Provide the necessary test weights to carry out full load tests and a team to carry these test weights.
- .4 The Engineer will check if the performance, labour and equipment provided meet the requirements of the Specifications and if the unit can be released for use.
- .5 If during this inspection it is found that corrective actions are required to meet the requirements of the Specifications, correct the deficiencies and make arrangements for another inspection as described above.

1.72 TECHNICAL SEMINAR

- .1 At the time of substantial performance, arrange with the Owner to provide a seminar for the Owner's staff.
- .2 Provide a paper copy of the documentation three working days before the seminar to the person designated by the Owner.
- .3 Include in the seminar a complete review of the documentation, operation of the equipment and demonstration of any special features.

1.73 WARRANTY OF WORK

- .1 Warrant that the materials, performance and workmanship are in accordance with the industry standard in every respect.
- .2 Make good defects not due to improper use which may develop within one year from the date of substantial performance of the project.
- .3 Warrant that the equipment performs to the standards set out herein.

- .4 Neither the final payment nor any provision of the Contract Documents diminishes the responsibility for negligence or faulty materials or workmanship within the extent and period provided by law.
- .5 Upon written notice remedy defects and pay expenses for damage to others resulting from defects.
- .6 Warrant the cylinder and PVC liner unconditionally for a period of twenty years.
- .7 Correct (parts and labour) diligently and at no additional cost any deficiency reported by inspecting authorities during five years following the substantial acceptance of the work, except for deficiencies resulting from changes in regulation or, when the maintenance is performed by another contractor, resulting from deficiencies in maintenance.

1.74 PARTS

- .1 Supply parts on request for a period of fifteen years subsequent to substantial performance of the project, at then prevailing prices.
- .2 Where purchased components are used, ensure that the original manufacturer's name and component designation are clearly marked on the part or in the parts catalogue.

PART 2 - WORK BY OTHER TRADES

2.1 WORK BY OTHER TRADES

- .1 In the event that the work by others as set out herein and specified by other professionals is in conflict with or inadequate for your equipment or design, so state on the bid form with all necessary details.
- .2 If no exceptions are noted on the bid form, pay the costs of all modifications necessary to suit your equipment and design.

2.2 COORDINATION WITH OTHER TRADES

- .1 Where the work joins another trade, provide drawings showing the actual dimensions and the method of joining the work to the work of the other trade and information such as anchors, templates and details for cast-ins.
- .2 Provide access and assistance as required, at no extra charge, in relation to work by other trades.

2.3 LIST OF WORK BY OTHER TRADES

- .1 Work to be performed by other trades for the elevator modernization will be the following:

Work by other trades

Division 02 - Existing conditions

- 1 A locked storage space during the modernization period.
- 2 If required, drilling of the jack hole.
- 3 If required, pumping and decontamination of the jack hole.

Division 03 - Concrete

- 4 Patching of the openings in the machine room to provide the fire resistance required by the Nation Building Code.

Division 05 - Metals

- 5 Extension of the pit access ladder at least 1200 mm above the lower landing floor..

Division 07 - Thermal and moisture protection

- 6 Waterproofing of the elevator pit.

Division 09 - Finishes

- 7 Cutting and patching of walls around hall fixtures back boxes and conduits.
- 8 Cutting and patching of openings for the passage of conduits between the hoistway and the controller location.
- 9 Initial painting of the machine room floor.
- 10 Sealing or painting of the machine room ceiling and walls to reduce dust.
- 11 Cab flooring - the installation of the new cab flooring would not be performed by the elevator contractor.

Division 15 - Mechanical

- 12 Replacement of the sprinkler heads in the machine room with heads of the intermediate temperature classification (green) and installation of guards on the sprinkler heads.
- 13 Installation of sprinklers at the top of the hoistway and in the pit.
- 14 Confirmation that the heating and air conditioning equipment in the machine room can continuously maintain a temperature of greater than 10C (50F) and less than 30C (85F) based on the following heat generated by the equipment.

elevator	
<i>heat generation</i>	<i>kW</i>
when active	2,9
when inactive	0,7

- 15 Air conditioning unit not located directly above the elevator controller.
- 16 Installation of a grill over the pit floor drain.

Division 16 - Electrical

- 17 Confirmation that the main feeders (600 V / 3 ph. / 60 Hz) and the main disconnect and its fuses can handle the currents indicated below, that the supply voltage will be maintained between 95% and 105% of the nominal voltage and that the frequency will be within 5% of the nominal frequency:

elevator	
<i>current with a 600 V / 3 ph. / 60 Hz power supply</i>	<i>A</i>
full load running up	44
full load starting up	110

- 18 In the machine (or control) room, two 15 A @ 120 V, single phase circuit breaker per elevator for cab lighting and in-cab outlet, located adjacent to the lock side of the machine room door, and the wiring between the disconnecting means and controller provided by the elevator contractor (the power for this circuit to be derived from the emergency power supply if the elevator is connected to the emergency power supply).
- 19 Installation in the machine room of a 110 V disconnect for the heat exchanger.

Work by other trades

- 20 An emergency power supply sufficient to start and run the elevator at full rated speed and capacity.
 - The emergency power will be provided on the same lines and the same disconnect as the normal power.
 - The emergency power unit will have means for switching between the normal power supply and the emergency power supply.
 - Four wires will be provided to connect two auxiliary contacts of the emergency power transfer switch to the elevator controllers of the group.
 - One of these contacts will be so arranged that on normal power the two wires associated with it make a closed circuit and on emergency power present an open circuit; the other contact will be so arranged that the two wires associated with it present a closed circuit except for an adjustable period of time (5 to 50 seconds adjustment, set initially at 15 seconds) prior to power supply transfer in either direction - from normal to emergency or from emergency to normal.
 - The emergency power will supply the 120V circuit for accessories in each cabin (light and ventilation).
- 21 In the machine (or control) room, light fixtures, located in front of the controller at at least 2130 mm (7") above the floor, and such additional fluorescent lighting as required to give a minimum illumination at floor level of 200 lx. The light switch to be located in the room adjacent to the lock side of the door. The power to be derived from the emergency power generator if the elevator is fed by an emergency power generator.
- 22 Light fixtures providing minimum illumination of 100lx at the hall door sills.
- 23 Replacement of each machine room outlet with a GFI outlet.
- 24 Replacement of each pit outlet with a GFI outlet.
- 25 In the elevator pit, protected lights, located clear of elevator equipment to give a minimum illumination at pit level of 160 lx and controlled by a light switch located adjacent to the pit entrance. The power to be derived from the emergency power generator if the elevator is fed by an emergency power generator.
- 26 Installation of a smoke detector in the elevator lobby of the main recall floor (normally the level with street access), which the signal will be sent to the elevator controller.
- 27 Installation of smoke detectors in the other elevator lobbies which the signal will be sent to the elevator controller.
- 28 Connection of the signal of the smoke detector in the elevator machine room to the elevator controller.
- 29 Connection of the signal of the smoke detector at the top of the hoistway to the elevator controller.
- 30 An active phone line connected to a junction box (junction box provided by the elevator contractor) in the elevator machine room.
- 31 Installation of a camera in the cab.
- 32 Installation of a security system with card reader in the cab to control the access to floor "C".
- 33 Electric power during erection, for illumination, operations of tools and hoist, starting, testing and adjusting.
- 34 A speaker in the cab ceiling.

PART 3 - ITEMIZED PRICES

3.1 ITEMIZED PRICE SUBMISSION REQUIREMENTS

- .1 Submit with the bid the prices to provide the following items indicated in the "Itemized prices" section of the specifications (note that these equipment or services are already included in the base bid).

3.2 ALLOWANCE FOR PUMPING AND DECONTAMINATION

- .1 Include in the proposal a 5000 \$ allowance per jack for the subsoil decontamination and the pumping of liquids in accordance with the following requirements:
 - .1 Remove and dispose of the contaminated subsoil and liquids, then fill and restore the ground concurrently with the vertical transportation work;

- .2 Perform the excavation work to minimize the potential volumes of contaminated soils;
 - .3 After the decontamination work is complete, demonstrate to the satisfaction of the relevant inspecting authorities that the site meets the requirements of the applicable regulations.
-
- .2 Submit a unit price by weight or volume, including labor, material, transportation, disposal, administration and profit for the decontamination work including the costs inherent to the delays required for the analysis and the temporary measures to protect contaminated soils by canvas or other methods compliant with current standards.
 - .3 Submit as supporting document a weighing slip from an approved site for contaminated soils disposal.
 - .4 When a tank truck is required, submit a detailed supporting document for the number of hours, which shall not exceed a total of three hours (round trip) in addition to the hours spent on site.
 - .5 If the price for the work covered by the cash allowance differs from the cash allowance, the base contract price for the complete cylinder replacement work shall be correspondingly increased or decreased as the case may be, but no adjustment shall be made for coordination, overhead, profit or incidental costs by the elevator contractor.

3.3 ALLOWANCE FOR THE JACK HOLE RECTIFICATION

- .1 Include in the proposal a 5000 \$ allowance per jack to rectify the jack hole to allow proper installation and alignment of the jack and of its protective casing.
- .2 If the price for the work covered by the cash allowance differs from the cash allowance, the base contract price for the complete jack replacement work shall be correspondingly increased or decreased as the case may be, but no adjustment shall be made for coordination, overhead, profit or incidental costs by the elevator contractor.

3.4 MAINTENANCE: FIRST YEAR

- .1 Provide full maintenance of the equipment until one year after the substantial performance of the equipment.
- .2 Provide this service in accordance with the maintenance section 14 90 00 of this specification.

END OF SECTION

SECTION 14 24 23: MODERNIZATION

PART 1 - GENERAL REQUIREMENTS

1.1 BASE REQUIREMENTS

- .1 Conform to section 14 20 00 of this specification.

1.2 EQUIPMENT DATA

- .1 To summarize, modernize the equipment as follows:

Elevator	inital conditions		modernization	
device type	passenger elevator		idem	
installation year	1985		-	
manufacturer	Otis		-	
modernization year	-		-	
machinery type	direct-acting hydraulic		idem	
machine location	adjacent to the hoistway		idem	
capacity (kg, lb)	1362	3000	idem	
rated speed (m/s, ft/min)	0,63	125	idem	
operation	collective selective, automatic		idem	
number of stops	5		idem	
front openings	1, 2		*1, 2	
rear openings	A, B, C		idem	
entrance type	single speed side opening		idem	
net door width (mm, in)	1070	42	idem	
net door height (mm, in)	2135	84	idem	
net cab width (mm, in)	2040	80	idem	
net cab depth (mm, in)	1470	58	idem	
net cab height (mm, in)	2285	90	idem	
gross cab height (mm, in)	2438	96	idem	
pumping unit	Otis		replace	
valve	Maxton		replace	
motor	Leroy-Somer AC (submersible)		replace	
motor power (kW, HP)	19	25	30	40
controller	Otis LRS3		replace	
drive type	hydraulic wye-delta start		replace (soft-start)	
oil heater	(none)		provide	
heat exchanger	(none)		idem	
jack type	buried cylinder, non-telescopic plunger		idem	
cylinder plastic protection	(none)		provide	
overspeed valve	(none)		provide	

Elevator	initial conditions	modernization
car buffer	spring	replace
guide-rails	"T" profile	retain
car guiding	spring-loaded roller-guides	replace
door operator	GAL	replace
hall entrances fire resistance	BOCA 1,5h	idem
hall door hardware	Otis	retain
hall door retainers	Otis	provide additional retainers
cab shell	metal shell	idem
cab finishes	plastic laminate	replace
car door sill	aluminium	replace (nickel-silver)
car platform guard	provided	replace
car top railing	(none)	idem
car door hardware	Otis	replace
car door restrictor	(none)	provide
door reopening device	infrared detector	replace
car station(s)	main only	replace
car position indicator	segments	replace (digital)
car position annunciator	(none)	provide
arrival signal	in-car lanterns	replace
communication system	hands-free phone	replace
emergency lighting	above the suspended ceiling	replace, in car station
security system	(none)	provide interface
camera in the cab	(none)	provide interface
travelling cable	plastic	replace
hall stations	single riser	replace
hall position indicator at main floor	provided	replace (digital)
floor designations	provided	replace
Firefighters' Emergency Operation	(none)	provide
emergency power operation	building emergency power	idem
CACF console	(none)	idem
monitoring system	(none)	idem
operating time (s)		12,3

1.3 DIMENSIONS

- .1 Provide equipment to suit the existing machine room, hoistway and pit dimensions.
- .2 Provide maximum net cab dimensions, taking into consideration the existing car platform dimensions, the Architect's cab drawings and the Code requirements.

PART 2 - PRODUITS

2.1 CONTROLLER

- .1 Provide a micro-processor based controller designed to give the required operation as herein specified.
- .2 Mount panels securely on substantial, self supporting steel frames designed for floor or wall mounting.
- .3 Provide completely enclosed controllers with doors.
- .4 Do not mount equipment on the doors.
- .5 Where relays are used, provide those having a design electrical life and mechanical life equivalent to thirty years operation in the given application, with their contacts designed for maximum conductivity and wiping action.
- .6 Provide electronic time delay devices which employ stable capacitors or crystals as the time base.
- .7 Install wiring on the controller, whether control or field wiring, in a neat workmanlike order and make connections to studs and terminals by means of solder or solderless lugs, or similar connecting devices.
- .8 Mark relays, contactors, fuses, printed circuit boards and other components clearly and permanently with designations as shown on the schematics.
- .9 Mount the designations for plug in components on the controller adjacent to the component; do not mount the designation on the plug in component.
- .10 Provide a written guarantee from the control manufacturer that over the life of the installation software and firmware updates will be provided at no charge to the Owner

2.2 LIMITED CURRENT STARTING: SOLID STATE

- .1 Provide a solid state starter to control the starting current.
- .2 Arrange that the device can be adjusted to restrict the elevator motor starting current to between two and five times the full load running current.

2.3 HYDRAULIC: TIME PROTECTIVE DEVICE

- .1 Provide a time protective device.
- .2 If the pump motor should run continuously for 20 seconds longer than the period of time necessary to move the elevator (in normal operation) from the bottom floor to the top floor, the time protective device will cause:

- .1 Up direction relays and contactors to be de-energized.
- .2 Automatic registration of a bottom floor call to bring the car to the lowest landing where it will remain with its doors open.
- .3 No response to any further hall calls or car calls until the main line switch has been opened and closed again.

2.4 COMPUTING DEVICES

- .1 Where computing devices are used, such as micro-processors or mini-computers, along with associated devices, design to the following requirements:
 - .1 Isolate the inputs from external devices (such as push-buttons) and isolate the outputs to external devices (such as indicators) by means of relays or optical devices;
 - .2 Provide the control program on read-only-memory with spare capacity to allow for future programming modifications and extensions;
 - .3 Provide crystal regulation of frequency;
 - .4 Provide for separate regulated power supplies to serve each micro-processor system.

2.5 CONTROL CIRCUITS GROUNDING

- .1 Arrange the control circuits so that one side of the control power supply for external circuits is grounded to facilitate testing and trouble shooting.
- .2 An external circuit is defined as one wired outside micro-processors or solid-state devices, as for example, buttons, relays, lights, limits, locks and such similar devices.
- .3 Arrange that accidental grounding in the control system will not defeat the safety circuits.

2.6 SOLID-STATE HARDWARE

- .1 Mount solid-state devices, except for high power silicon controlled rectifiers, on removable printed circuit boards.
- .2 Gold plate the contact points of edge connectors.
- .3 Use G10 glass epoxy with minimum equivalent 57 g (2 ounce) copper.
- .4 Coat the circuits with tin-lead.
- .5 Provide a solder resist screen.

- .6 Provide plated through holes for double sided boards.
- .7 Make all connections to the printed circuits on the printed circuit boards by means of properly dimensioned pads.
- .8 Do not provide "patched" connections.
- .9 Design solid-state devices for a high level of noise immunity.
- .10 Incorporate electrical noise suppression devices in the power supplies and the inputs and outputs associated with the solid-state circuits.
- .11 Provide filters and circuits to limit the generated electromagnetic noise level at any frequency to not more than 0.1 dB above the ambient electromagnetic noise level, as measured in the centre of the machine room using a calibrated radio frequency receiver designed in accordance with CSA Standard C108.1.1 together with a calibrated rod or loop antenna.
- .12 Provide filters and circuits to limit the generated electromagnetic noise level at 10 kHz to not more than 0.01 dB above the ambient electromagnetic noise level, as measured in the centre of the machine room using a calibrated radio frequency receiver designed in accordance with CSA Standard C108.1.1 together with a calibrated rod or loop antenna.

2.7 POWER INTERRUPTION RESTART

- .1 Provide means so that the elevator system will restart automatically in the event of power interruption.
- .2 Where volatile memories are provided for position and other data necessary to the continuing operation of the equipment, provide means of preserving this data on power failure or fading ('brownout') for a minimum of four hours and means of automatic recovery upon restoration of normal power.

2.8 HYDRAULIC: PUMPING MACHINE UNIT

- .1 Provide a pumping machine unit compactly and neatly designed with all the components as follows in a self-contained unit: drip pan, floating inner base for mounting motor pump assembly, oil reservoir with tight fitting tank cover, oil fill strainer with air filter, self-cleaning strainer in suction line, oil hydraulic pump, electric motor, oil control unit.
- .2 Provide an oil level gauge that can be read without removing the tank cover.
- .3 Provide, to measure the oil temperature, a thermometer that can be read without removing the tank cover.

- .4 Provide a pump especially designed and manufactured for oil hydraulic service of the rotary positive displacement type inherently designed for steady discharge with minimum pulsations to give smooth and quiet operation.
- .5 Provide a motor designed for oil hydraulic service.
- .6 Provide equipment which will deliver its rated output continuously with a temperature rise not to exceed 50°C (90°F).
- .7 Provide an oil control unit consisting of the following components: relief valve, safety check valve, levelling valve, manual lowering valve, tank shut-off valve.
- .8 Design the equipment so that all adjustments are accessible and can be made without removing the assembly from the oil line.
- .9 Provide variable flow bypass valves to give controlled high and levelling speed operation.
- .10 Provide valves with individual adjustments, such that changing one adjustment does not affect other adjustments.
- .11 Provide an externally adjustable relief valve capable of by-passing the total oil flow without increasing the back pressure more than 10% above that required to barely open the valve.
- .12 Provide a 50 mm (2") pressure gauge, complete with isolating shut-off valve, for measuring the setting of the relief valve.
- .13 Design the safety check valve to close quietly without permitting any reverse flow and to support the elevator on a positive locked column of oil when the car is at rest.
- .14 Provide an externally adjustable up start valve to by-pass oil flow during initial start of the motor pump assembly, and to close slowly, gradually diverting oil to the jack unit, insuring smooth up starts, so as to relieve load on the motor during starting.
- .15 Provide an externally adjustable lowering valve and levelling valve for drop away speed, lowering speed, levelling speed and stopping speed to insure smooth down starts and stops.
- .16 Provide a manual lowering valve for manual lowering of the elevator car in the event of power failure and for use in servicing and adjusting the elevator mechanism.
- .17 Provide shut off valves in the machine room and elevator pit for isolating oil in the power tank unit to facilitate servicing and adjusting the elevator mechanism without removing the oil from the tank.

- .18 Provide self cleaning strainers to prevent foreign materials from lodging in the oil system.
- .19 Provide an externally adjustable up stop valve to by-pass the oil flow for landing stops in the up direction.
- .20 Provide temperature and pressure compensation so as to minimize speed variations.
- .21 Arrange the equipment so that the car stops at the landing through controlled oil flow with the motor and pump running and so that the motor shuts off only after the car has come to rest at the landing.
- .22 Use flexible hose on the pumping machine unit where required but only within the regulations of the governing safety codes.
- .23 Provide a tank of sufficient capacity to contain, as a minimum, all of the oil in the hydraulic system (pipe lines and hydraulic cylinder) plus 10%.

2.9 HYDRAULIC: MAIN LINE STRAINER

- .1 Provide a main line strainer and shut off cock assembly of the self cleaning type, equipped with a 60 minimum mesh element, and a magnetic drain plug, in the oil line.
- .2 Design the unit for a minimum 2800 kilopascals (400 psi) working pressure and provide easy access for cleaning.

2.10 HYDRAULIC: SILENCING DEVICES

- .1 If the motor and pump are not submersible:
 - .1 Enclose the power unit on all four sides with sheet steel panels combined with 20 mm (3/4") suitable sound-deadening material;
 - .2 Form the panels with approximately 20 mm (3/4") returns, returning to, but separated from, the main power unit frame with suitable rubber mouldings.
- .2 To reduce hydraulic pulsations through the oil, provide a blow-out proof double-faced hydraulic muffling device in the oil line adjacent to the power unit, downstream to the valve assembly.
- .3 To reduce any vibration transmitted through the oil line itself, provide two approved blow-out proof sound isolating couplings in the oil line, located between the check valve and the hydraulic jack.
- .4 Design each sound-isolating coupling to completely eliminate any solid metal to metal contact from the pipe on one side of the coupling to the pipe on the other side.

- .5 Mount the motor and pump on a resilient rubber base to isolate them from the oil reservoir, controller and building structure.

2.11 PIPING

- .1 Provide pipes and fittings to connect the power unit to the jack unit.
- .2 Provide a shut-off valve in the pit.
- .3 Seal connections adequately to prevent any leakage or seepage of oil.
- .4 Provide pipe of minimum 50 mm (2") nominal size to reduce oil velocity, noise and vibration.
- .5 Provide sound-isolating pads between the piping and its supports to reduce transmission of vibrations to the building structure.
- .6 Run the oil lines above ground, suspending the oil lines with isolating hangers to reduce sound transmission.

2.12 OVERSPEED VALVE

- .1 Provide an overspeed valve in the elevator pit.
- .2 Use Victaulic couplings to connect the valve in the oil line.
- .3 Arrange the valve to operate in the event that the elevator speed in the down direction exceeds 125% (plus or minus 10%) of the elevator operating speed in the down direction
- .4 Arrange that the valve cuts off the flow of oil from the hydraulic jack in the event that the set tripping speed is exceeded.
- .5 Arrange that when the valve operates the elevator will be decelerated at a rate of not less than 0.25 g nor more than 1.00 g.
- .6 If the valve is field-adjustable, provide a numbered seal and record the date and number in the log book.

2.13 MACHINE ROOM EQUIPMENT GUARDING FOR HYDRAULIC EQUIPMENT

- .1 Provide guards for the hydraulic machine, high-voltage components, tripping hazards and any other machine-room items that present a hazard to personnel.
- .2 As an alternative to individual guards for the external motor and belts, provide an expanded metal screen around the lower part of the hydraulic machine.

- .3 Provide machine room equipment guarding in accordance with the prevailing regulations.
- .4 Provide drawings of the guarding under the seal of a Professional Engineer.
- .5 Where expanded metal screens are used for guards construct them of minimum 2.2 mm thick metal so supported and braced as to deflect not more than 15 mm when subjected to a force of 450 N applied horizontally to the screen at any point
- .6 Arrange the guards so as to prevent hands, arms, or any other part of a worker's body from coming in contact with moving parts
- .7 Affix the guards in a strong and substantial manner so that they cannot be accidentally removed.
- .8 Construct the guards of durable materials that can withstand the workplace conditions.
- .9 Arrange the guards to protect from falling objects so that no objects (such as tools) can fall into moving parts or into open electrical components.
- .10 Ensure that the guards do not themselves create a hazard (such as shear point, a jagged or sharp edge).
- .11 Provide removable guards such that regular maintenance procedures can be performed.
- .12 Arrange the guards so as not to impede a worker from performing the work efficiently and conveniently.
- .13 Wherever practicable, arrange the guards so that those devices requiring regular attention can be maintained without removing the guards.
- .14 Wherever practicable, provide fixed guards that cannot be easily removed.
- .15 Finish the metal components of the guarding devices in a bright yellow paint with one base primer coat and two finishing coats or, alternatively, in baked enamel, so as to make them highly visible.
- .16 Where polycarbonate covers are used, add marking stripes of tape in bright yellow so as to make them highly visible.
- .17 Provide protective guards for high voltage circuits.
- .18 Arrange that those elements of the controller with potentials to ground in excess of 130 V are separated from the low voltage elements by means of barriers that can be removed for maintenance and repair purposes.

- .19 Provide barriers consisting of clear polycarbonate covers (where consistent with the prevailing regulations), hinged so as to allow access without removing the covers.
- .20 Arrange the barriers so that they are of sufficient dimension that the controller covers cannot be closed completely when the barriers are in the open position.
- .21 Provide an entry in the elevator maintenance logbook confirming that the elevator controller covers and doors are closed and that the machine room guards are in place and functioning properly, this entry to be checked when performing regular maintenance.

2.14 HYDRAULIC FLUID: BIODEGRADABLE

- .1 Provide hydraulic fluid of the non-toxic, biodegradable type having a minimum viscosity index of 150 measured using the ASTM D2270 method.
- .2 Do not provide vegetable oil.

2.15 HYDRAULIC: OIL VISCOSITY CONTROL

- .1 Provide means, consisting of heaters, heat exchangers, hydraulic and electrical controls, as required to maintain the hydraulic fluid in the reservoir, pump and control valve at a temperature of 37C (100F) plus or minus 5C (9F).

2.16 HYDRAULIC JACK HOLE

- .1 Remove the existing jack together with any backfill or other material that would impede the installation of the new jack.
- .2 Provide any incidental pit floor concrete chipping around the jack hole necessary for the removal of the cylinder.
- .3 Prior to the conclusion of the project, as necessary patch the concrete floor and seal against water.
- .4 If necessary, provide a pumping truck to drain and remove any water or debris from inside the jack hole.
- .5 Provide equipment and labour as necessary to remove or agitate any soil or slurry that has collapsed into the hole to permit the new cylinder and PVC casing installation.

2.17 JACK UNIT

- .1 Provide a jack unit of sufficient size to lift the gross load the height specified.
- .2 Factory test the jack unit to ensure adequate strength and freedom from leakage.

- .3 Do not use brittle material, such as gray cast iron or semi steel, in the jack construction.
- .4 Provide a jack unit consisting of the following parts: a non-telescopic plunger of heavy seamless steel tubing accurately turned and polished, a stop ring electrically welded to the plunger to positively prevent the plunger leaving its casing, an internal babbitt-lined or bronze guide bearing, packing of suitable design and quality, a drip ring around the casing top, an outer casing made of steel tubing provided with a pipe connection with an air bleeder.
- .5 Weld brackets to the jack casing for supporting the elevator on pit channels.
- .6 Use packing of the single sealing edge type of teflon, roulon or similar material to reduce wear and friction.
- .7 Provide two bottom bulkheads, one above the other.
- .8 Design both bulkheads to withstand the pressure applied.

2.18 HYDRAULIC: CYLINDER PROTECTION

- .1 Protect the hydraulic cylinder against corrosion with a plastic sleeve so arranged as to provide a water and air tight seal for the portion of the cylinder extending below the pit floor.
- .2 Install the cylinder inside a protective pipe as follows:
 - .1 Use ABS or PVC pipe;
 - .2 Seal the pipe at the bottom and sides so as to provide a water and air tight seal for the buried portion;
 - .3 If joints are required, weld them with solvent or heat;
 - .4 Provide a minimum pipe wall thickness of 6 mm (1/4");
 - .5 Provide a pipe of sufficient diameter and length to allow a free space of at least 38 mm (1.5") between the cylinder and the protective pipe.
- .3 Eliminate the existing cathodic protection system.

2.19 HYDRAULIC JACK LEAK MONITOR

- .1 Provide a jack leak monitoring system to continuously monitor for water or oil leakage into the space between the cylinder and the protective plastic pipe.
- .2 Provide LEDs to indicate oil or water infiltration.
- .3 Provide a dry contact arranged to open when oil or water is detected.

- .4 Connect this contact into the control circuit and arrange that when opened it causes the elevator when in normal operation mode to return to the lowest landing and park there with its doors closed - arrange that the door open button remain operative.
- .5 Provide a jack leak monitor as manufactured by EECO, or approved equivalent.

2.20 HYDRAULIC: PLUNGER ATTACHMENT

- .1 Affix the plunger to the car frame so as to support the weight of the empty car, with the car door closed, through the centre of gravity.
- .2 Provide sound and vibration isolation between the plunger and the car frame.

2.21 HYDRAULIC JACK REPLACEMENT

- .1 Do not lift the cab using the existing jack except in case of a preventive replacement of the jack.
- .2 Remove the existing jack together with any backfill concrete or sand around the cylinder.
- .3 Provide a pumping truck to remove any water or debris from inside the jack hole.
- .4 Provide equipment and labour as necessary to remove or agitate any soil or slurry that has collapsed into the hole to permit the new cylinder and plastic casing installation.
- .5 Provide, as required, additional piping and fittings to connect the pumping unit to the jack.
- .6 Install the plastic casing centered on the car sling and plumb within 3 mm (1/8") over its length.
- .7 Backfill as necessary to maintain the plastic casing in its correct position.
- .8 Install the new jack centered on the car sling and plumb within 3 mm (1/8") over its length.
- .9 Submit a certificate to the Owner outlining the alignment of the installed plastic casing and jack unit.
- .10 Provide, if necessary, a new channel to accommodate the jack and the car buffers.
- .11 Prior to the conclusion of the project, patch the pit floor and walls and ensure it is sealed to a hydrostatic pressure 0.14 bar (2 psi).

2.22 JACK UNIT TEST: BURIED CYLINDER

- .1 After the installation of the jack unit is complete carry out a test of the cylinder and sleeve.
- .2 Detect and remove any liquid between the cylinder and sleeve using an air compressor as per the directives from the cylinder manufacturer;
- .3 Pressure test the system using an air compressor as per the directives from the cylinder manufacturer.

2.23 HYDRAULIC: SCAVENGER PUMP

- .1 Provide a scavenger pump for each cylinder to return oil leaking through the packing to the tank of the pumping unit by automatic means.
- .2 Adequately filter the oil returned by the scavenger pump.
- .3 Provide a float switch in the pit to shut off the scavenger pump in the event of high water level so as to prevent water being pumped into the tank.
- .4 Provide a check valve at the hydraulic machine in the scavenger pump oil line to prevent oil flowing from the reservoir in the event the scavenger pump line is ruptured.
- .5 Provide fire-resistant tubing for the scavenger pump oil line.
- .6 Securely fasten the scavenger pump unit to the pit floor.

2.24 PIT EQUIPMENT

- .1 Provide buffer extensions, support beams, stop switches, work platform with ladder to accommodate the pit depth.
- .2 Where required, conform to section 2.6 or 3.6 of the Code.

2.25 GUIDE RAILS: RETAIN

- .1 Retain the existing guide rails and brackets.
- .2 Ensure that the guide rail system is of structural strength and rigidity sufficient to limit the horizontal deflection of the guide at any point to less than 0.6 mm (0.025") under normal conditions of operation.
- .3 Align guide rails with a variation of not more than 1.6 mm (0.06") over any 6 m (20') section and with a maximum variation of not more than 0.8 mm (0.03") in 25 mm (1").
- .4 Ensure that the guide rails and brackets are installed in a strong and substantial manner.

- .5 Extend rails to within less than 300 mm (12") and more than 150 mm (6") of the underside of the overhead slab.

2.26 ROLLER GUIDES: CAR

- .1 Equip the car with roller guides mounted at both the top and the bottom of the car frame.
- .2 Spring load or flexibly mount the roller guides.
- .3 Provide rollers of 150 mm (6") minimum diameter, with prelubricated sealed ball bearings.
- .4 Design the roller to secure good contact with the rail.
- .5 Provide rollers true and free from deformations of the surface so as to provide a smooth and even ride of the elevator.
- .6 Grind the rollers within a tolerance of 0.05 mm (0.002") total indicator reading.

2.27 POSITION TRANSDUCER

- .1 Provide a position transducer device to transmit to the control system the position of the elevator.
- .2 Arrange that the device transmit a minimum of 10 counts per 25 mm (1") of travel.
- .3 Provide a device having an overall precision within ± 1.0 mm (± 0.04 ").
- .4 Arrange the elevator controls so that the output from this device is read at least every 5 ms.
- .5 Transmit the signal from this device either in serial format using a standard protocol (e.g, CAN) or in parallel format using low impedance (less than 10 kilohms) inputs.
- .6 If the transducer is a relative (pulse counter) type rather than an absolute encoder type:
 - .1 Provide Gray encoding so as to indicate the direction of movement of the car and to offset 'false' counts caused by vibration;
 - .2 In the event of a counter error reset the position with an accuracy within ± 2.5 mm (± 0.1 ") by returning the car at low speed to a fixed point in the hoistway.

2.28 LIMIT SWITCH DOWELLING

- .1 After the final limit switches are adjusted and prior to the performance of safety tests and checks, fasten, by throughbolting or dowelling, the final limit switches

and final limit switch brackets so as to minimize the possibility of future incorrect adjustment.

2.29 CAB DESIGN: TO THE ARCHITECT'S PLANS

- .1 Provide a cab in accordance with the Architect's plans.
- .2 Provide the following:
 - .1 Returns, transom and doors finished in stainless steel number 4 finish;
 - .2 Nickel-silver car sill with buffed finish;
 - .3 Sub-floor;
 - .4 Suspended ceiling;
 - .5 Applied finishes for the walls without doors;
 - .6 Handrails;
 - .7 Hooks for protective pads;
 - .8 Light fixtures;
 - .9 Cutouts for the car fixtures.
- .3 Supply any other material and any additional labour necessary to provide a completed, installed cab.
- .4 Install in the cab ceiling the speaker provided by others.

2.30 PROTECTIVE PADS

- .1 Provide per elevator one set of protective pads covering all exposed wall surface, attached to inconspicuous pad hooks at the top of the cab and reaching to within 100 mm (4") of the car floor.

2.31 CAR PLATFORM GUARD

- .1 Provide a car platform guard.
- .2 If the pit depth limits the platform guard height, provide a guard having the maximum height taking into consideration the existing pit depth.

2.32 CAB WEIGHT

- .1 When the deadweight of the car is changed perform the following duties.
- .2 Where there is evidence of a previous cab modernization and the prior weight changes were not recorded or where there is doubt as to the accuracy of the car

crosshead data tag, weigh the car and the counterweight so as to determine the cumulative deadweight change (The cumulative deadweight change is the sum of previous deadweight changes and the current proposed weight change).

- .3 Where no original crosshead data tag exists, prior to cab alterations weigh the car and the counterweight.
- .4 If the cumulative deadweight change is less than 115 kg (250 lb):
 - .1 Record the weight change on an Auxiliary Data Tag;
 - .2 Post the Auxiliary Data Tag on the car crosshead.
- .5 If the cumulative deadweight change is greater than 115 kg (250 lb) or more than 5% of the weight of the originally installed car plus the elevator capacity:
 - .1 Perform a full engineering assessment of the installation with regard to all equipment which may be affected by the weight change including machine, car frame, safeties, buffers, traction, lift ropes, plunger strengths and hydraulic components under pressure;
 - .2 Record both car and counterweight changes on the Auxiliary Data Tag;
 - .3 Post the Auxiliary Data Tag on the car crosshead.
- .6 Where alterations include the addition of glass or mirror, or the addition or alteration of a suspended ceiling:
 - .1 Record in the log book the date the elevator work was completed and the elevator returned to service;
 - .2 Prior to placing the elevator in service, perform the following tests to verify that the new or altered items will not break or become dislodged:
 - .1 For electric elevators a no load car buffer test at contract speed;
 - .2 For electric elevators a no load counterweight buffer test at contract speed;
 - .3 Emergency stop in the up direction;
 - .4 Emergency stop in the down direction.
- .7 Record in the logbook details of the tests including the date, the mechanic's name and the contractor's name.
- .8 Provide an Auxiliary Data Tag to meet the requirements of Code.
- .9 Enter, as a minimum, the following data on the Auxiliary Data Tag:

- .1 The weight change of the car and counterweight;
- .2 The year and month of the alteration;
- .3 The name of the contractor who performed or supervised the work.
- .10 For traction elevators, test the traction relations in accordance with the Code.

2.33 OVERLOAD DETECTOR

- .1 Provide elevator cab load-weighing devices, associated control software and in-car signalling equipment to provide an audible and visible overload warning.
- .2 Arrange that the cab load-weighing devices and associated control software activate the in-car overload signalling equipment when 100 percent of rated elevator capacity is reached.
- .3 Prevent the elevator from operating until the elevator cab load is decreased to a value below the overload threshold.
- .4 Provide a light with visible text 'Overloaded Elevator' which illuminates and an audible warning which sounds when an overload condition exists.
- .5 Extinguish the light and silence the audible warning when the overload condition no longer exists.

2.34 CAR STATION: WITH SERVICE CABINET

- .1 Provide one car station.
- .2 Provide in the station the devices required for normal automatic operation, including the following:
 - .1 Floor push buttons;
 - .2 Door open button;
 - .3 Door close button;
 - .4 Alarm button;
 - .5 Phone button.
- .3 Number the car call buttons to correspond to the floor served.
- .4 Provide in conjunction with the car buttons a call registered light for each button to be lighted when the button is pressed and extinguished when the car stops at the selected floor.

- .5 Arrange that, when a car button is pressed, an audible tone is generated having an adjustable volume level of between 55 and 70 dBA, as measured from within the elevator cab.
- .6 Provide a locked service cabinet, located below the main car station, containing those devices, other than those used for normal automatic operation, required for the various control features, including the following:
 - .1 Light switch;
 - .2 Fan switch;
 - .3 Emergency lighting test switch.
- .7 Engrave the car station with markings and signage such as car capacity, elevator number, switch positions and function, and other markings required by the prevailing codes and local regulations.
- .8 Hinge the car station so that it can swung open to allow servicing the internal components of the car station.
- .9 Provide a hinge capable of supporting without distortion a test weight of 11 kg (23 lb) resting on the panel non-hinged edge with the panel swung open.
- .10 Provide a "No smoking" symbol on the car station.
- .11 Engrave the capacity on the car station in International System (kg) and in Imperial System (lb).
- .12 Engrave the elevator identification on the car station ("1").

2.35 CAR POSITION INDICATOR: DIGITAL READOUT

- .1 Provide a digital car position indicator mounted above each car station.
- .2 Arrange the indicator to display a number or symbol at least 50 mm (2") high.
- .3 Indicate the position of the car at all times, corresponding to the landing through which the car is passing or at which it is stopped.
- .4 Provide a segmented display using light emitting diodes with a minimum of 16 segments per character.
- .5 Arrange the circuits so as to provide continuous indication of car position.
- .6 Overlapping dual indication, when the elevator is between floors, is acceptable.

2.36 EMERGENCY LIGHTING

- .1 Provide a back-up battery power system for emergency cab lighting and car emergency signaling devices.
- .2 Provide a lighting level of at least 11 lux of illumination at each car operating panel for a minimum period of four hours, using at least two lamps of equal rating.
- .3 Cause the lamps to be immediately energized in the event of a power failure or electrical fault de-energizing the normal elevator lighting circuit.
- .4 Provide for the automatic disconnection of the lamps and the automatic recharging of the lighting unit when normal power is restored to the elevator lighting circuit.
- .5 Provide a rechargeable battery of the hermetically sealed type, or of a type which provides a reserve of electrolyte, capable of operating unattended and requiring no addition of water or electrolyte for a period of not less than 10 years, with provision for visual checking of the electrolyte level without opening the battery or removing caps or fittings.
- .6 Arrange the battery charging to operate automatically upon restoration of normal power to the unit, to remain in operation until the battery is fully recharged and to maintain the battery at full rated capacity at all times when the unit is not in operation.
- .7 Provide a pilot lamp to indicate that the normal power supply the unit and battery charging is in operation.
- .8 Arrange that the unit can be conveniently tested and operated manually.
- .9 Install the unit as part of the car so that it is not readily removed - do not provide portable equipment.
- .10 Install the lamps in the car station and protect them with a lens installed flush with the car station face plate.
- .11 Provide in the cab a spring-return switch for testing of the emergency lighting by authorized personnel.

2.37 CAB: DUPLEX RECEPTACLE

- .1 Provide a 110 V GFI duplex receptacle in the cab for maintenance purposes.
- .2 Locate the receptacle in the service cabinet or, if no service cabinet is provided, below the main car station.
- .3 Run the wires for this receptacle separately from the wires for the other car light and ventilation equipment and connect it to a separate breaker in the machine room.

2.38 CAR POSITION ANNUNCIATOR

- .1 Provide automatic verbal announcement to announce the floor at which the car stops.
- .2 Provide a solid-state means to adjust the volume over a range from 55 and 70 dBA.
- .3 Use for the announcements a female voice typical to newscasters of the public radio.

2.39 TELEPHONE: HANDS-FREE OPERATION

- .1 Provide a hands-free telephone with automatic dialer capable of initiating and receiving calls.
- .2 Integrate the telephone into the car station.
- .3 Provide a push button to initiate the telephone connection.
- .4 Arrange that the telephone connection can be initiated by an external call.
- .5 Provide an indicator light to confirm that communication has been established.
- .6 Pierce the car station for the push button and indicator light with the indicator light mounted flush with the panel.
- .7 Provide a speaker/microphone for communication.
- .8 Pierce the car station in front of the speaker with multiple holes 3 mm (1/8") in diameter to allow passage of sound to and from the speaker.
- .9 Identify the telephone and the button with a raised symbol and Braille.
- .10 Provide wiring for the telephone from the cab to the machine room.
- .11 Connect the wiring on the car to a terminal block mounted in or adjacent to the telephone box.
- .12 Terminate the wiring in the machine room at a separate enclosed external terminal block mounted on the controller.
- .13 Provide the terminal block and its enclosure and locate it so that personnel other than elevator mechanics can easily run their conduit and wiring to these terminals without interfering with or touching the elevator wiring or controls.
- .14 Where more than one controller is in a common machine room bring wiring to one common terminal block.
- .15 Clearly mark the terminal block.

- .16 Provide wiring of the twin conductor shielded type with grounded shields.
- .17 Provide equipment and wiring compatible with and acceptable to the telephone company providing service to the project.

2.40 IN CAR LANTERNS AND GONGS: APPLIED

- .1 Provide in car lanterns complete with electronic gongs to indicate the future direction of the elevator.
- .2 Install the lanterns on the column of each elevator cab entrance that is the most easily visible from the hall call station.
- .3 Make openings in the car door jambs to insert the lantern boxes and provide plates extending beyond the openings.
- .4 Arrange the lanterns and circuits so that as the car doors start to open in response to a call, the lanterns illuminate and the gong strikes.
- .5 Sound the gong once to indicate the up direction and twice to indicate the down direction.
- .6 Maintain the lantern illuminated until the car has stopped and the door open time has elapsed.
- .7 Do not illuminate the lantern on a door re-open unless the re-open is caused by a reversal of direction of travel of the car.
- .8 Arrange the operation of the lanterns and gongs to comply with requirements for the handicapped.
- .9 Provide LEDs for illumination.
- .10 Design the fixture so that the lamps may be readily changed.
- .11 Do not mount any equipment to the covers; arrange that the covers can be removed completely without disturbing the electric wiring.

2.41 CAB VENTILATION: FAN MOUNTED ON CAR ROOF

- .1 Provide an exhaust fan capable of developing 30 Pa (0.004 psi) static pressure differential with a minimum capacity of 165 L/s (350 cfm) with the elevator traveling at rated speed.
- .2 Provide a two-speed motor for the fan with the speed control located in the car operating panel (in the service cabinet if provided).
- .3 Mount this fan on the cab roof outside of the perimeter of the emergency exit
- .4 Protect the fan against damage.

- .5 Provide neoprene isolators to minimize noise and vibration.
- .6 Arrange that the noise level caused by the fan, measured in the car with the fan running, does not exceed 54 dBA assuming a maximum ambient noise level of 50 dBA.

2.42 CAR LIGHTING: AUTOMATIC

- .1 Arrange that the car lighting and cab fan are turned off after five minutes (or as soon as allowed by Code) when the following conditions are met:
 - .1 The elevator is level at a floor;
 - .2 The elevator doors are closed;
 - .3 The elevator has not been selected to answer a call;
 - .4 The elevator is on automatic operation;
 - .5 The elevator safety circuit (including interlocks) is intact.
- .2 Should any of the above conditions no longer obtain or when emergency communication devices are initiated, turn the car lights and fan on.

2.43 DOOR REOPENING DEVICE: MULTIPLE BEAMS

- .1 Provide a multiple infra-red beam door reopening device.
- .2 Design and locate the receivers and emitters so that the active area of the door opening, i.e. the full width and from within 25 mm (1") of the floor to a height of 1800 mm (6'), is protected, such that a person or object passing through the car entrance causes the doors to re-open.
- .3 Position the receivers and emitters at least 25 mm (1") back from the leading edge of the door.
- .4 Provide logic control to ensure that each receiver receives light from every emitter.
- .5 Arrange that if the system fails to provide protection over the active area of the door opening, the elevator will park at the current floor with its doors open and the lights off, or the system will go over to nudging operation.
- .6 Provide a signal on the device or in the controller to indicate that a failure has occurred.
- .7 Provide for the door reopening device a by-pass feature including:
 - .1 Closing of the doors at reduced speed and power;

- .2 A buzzer in the car station operating as a warning to the person obstructing the door.
- .8 Supply a device, reliable and consistent in operation, not affected by dust or temperature changes, and having inherent long term reliability with minimum maintenance.

2.44 CAR INSPECTION DEVICES

- .1 Provide, on the top of the car, a fixed lamp receptacle, with switch, outfitted with wire clamp guards, and a GFI duplex receptacle with safety ground connection.
- .2 Provide, on the top of the car, an inspection station consisting of an emergency stop button, up, down and common inspection running buttons, on-off switch for the door operator and other devices necessary for top-of-car inspection operation.

2.45 CAR DOOR EQUIPMENT

- .1 Provide car door header, hangers, tracks, door electrical contacts, door operator, and all incidental devices necessary for the correct operation of the doors.
- .2 Provide, for each sliding car door panel, sheave type, two point suspension hangers.
- .3 Provide sheaves not less than 75 mm (3") in diameter with ball bearings, properly sealed to retain grease lubrication, and mounted on stands directly attached to the panels.
- .4 Equip hangers with adjustable ball bearing rollers to take the up-thrust of the doors.
- .5 Arrange the tracks and sheaves so that there is no metal to metal contact, and so that the doors operate properly without any regular lubrication.
- .6 Design the door equipment and associated components for a minimum of noise.

2.46 DOOR OPERATOR: LINEAR

- .1 Provide a heavy duty door operator to open and close the car and hoistway doors simultaneously.
- .2 Mount the operator on the cab above the car door.
- .3 Provide either one or two permanent magnet synchronous AC drive motors rated at a total of 250 W (1/3 HP) minimum.
- .4 Arrange that the operator functions on a single phase 110 or 220 VAC supply.

- .5 Provide a solid state motion control system using a DC link (single phase AC to DC to three phase variable frequency AC).
- .6 Provide event logging with non-volatile memory so as to retain the event log under power-off conditions.
- .7 Directly connect the operator motor or motors to a circulating flat belt with integral teeth (power timing belt).
- .8 Connect the belt to the door panels so as to move the door panels as the operator motor turns.
- .9 Provide a solid state door operator control incorporating negative feedback circuits for position, acceleration, velocity and torque.
- .10 Provide fully automatic installation algorithm profiles that self-adjust the motion profile for the relevant parameters.
- .11 Provide an output from the door control for a pre-start command to the elevator speed control system.
- .12 Provide optical isolation for input and output signals.
- .13 Provide signal line short circuit protection.
- .14 Provide a serial input to the door control to allow adjustment of speed, acceleration, torque and pre-start point using a notebook computer or keypad.
- .15 Provide the keypad or software for a standard notebook computer.
- .16 Arrange that the settings for the door operator can be uploaded to the keypad or notebook computer and then downloaded to another identical operator.
- .17 Provide an average door closing speed of 300 mm (12") per second, respecting the parameters for door force and door inertia as set out in the elevator code.
- .18 Provide an average door opening speed of 700 mm (28") per second.
- .19 Provide, either in the door operator control or in the main elevator control, means to automatically recycle the doors in the event that they stall during the opening or closing operations.
- .20 Design the door operator and associated components for a minimum of noise.

2.47 CAR DOOR RESTRICTOR

- .1 Provide a car door restrictor to prevent the opening of the car door from inside the cab unless the elevator is in the door unlocking zone.

2.48 HOISTWAY DOORS: REFURBISHING

- .1 Replace any existing steel hall door hanger rollers with plastic insert rollers.
- .2 Check and replace gibs, rollers, hangers, relating cables, closers, interlocks and all other door components that have more than 10 per cent wear.
- .3 Replace interlock components such as contacts, bushings and pick-up rollers if there is any indication of wear.
- .4 Replace any relating cables that are not 7X19 stranding with 7X19 cables.
- .5 Install sound absorbing materials so as to eliminate interlock noise.
- .6 Replace astragals (car and hall doors).
- .7 Clean, lubricate and re-adjust car and hoistway door equipment.
- .8 Adjust the doors so that with the door closing device disconnected, the doors can be started into motion, from any position, with a force of less than 25 N (6 lb) per door panel applied horizontally at the mid-point of the door in line with the direction of movement of the door.
- .9 Adjust the hoistway door rollers so as to obtain 6 mm (1/4") clearance from the car sill and on either side of the skate.
- .10 Adjust the hoistway door roller pressure so that when engaged in the skate both rollers exert a firm pressure on the skate.
- .11 Eliminate any rattles, loose connections or worn bearings that might cause noise.
- .12 If required, provide interlocks and relating mechanisms compatible with the new door operator.
- .13 Take the necessary measures to ensure that the hall entrances retain their fire resistance certification.

2.49 CAR AND HOISTWAY DOOR SAFETY RETAINERS

- .1 Provide safety retainers at the top and bottom of horizontally sliding doors to retain the closed door panel in position if the primary guiding means fail.
- .2 Provide retainers that will prevent the displacement of the door panel top and bottom by more than 20 mm (0.8") when the door panel is subjected to a force of 5 kN (1125 lb) applied towards the hoistway at right angles to the panel over an area of 300 mm by 300 mm (12" by 12") at the centre of the panel.
- .3 Provide retainers that will withstand, without detachment or permanent deformation, a force of 1 kN (225 lb) applied upward at any point along the width of the door panel together with an additional concurrent force of 1.1 kN (250 lb)

applied at right angles to the door at the centre of the panel over an area of 300 mm by 300 mm (12" by 12").

- .4 Arrange that the retaining means are not involved in the guiding of the panel and are not subjected to wear or stress during normal door operation.

2.50 HOISTWAY ENTRANCE LUNAR KEY ACCESS

- .1 Provide lunar key access for each hoistway entrance.
- .2 Provide a stainless steel or aluminum eyelet around the hole in the door panel.

2.51 DOOR FRICTION

- .1 Adjust the doors so that with the door closing device disconnected, the doors can be started into motion, from any position, with a force of less than 25 N (6 lb) per door panel applied horizontally at the mid-point of the door in line with the direction of movement of the door.

2.52 FLOOR MARKING: HOISTWAY

- .1 Identify each landing by means of markings on the inside of the hoistway.
- .2 Place these markings so that people in a stalled elevator will be able to readily see the floor marking upon opening partially the car door.
- .3 Use a stencil to ensure that the floor markings are neat and uniform in appearance.
- .4 Provide numerals and letters at least 100 mm (4") high and of a clearly contrasting colour to the colour of the doors and fascias.

2.53 DOOR EQUIPMENT DOWELLING

- .1 After the hangers, interlocks, relating devices, door operating clutches, rollers and other door equipment have been correctly adjusted, install dowels or pins to prevent movement or unauthorized readjustment.

2.54 ENTRANCE FLOOR MARKINGS

- .1 Provide, on each hall entrance jamb, raised tactile and braille metallic markings to designate the floor.
- .2 Provide markings as selected by the Owner or Architect.
- .3 Provide samples for review.

2.55 HALL PUSH BUTTON STATIONS: SINGLE RISER

- .1 Provide a single riser of hall push button stations.

- .2 Provide one station for each floor.
- .3 Provide at the intermediate floors, for each station, up and down push buttons located one above the other and call registered lights.
- .4 Provide at the upper terminal and lower terminal, for each station, a single button and call registered light.
- .5 Secure the hall push button stations to the wall using countersunk spanner head fasteners or approved equivalent.

2.56 HALL POSITION INDICATOR: DIGITAL

- .1 Provide a digital position indicator mounted above the main floor entrance.
- .2 Arrange the indicator to display a number or symbol at least 50 mm (2") high.
- .3 Indicate the position of the car at all times, corresponding to the landing through which the car is passing or at which it is stopped.
- .4 Provide a segmented display using light emitting diodes with either a minimum of 16 segments or 5 x 7 dot matrix per character.
- .5 Arrange the circuits so as to provide continuous indication of car position.
- .6 Overlapping dual indication, when the elevator is between floors, is acceptable.

2.57 HALL STATION EMERGENCY RECALL SWITCH

- .1 Provide in the main floor hall station a key switch for emergency recall operation.

2.58 MAIN FLOOR ELEVATOR MARKINGS

- .1 Provide at the main floor, for each elevator designated as a Firefighter's Elevator, a suitable symbol such as a Firefighter's Hat.
- .2 Provide at the main floor for each elevator a numeral indicating the number of the elevator.
- .3 Provide markings as selected by the Owner.
- .4 Provide samples for review.

2.59 HOISTWAY ACCESS SWITCHES

- .1 Provide a hoistway access switch at each terminal landing to move up and down the car - do not provide a hoistway access switch at the lowest landing where access to the pit is by the means of a separate pit access door.
- .2 For horizontally sliding doors, locate the switch in the entrance frame or in the sight guard in an inconspicuous place.

2.60 ELECTRIC WIRING: TO DISCONNECTS

- .1 Provide wiring required to interconnect the new equipment.
- .2 Provide copper wire.
- .3 Provide insulated wiring having a flame retarding and moisture resisting outer cover.
- .4 Where flexible conduit is used, supply it in aluminum.
- .5 Where shielded wire is specified, provide wire of not less than 0.52 mm² area (20 gauge) having individually shielded pairs with 100% shielding.
- .6 Provide colour or number coded wires in multiwire cables.
- .7 Provide waterproof terminal labels.
- .8 Provide stranded field wire except for the individual wires in multiwire cables which may be either stranded or solid.
- .9 Provide travelling cable to connect car operating panels and other car operating devices to the controller in the machine room.
- .10 Provide a minimum of ten percent spare wires throughout the elevator wiring signal runs.
- .11 Provide wiring from the machine room disconnect to the controller.
- .12 Provide, if required by the inspecting authorities, additional disconnect means or stop switches and associated wiring.

2.61 TRAVELLING CABLE

- .1 Provide travelling cables with flame-retarding and moisture-resisting outer covers and stranded conductors.
- .2 Supply cables approved for elevator use.
- .3 Provide in the travelling cables:
 - .1 14 AWG (1.5 mm²) conductors for constant current-carrying circuits;
 - .2 18 AWG (0.75 mm²) conductors for signal circuits;
 - .3 20 AWG (0.5 mm²) shielded pair conductors with shielding for telecommunications circuits and data circuits;
 - .4 «CAT5E-equivalent» cables to connect the TCP/IP camera in the cab;

- .5 Six 20 AWG (0.5 mm²) conductors with shielding for the security system;
- .6 Two 18 AWG (0.75 mm²) conductors with shielding for the communication system;
- .7 Conductors for the speaker provided by others that will be installed in the cab ceiling.
- .4 Provide ten percent additional minimum spare signal and current-carrying wires in each cable.
- .5 Terminate cables using terminal blocks or suitable connectors having identifying numbers to facilitate replacement and service.
- .6 Suspend light weight cables using a wire mesh sleeve to relieve strain in the individual conductors and heavier cables using a steel supporting strand if the suspended weight exceeds 35 kg (70 lb).

2.62 ELECTRIC WIRING INSTALLATION

- .1 Install wiring in accordance with the prevailing codes.
- .2 Run the wire in metal conduit, duct or electrical metallic tubing.
- .3 Connect hoistway wiring, travelling cables and other similar items to terminal blocks mounted in the controller.
- .4 Provide a separate junction box with terminals for the connection of 'non-elevator' devices, such as telephones and connect from the elevator controller to this junction box as required.
- .5 Mount this junction box on the side of one controller in the machine room, or at some designated point in the hoistway conveniently located for the external connections to be made.
- .6 Connect spares and shielded wires continuously from the point of origin to destination using car, hoistway, controller or other terminal blocks as necessary.
- .7 For shielded wires use compatible connectors or terminal blocks designed to minimize signal deterioration.
- .8 Check wires, including spares, for continuity and grounds.
- .9 Mark each wire by a number and each group as to destination.
- .10 Mark connections on intermediate terminal blocks with corresponding numbers.
- .11 Mark individual wires by numbered adhesive waterproof markers.

- .12 Label groups of wires and multiwire cables with waterproof markers.
- .13 Mark terminals with waterproof labels.
- .14 Make no splices.
- .15 Attach waterproof, neat, legible lists, showing wiring runs, colour codes and number codes, to the controller.

2.63 SECURITY SYSTEM COORDINATION

- .1 Coordinate with the security system supplier for the installation of an elevator card reader security system.
- .2 Provide accessible space, mounting supports and wiring for a car reader and a security controller in the car station.
- .3 Provide a black translucent polycarbonate insert 125 mm (5") wide by 50 mm (2") high mounted flush in the car station at a height acceptable for barrier free design.
- .4 Provide a free space 100 mm (4") in height, 175 mm (7") in width and 75 mm (3") in depth centered behind the car station for the card reader.
- .5 Provide, within 250 mm (10") of the security antenna, a free space 200 mm (8") in height, 200 mm (8") in width and 75 mm (3") in depth, for the security controller installation.
- .6 Provide, in the cab main front return panel, within 1000 mm (3') of the security controller, a 120 V 60 Hz AC receptacle for the exclusive use of the security system.
- .7 Provide an elevator security interface box in the machine or control room mounted on the side of an elevator controller, complete with terminal blocks and wiring space for the interconnection of the security system to the elevator control system.
- .8 Provide, as part of this interface box, a by-pass switch allowing the elevator system to function without restriction by the security system
- .9 Provide the wiring between the cab and the interface box, including a 3 m (10') extra length at each end to allow an extension if required.
- .10 Interface with the security system using serial data transfer.
- .11 Provide a signal, unique for each car call, to the security system when a car call "request" is entered (with car buttons) and enter the car call when a return signal is received from the security system validating the request.

- .12 Arrange that the elevator system functions without restriction by the security system when firefighters' emergency operation is activated.
- .13 Provide any incidental elevator material and elevator work necessary to obtain a complete functioning elevator security system.
- .14 Submit for review car station drawings, interface box drawings, location drawings and electrical schematics.

2.64 CLOSED CIRCUIT CAMERA SECURITY SYSTEM

- .1 A closed circuit camera system will be installed in the cab by others.
- .2 Provide wiring from the camera in the cab to the machine or control room.
- .3 Provide two modules with RJ45 plugs ("Phoenix" type or approved equivalent), one in the junction box on the car top and the other in a junction box in the machine room, to interface the "CAT5E-equivalent" cables in the travelling cables with the RJ45 cables provided by the CCTV contractor that will install the TCP/IP camera.
- .4 Run the interconnecting wiring from the elevator security interface box in the machine or control room to the top of the elevator cab.
- .5 Provide an excess loop of 3 m (10') of cable at either end.
- .6 Provide a cable access hole in the top of the cab at the camera location.
- .7 Provide assistance to the CCTV contractor for the installation of the camera.

PART 3 - OPERATION AND PERFORMANCE

3.1 OPERATION: SELECTIVE COLLECTIVE

- .1 Provide an automatic selective collective operation.

3.2 OPERATION: CALL INITIATION

- .1 Control the elevator automatically by buttons in the car, marked to correspond with the respective landings served, and by the call buttons at the landing stations.
- .2 Register a call by momentary pressure of a button.

3.3 OPERATION: CALL RESPONSE

- .1 Store all hall and car calls in the control memory until answered.
- .2 Cancel a call when it is answered by a car.

- .3 Stop a running car at the first landing for which a car call is registered.
- .4 Stop a running car for a hall call registered for the same direction as the car is travelling, subject to higher priority assignments and to load in the car.

3.4 DOOR OPEN PAUSE TIME

- .1 Arrange the circuits so that when the car is stopped in response to a hall call the doors remain open a predetermined length [approximately 5 seconds].
- .2 Unless otherwise specified (e.g. to allow for advance hall lantern warning), arrange the circuits so that when the car is stopped in response to a car registered call the doors remain open a predetermined length of time (approximately 3 seconds).
- .3 Make the times separately adjustable over a range from 0.25 seconds to 15 seconds.
- .4 Arrange the circuits so that the door open pause time is cancelled if a car call button is pressed or the door close button is pressed.

3.5 OPERATION: FAULT RECOVERY

- .1 Provide a recovery circuit arranged to take the elevator at low speed to the next floor in the event of an overspeed condition, overload trip, or other similar fault condition.
- .2 Do not implement the recovery circuit if the movement of the car would endanger the passengers in the car.
- .3 Provide a circuit separate from the normal speed control circuits, with power derived through separate controls and limited in power by resistance or fixed devices to an appropriate low level. Do not use, in this circuit, any solid state or other device which could fail in a mode that would allow an increase in applied power.
- .4 Upon arrival of the car level at the next floor, cause the doors to open and remain open, and turn off the car lights.
- .5 Leave the elevator in this state until the fault is corrected and the car restored to service.

3.6 OPERATION: INDEPENDENT SERVICE

- .1 Provide independent service.
- .2 On independent service:
 - .1 Remove the car from the automatic supervisory control system;

- .2 Arrange the circuits so that the car does not respond to hall calls;
- .3 Render the hall lanterns (if provided) inoperative;
- .4 Cause the car to park with its doors open;
- .5 Arrange the controls so that the car responds to any car calls registered if a button is held until the doors are closed and the interlocks made-up;
- .6 Cause the doors to reopen if the button is released at any time up to the point at which the elevator starts to move;
- .7 Render inoperative the normal door protective devices;
- .8 Arrange the controls so that the attendant can select direction of travel;
- .9 Cancel all registered car calls when the direction reverses or a car call is answered.

3.7 OPERATION: DOOR PROTECTIVE DEVICE

- .1 Arrange the door protective device so that, should it detect a person or any object in its path, at any point during the door closing operation, it will cause the doors to return to the open position.
- .2 Adjust both the detection device and the door operation so that an object or person in the way of the door will cause the doors to reverse without the door panel of either hall or car doors actually striking the object or person.

3.8 DOOR PROTECTIVE DEVICE BY-PASS (NUDGING)

- .1 Should a door protective device be operated continuously for more than 20 seconds after the elapse of the normal door open time, cause the doors to close slowly under reduced power and operate a buzzer in the car panel as a warning to the person obstructing the door.
- .2 Cause the 20 seconds to be reduced to 6 seconds until a normal door cycle is performed.

3.9 NOISE LEVEL: DOOR OPERATION

- .1 Arrange the equipment so that the noise level, as measured within the cab, does not exceed 60 dB at any time during a full door open, door close and door reversal cycle.
- .2 Initiate the door reversal by triggering the door protective device.
- .3 Measure the noise level using an ANSI type 2 sound level meter on the "A" scale with an "F" response.

3.10 NOISE LEVEL: CAB

- .1 Arrange that, with the elevator travelling from one end of the hoistway to the other, the noise level as measured within the elevator cab will not exceed 53 dB (assuming an ambient noise level not exceeding 50 dB).
- .2 Measure this noise level with an ANSI type 2 sound level meter on the "A" scale with an "F" response.

3.11 NOISE LEVEL: MACHINE ROOM

- .1 Design the equipment so that the noise level with the elevator running, as measured by a meter positioned in the centre of the machine room, does not exceed 80 dB.
- .2 Measure this noise level using an ANSI type 2 sound level meter on the "A" scale with an "S" response.

3.12 LEVELLING

- .1 Cause the car to stop automatically at floor level, without overshoot, regardless of load or direction of travel so that the car sill is level, within 6 mm (1/4"), with respect to the hoistway sill.
- .2 When the elevator cab is stopped at a floor, correct for over travel or under travel or movement of the cab away from the floor, by returning the car imperceptibly to floor level.

3.13 SPEED CONTROL: HYDRAULIC

- .1 Provide a speed control system of the hydraulic-electric type in which control is accomplished by varying the oil flow to and from the hydraulic jack.
- .2 Design and adjust the equipment so that the average acceleration over the period of constant acceleration is 0.6 m/s^2 (2.0 ft/s^2) plus or minus 10%.
- .3 Design and adjust the equipment so that the average change in acceleration (jerk) is 1.8 m/s^3 (6.0 ft/s^3) plus or minus 10%.
- .4 Design and adjust the equipment so that the rated speed is maintained with an accuracy of 5%.

3.14 OPERATING TIME

- .1 Adjust the equipment so that the elapsed time to travel one typical floor does not exceed the time shown in the equipment data table of this Section.
- .2 Measure this time under the following conditions:
 - .1 A typical floor height of less than 4000 mm (13');

- .2 Floor levelling accuracy of ± 6 mm (1/4");
 - .3 Start time when the fully opened doors begin to close, and stop time when the car is stopped level with the next floor and the car and hall doors are 800 mm (32") open;
 - .4 Time measured with full load in the car and in both directions of travel;
 - .5 Power door operation for the hall and car doors conforms to the elevator code requirements.
- .3 Adjust the equipment so that the operating time is compatible with dependable, consistent operation without undue wear or excessive maintenance and so that this operating time can be readily maintained over the life of the elevator installation.
- .4 Adjust the equipment so that, with the control functioning so as to give the required time, the elevator operates under smooth acceleration and retardation and provides a comfortable and agreeable ride.

3.15 EMERGENCY POWER OPERATION: NO SWITCHING

- .1 The supplier of the emergency power system (provided by others) will arrange that:
- .1 The emergency power source will provide sufficient power to run the elevator at its contract speed and capacity;
 - .2 The emergency power will be provided on the same lines and the same disconnect as the normal power;
 - .3 Four wires will connect two auxiliary contacts of the emergency power transfer switch to the elevator controllers of the group;
 - .4 One contact ('Emergency Contact') will on normal power make a closed circuit and on emergency power present an open circuit;
 - .5 The other contact ('Delayed Contact') will present a closed circuit except for an adjustable period of time (5 to 50 seconds adjustment, set initially at 15 seconds) prior to power supply transfer in either direction - from normal to emergency or from emergency to normal.
- .2 Arrange that when the 'Emergency Contact' is open the signal light marked "ELEVATOR EMERGENCY POWER" is illuminated.
- .3 Arrange that when the 'Delayed Contact' is open, the elevator stops.
- .4 Arrange that when the 'Emergency Contact' is open and the 'Delayed Contact' is closed the elevator runs normally answering hall and car calls.

3.16 FIREFIGHTERS' EMERGENCY OPERATION

- .1 Provide Firefighters' Emergency Operation including:
 - .1 Phase I automatic Emergency Recall Operation;
 - .2 Emergency recall to an alternate level;
 - .3 Phase II Emergency In-Car Operation.

END OF SECTION

SECTION 14 90 00: MAINTENANCE

PART 1 - GENERAL REQUIREMENTS

1.1 BASE REQUIREMENTS

- .1 Conform to section 14 20 00 of this specification.

1.2 SCOPE

- .1 Provide labour, materials, products, equipment and services necessary for the full maintenance of the elevator with the exception of the components that are specifically excluded.

1.3 CONTRACT DURATION

- .1 Provide full maintenance on the equipment to the maintenance procedures set out in the Specifications for such other periods as may be defined in the Contract Documents.

1.4 PURPOSE

- .1 The purpose of the maintenance program is to prolong the life of the equipment, to secure the Owner's equity and to provide trouble-free service.

1.5 MINIMUM STANDARD

- .1 As a minimum standard, perform to the Specifications and to the Code.
- .2 Maintain the equipment at all times in the same or better condition as at the commencement of the maintenance work.

1.6 ROUTINE MAINTENANCE

- .1 Provide labour, materials, products, equipment and services necessary to complete maintenance testing and inspections required by the Authority Having Jurisdiction at the appropriate intervals (i.e. monthly, quarterly, semi-annual, annual, 5-year, Category 1, Category 3, Category 5, etc.).
- .2 Perform a routine maintenance inspection once a month, as a minimum.
- .3 In the course of the examination, should faulty parts be discovered replace them at once, and should any unusual operations or noises be found take corrective action immediately.
- .4 Schedule parts showing excessive wear for replacement on the next regular examination.

1.7 RULES OF WORK: ELEVATORS

- .1 Check with and obtain approval from the site building management prior to taking an elevator out of service.
- .2 Keep the site building management informed of work activity including, but not limited to, the following:
 - .1 When an elevator is taken out of service;
 - .2 When an elevator is placed back in service;
 - .3 When starting work each day;
 - .4 When finishing work each day.
- .3 Perform work on an elevator at a floor selected by the site building management.
- .4 Where possible restrict activities to inside the hoistway with the hall doors closed.
- .5 Do not leave materials or tools in the elevator lobbies or other public areas.
- .6 Do not leave an elevator out of service with the hall and car doors open except as approved by site building management.
- .7 When taking an elevator out of service station someone at the entrance so as to ensure that a passenger does not enter and is not trapped in the cab.
- .8 When finished working on the elevator ensure that the elevator is in proper working order.

1.8 MAINTENANCE MEETINGS

- .1 Have qualified and capable representatives attend a meeting with the Owner and the Consultant at least every three months to review work procedures, extra charges, elevator call backs, and any Owner concerns.
- .2 At the option of the Owner the meetings may be held by telephone conference.

1.9 PEAK HOURS

- .1 Peak hours are from 7:45 to 9:15, from 11:45 to 13:15 and from 16:30 to 18:00.
- .2 Do not remove or leave any equipment from service for normal maintenance during peak hours.

1.10 REGULAR HOURS OF WORK

- .1 Regular hours of work are from 8:30 to 16:30 Monday to Friday, excluding statutory holidays.

1.11 OVERTIME PREMIUM

- .1 In the event that the Owner, for whatever reason, pays for overtime worked to complete the work as set out in the Specifications, he shall pay the added cost of the overtime plus twenty-one percent for all miscellaneous charges such as overhead, inefficiency, et cetera.
- .2 The added cost shall be the difference between the actual overtime cost and actual straight time cost.
- .3 The actual cost shall be that amount that the Contractor is required to pay to his employees on the job site together with any amounts that he is required to pay on their behalf in contributions to various fringe benefits.
- .4 Obtain from the Owner prior written authorization for overtime to be worked and chargeable, as described above, to the Owner. This authorization shall be for specific amounts and for specific times.
- .5 Submit time sheets for all such overtime worked for approval to the Owner or his designated representative within 48 hours of the time that such overtime is worked.
- .6 If the procedures as set out above are not followed, assume all costs of the time worked.
- .7 Do not charge the premium for work already required in overtime as set out in the Specifications.

1.12 DEFECTIVE WORK AND NON-PERFORMANCE

- .1 The Owner reserves the right to correct any defective work and to charge the cost to the contractor.
- .2 Should the contractor fail to execute any of the work set out in the contract the Owner reserves the right to do this work and to charge the cost to the contractor.
- .3 The Owner reserves the right to withhold payment in the event of non-performance or to pay only for that portion of the work that has been executed.
- .4 The Owner will give reasonable notice in writing prior to taking such action unless the defective work or non-performance prejudices the safety of the installation.

1.13 CONTRACT CANCELLATION

- .1 The Owner may elect, at its option, to cancel the contract prior to its normal termination:
 - .1 If the maintenance is not executed in accordance with the Specifications, as evidenced by the report of a recognized independent elevator consultant, and

- .2 If, within four weeks of written notice, the necessary corrective action has not been completed;
 - .3 If there is a continuing failure to perform as evidenced by more than two negative reports in any twelve month period with no positive or neutral reports in the same twelve month period. (A negative report is one which defines the level of contract performance as less than 95% of the specified requirements.
- .2 In the event of such cancellation, the Owner may, at its option, elect to use another company to restore the equipment to the Specifications standards and to charge the cost of this to the elevator contractor.
 - .3 The Owner has the option to cancel the contract upon one month's written notice if there is a significant change in the circumstances of the contract (e.g. a change in ownership of the equipment, a modernization or replacement at the Owner's cost of equipment components, a change in ownership of the maintenance company); this option to be available to the Owner for a period of three months from the date on which the changed circumstances become known to the Owner.

1.14 PROTECTION OF WORK AND PROPERTY

- .1 Take all necessary precautions to ensure that the work covered by the Specifications is done in a manner that does not endanger any person.

1.15 LIABILITY INSURANCE

- .1 Provide, during the period this contract is in force, premises liability, including public liability insurance and property damage insurance in the amount of \$5,000,000 inclusive, to be covered against any claims for damage to property or for personal injury, including death, which may arise from operation under this contract, whether such operation is by yourself or by any subcontractor or anyone directly or indirectly employed by you.
- .2 Upon completion of the contract, have in force a completed operations and products liability insurance, in the amount of \$5,000,000 inclusive, to be covered against any claims for damages to property or for personal injury, including death, which may arise after the premises liability is terminated. This insurance shall remain in force for a minimum period of two years after completion of the contract.
- .3 Submit certificates of such insurance with the Owner before work is begun.
- .4 The certificates shall state that the insurance will not become ineffective without sufficient written notice to the Owner.

1.16 ASSIGNMENTS

- .1 Do not assign nor sublet the contract without the written consent of the Owner.

- .2 Do not assign any payment due or to become due as a result of this contract without the written consent of the Owner.

1.17 ACCESS CODES

- .1 If the contract is cancelled, provide to the Owner, for those elevator systems or components that have access codes or access tools for commissioning, programming or other purposes, the access tools and a hard copy listing of the access codes.
- .2 If the Owner provides access codes or access tools, preserve these codes and tools confidential for use only on the particular equipment for which the Owner has provided them.
- .3 Change access codes only when authorized in writing by the Owner.

1.18 MIS-ADJUSTMENT

- .1 Keep the equipment in substantially new condition and maintain its performance as or better than new.
- .2 Do not change any of the elevator adjustments in such a way as to lead to a de-rating of the performance.
- .3 In particular do not:
 - .1 Increase the door open pause times without written instructions from the Owner;
 - .2 Decrease the door operating speed;
 - .3 Change the brake spring setting;
 - .4 Change the brake lift setting;
 - .5 Decrease the acceleration;
 - .6 Decrease the deceleration;
 - .7 Decrease the rated speed.
- .4 Do not, in the course of routine maintenance or trouble shooting, re-adjust any of those settings which affect the performance of the equipment.
- .5 Should it appear that some setting has changed or some problem has arisen such as to alter the performance of the equipment, arrange that a qualified adjuster with the appropriate tools, manuals and training make the necessary re-adjustments in an organized, systematic way.
- .6 Do not allow ad hoc adjustments to the equipment.

1.19 COORDINATION WITH OWNER

- .1 Before each routine maintenance inspection contact a representative specified by the Owner.
- .2 Discuss the operation of the equipment with the Owner's representative and take immediate action on problems.
- .3 Should a problem be of a nature that cannot be satisfactorily resolved during the inspection or trouble call, report back to the Owner's representative to explain why it was not possible to correct the problem and when the problem will be resolved.

1.20 PERSONNEL

- .1 Supervise your personnel so that they present a neat appearance and their movement in the building is within the requirements of their work.
- .2 Provide uniforms or other obvious means of identification for personnel.

1.21 REPAIRS

- .1 For scheduled repair work, outside of the regular maintenance procedure, give the Owner at least two weeks prior notice.
- .2 For unscheduled repair work, outside of the regular maintenance procedure, give the Owner immediate notice.
- .3 Communicate, in writing, the status of repairs to the Owner at the beginning and close of the normal working day.
- .4 Discuss with the Owner the relevance of continuing the work in overtime to complete the repairs and only proceed when receiving a written authorization from the Owner.
- .5 Where possible indicate the time required for completion of repairs.

1.22 SAFETY DEVICES

- .1 At no time permit the equipment to operate while any of the safety devices, mechanical or electrical are in-operative.
- .2 In the event that any of the emergency safety devices such as final limits, safety operated switches, governor switches, overspeed devices, underspeed devices, car safeties, are activated while the equipment is in use by the public submit a written report to the Owner detailing the incident and the corrective action taken.

1.23 CODES AND ORDINANCES

- .1 Supply equipment and do work in accordance with building codes, by-laws, regulations and requirements of the local, provincial and federal authorities in effect at the time of the execution of the work.
- .2 Supply equipment and do work in accordance with the Code, and any other code which may govern the requirements of the installation.
- .3 Comply with the requirements of the Occupational Health and Safety Act and Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .4 Prior to submission of the proposal and throughout the duration of work, give prompt notification in writing of any regulations or requirements known to be in process which might affect the acceptability of the work.
- .5 If changes in codes or regulations result in extra costs, those taking effect subsequent to the date of proposal submission shall be treated as an extra to the contract.

1.24 EQUIPMENT DEFECTS

- .1 Should a defect in the equipment or the design of the equipment become apparent based on experience with this installation or similar installations elsewhere, advise the Owner immediately in writing setting out the steps to be taken to correct the problem.
- .2 Forward to the Owner copies of any memoranda, internal or external, published or unpublished, dealing with actual or potential flaws in the equipment and design.

1.25 CALL-BACK SERVICE

- .1 Provide twenty-four hour call-back service.
- .2 Provide a telephone answering service staffed twenty-four hours per day.
- .3 Provide call-back service during regular working hours.
- .4 At the time the call is placed the Owner may choose to indicate that the call can be handled during regular hours; otherwise, answer the call immediately whether it be in overtime or regular time.
- .5 Respond only to calls placed by the Owner except in the case of emergency calls.
- .6 Ensure that calls received by the answering service are transmitted immediately to a responsible person for action.
- .7 Provide regular call-back response within a maximum of two hours from the time a call is placed until the arrival of a maintenance person at the site.

- .8 Provide emergency call-back response within a maximum of 45 minutes from the time a call is placed until the arrival of a maintenance person at the site.
- .9 Provide emergency call-back service 24 hours per day, seven days per week.
- .10 Do not charge premium for overtime emergency calls - an emergency is a situation such as an entrapment, an incident, an accident, a shut down of more than one elevator in a group or the absence of elevator service to a floor.

1.26 MAINTENANCE: ASSISTANCE FOR INSPECTIONS & TESTING

- .1 Provide all necessary co-operation and assistance to allow inspections of the equipment by the Consultant and by the Inspecting Authorities.
- .2 Provide all necessary co-operation and assistance, either in regular time or overtime, to allow testing of those systems associated with the equipment such as fire detectors, emergency power, firefighters' emergency operation, communication systems, security systems and other systems ancillary to the equipment.
- .3 In the event that this requires the supply of more than one crew for more than three hours per unit per year, submit a request to the owner for an extra to contract payment.

1.27 DIRECTIVES

- .1 Advise the Owner of directives received from the Inspecting Authorities and from the Regulatory Authorities.
- .2 Carry out directives from the Inspecting Authorities and from the Regulatory Authorities within the period of time set out on the directives, working in overtime if necessary to meet the required date, except for those items that are:
 - .1 The responsibility of the Owner;
 - .2 Directives resulting from changes to the existing regulations.
- .3 Confirm in writing the execution of the directives.

1.28 DELAY IN MAKING REPAIRS

- .1 Execute promptly the necessary repairs to a non-functioning unit to service.
- .2 Should the initiation of corrective measures required to repair a non-functioning unit be delayed beyond one normal working day (i.e. 24 hours) issue a credit for that unit for the month.

1.29 DEFICIENCIES NOT CORRECTED

- .1 If there is a failure to carry out instructions of the inspecting authorities (except for those items that are the responsibility of the Owner and directives resulting from

changes to the existing codes) within the period of time allowed by the authorities issue a credit to the Owner for the cost of the inspecting authority reinspection.

1.30 BUILDING SYSTEM TESTS

- .1 Provide assistance to the Owner for the testing in overtime of building systems such as Emergency Power and Firefighters' Emergency Operation.

1.31 SOFTWARE AND FIRMWARE UPDATES

- .1 Check each January with the control manufacturer for software and firmware updates.
- .2 Advise the Owner of the status of these updates.
- .3 Obtain and install updates.

1.32 MANUFACTURERS' PARTS

- .1 Supply replacement parts identical in make and model to the original parts where at all possible.
- .2 Provide substitutes when genuine parts are not available.
- .3 Where identical parts are not available or a better substitute is available submit the alternative part for the approval of the Owner.

1.33 SUBSTITUTE PARTS

- .1 Where items visible to the general public, in particular exposed finishes and fixtures, are to be replaced, submit drawings, photographs or samples, as required, in ample time for consideration and review.
- .2 Submit samples of metals, plastic laminates and finishes properly identified as to project, location and material.
- .3 Supply materials in accordance with the reviewed samples.
- .4 The review does not include the checking of measurements nor the approval of variations from the Specifications or the Contract Documents.

1.34 PARTS STOCKED LOCALLY

- .1 Arrange that the following spare parts are available on site (in a metal cabinet with a baked enamel finish), in a service vehicle or from the local maintenance office and allow the Owner, at his request, to inspect these parts:
 - .1 Hall fixtures: two complete hall station assemblies (with call registered light assemblies), four button heads, and a hall lantern of each type;

- .2 Car operating panel fixtures: three complete car push button switch assemblies (with call registered light assemblies), four button heads, and one position indicator;
- .3 Car door equipment: two car door sheaves and one set of door gibs;
- .4 Hall door equipment: one complete hoistway door closer assembly, two interlocks, four hall door sheaves, and two sets of door gibs;
- .5 Three fuses of each size used in the controller and in the main line disconnect;
- .6 Relays: one complete relay of each type with spare contacts and coils;
- .7 Rotary electric equipment: a set of each type of brushes;
- .8 An adequate supply of cleaning solvent, wipers, general purpose oil and door operator oil.

1.35 PARTS AVAILABLE AS REQUIRED

- .1 Arrange that the following spare parts are available within 48 hours on site and provide to the Owner, at his request, the methods and procedures used to ensure that this delivery time can be met:
 - .1 A printed circuit board of each type used, completely assembled and verified;
 - .2 One complete door operator assembly;
 - .3 One complete door protective device assembly;
 - .4 One complete roller guide assembly of each size used;
 - .5 Spares for parts used in quantity on the equipment in the ratio of one spare for every 100 such parts.

1.36 TOOLS MAINTAINED LOCALLY

- .1 Arrange that the following tools are available in a service vehicle or from the local maintenance office and allow the Owner, at their request, to inspect these tools:
 - .1 One blower;
 - .2 One door pressure gauge;
 - .3 One rechargeable fluorescent portable light;
 - .4 Signs stating "REGULAR MAINTENANCE BEING PERFORMED";

- .5 One vacuum cleaner;
- .6 One step ladder;
- .7 Two chain blocks or lift pulls;
- .8 Two sets of feeler gauges;
- .9 One sound level meter;
- .10 A micrometer;
- .11 One F.E.T. volt-ohm-milliammeter;
- .12 One cellular phone for each maintenance mechanic;
- .13 One stop watch;
- .14 One tachometer;
- .15 Test weights totaling 2270 kg (5000 lb) and a hand cart for transportation.

1.37 BUILDING LOG

- .1 Complete required entries for building log systems.

1.38 MAINTENANCE LOG BOOK

- .1 Provide a maintenance log in a permanently bound journal having pre-numbered pages.
- .2 Indicate in the journal the following information: date, time, name of maintenance man, regular maintenance, regular time callback, over time callback, action taken, work completed, and further repairs required.
- .3 The journal is the property of the Owner.
- .4 Maintain the journal current, on the premises, and available for inspection by the Owner at any time.
- .5 Make entries in ink, legibly, consecutively and without blanks.

1.39 MISSED MAINTENANCE

- .1 Should the monthly maintenance not be performed or should the maintenance not be signed as complete in the maintenance log issue a credit for the month.

1.40 TIME TICKETS

- .1 Indicate the section of the normal maintenance schedule on each time ticket with details of the portion of the section completed.

- .2 Submit time tickets for each call-back detailing the cause of the call-back and the action taken.
- .3 If electronic time tickets are used, provide the Owner with 24 hour internet access to the time ticket records.

1.41 ACCIDENTS AND CLAIMS

- .1 In the event of an accident causing death, personal injury or property damage, arising out of or in connection with the equipment or the performance of the work whether on or adjacent to the site advise the Owner immediately giving a verbal report and submit to the Owner within 24 hours of the accident signed written reports from each of the maintenance personnel involved.
- .2 In the event of an injury to anyone working on or using the equipment, take whatever immediate action is necessary to aid the injured person and to prevent further injury to others.

1.42 MAINTENANCE MANUAL

- .1 Supply to your maintenance personnel a manual describing proper maintenance procedures and methods of maintaining the equipment in proper order.
- .2 Prior to the start of the maintenance contract give a soft copy of this manual in PDF format to the Owner so that his staff may better describe and report problems that arise.
- .3 If, in the course of the maintenance contract, changes are made to this manual, supply to the Owner a revised copy of the manual.

1.43 ELECTRICAL DIAGRAMS

- .1 Provide a set of schematic electrical diagrams either covered in clear plastic and mounted on the machine room wall or bound permanently in a durable binder if the diagrams are of dimensions less than 300 mm (12") by 600 mm (24").
- .2 If, in the course of the maintenance contract, changes are made to the wiring or control, supply to the Owner marked-up prints of the altered schematics and field wiring diagrams showing the changes.

1.44 MAINTENANCE CONTROL PROGRAM

- .1 Within two months of the start of the maintenance contract provide to the Owner and the Consultant a copy of the Maintenance Control Program for each device.
- .2 During the course of the maintenance contract update the Maintenance Control Program as necessary and forward to the Owner and the Consultant a copy of the updated Maintenance Control Program.
- .3 Provide a soft copy of the program in PDF (*Portable Document Format*) format.

1.45 MONTHLY DATA SUBMISSION

- .1 Provide data in an electronic format as prescribed by the Owner.
- .2 In the absence of other requirements, submit data each month for call-backs and maintenance work in a Comma-Separated-Values (.csv) file with each line having the following information: Licence #; Call Time; Response Time; Resolution Time; Problem Description; Corrective Action; Entry Type; Scorecard Exemption; Exemption Reason with each item having the following meaning:
 - .1 Licence #: The licence number assigned to the unit by the Authority Having Jurisdiction (where one has not been assigned, is not unique or is not known please coordinate with the Owner).
 - .2 Call Time: Date and time the call-back is reported by the client or date and time the elevating device is removed from service for maintenance or repair in format YYYY-MM-DD HH:MM.
 - .3 Response Time: Date and time technician arrives on site to respond to the call-back or date and time the elevating device is removed from service for maintenance or repair in format YYYY-MM-DD HH:MM (in the event of a deferred call-back, the elapsed time will start based on 07:00 on the first business day following the original Call Time).
 - .4 Resolution Time: Date and time the elevating device is returned to service in format YYYY-MM-DD HH:MM.
 - .5 Problem Description: Description of problem as reported.
 - .6 Corrective Action: Description of work done to correct problem as reported by the technician.
 - .7 Entry Type: Type of call as "C" for call-back, "E" for call-back with entrapment, "D" for call-back with deferred response, "R" for maintenance or repair.
 - .8 Scorecard Exemption: Marked "Y" or "Yes" if the Contractor is requesting an exemption from the scorecard for this call-back (null values or "N" are the only other acceptable values).
 - .9 Exemption Reason: Description of why the Contractor is requesting the call-back or repair be exempted from the scorecard calculations (an entry in this field is required when the Scorecard Exemption field is "Y" or "Yes").
- .3 Submit the data for the month on or before the fifth day of the following month.
- .4 The Owner, acting reasonably, may at any point during the contract:
 - .1 Change the format of the data submission.

- .2 Require a direct electronic exchange of data using standard protocols for data exchange to a Consultant website.

1.46 YEARLY REPORT

- .1 Each year, on the anniversary date of the contract, submit to the Owner a report consisting of the following items:
 - .1 A complete summary of the activity for the year including, but not limited to, call backs, repair work, complaints;
 - .2 A certification that the various items as listed above were checked at the specified times and that they were found to be functioning correctly or, if not functioning correctly, notations of the problems and the corrective action taken;
 - .3 An evaluation of the standard of maintenance for the year as compared to prior years and to the standards of the industry for similar installations.

1.47 CONSULTANT'S REPORTS

- .1 Carry out such maintenance, repair and replacement, as listed on the Consultant's reports.

PART 2 - HYDRAULIC ELEVATOR

2.1 WORK INCLUDED

- .1 Maintain, repair or replace:
 - .1 Hydraulic machine, pump, pump motor, controller, plunger, cylinder, hydraulic fluid, door equipment, elevator intercommunication system, and other mechanical and electrical parts required for the operation of the equipment.

2.2 WORK NOT INCLUDED

- .1 Do not maintain, repair or replace:
 - .1 Buried cylinder without protective plastic casing, cab finishes (including ceiling lights), handrails (except for attachments on the exterior of the cab), flooring, hoistway enclosure, and hall door, sill and frame finish;
 - .2 Electrical conduit and wiring outside the hoistway and machine room;
- .2 Submit, to the Owner, a bid for repairs or the replacement of parts due to vandalism, or for additional changes and costs not covered by the maintenance contract but required by the regulating authority.

2.3 PARTS AVAILABLE AS REQUIRED

- .1 Arrange that the following spare parts are available within 48 hours on site and provide to the Owner, at his request, the methods and procedures used to ensure that this delivery time can be met:

- .1 One set of packing for the hydraulic jack;
- .2 One hydraulic valve solenoid coil for each type used on the equipment.

2.4 TOOLS MAINTAINED LOCALLY: HYDRAULIC ELEVATORS

- .1 Arrange that the following tools are available in a service vehicle or from the local maintenance office and allow the Owner, at his request, to inspect these tools:

- .1 One dial pressure gauge;
- .2 One air compressor.

2.5 HYDRAULIC OIL

- .1 Do not add hydraulic oil to the system before determining the cause of the loss of oil.
- .2 Receive written authorization from the local service superintendent prior to adding oil with the amount of oil stated and the reason for adding it.
- .3 Transmit to the Owner a copy of this written authorization.
- .4 Do not keep hydraulic oil on site or in service vehicles.
- .5 Maintain stocks of hydraulic oil and access to hydraulic oil under the control of the local service superintendent.

2.6 MONTHLY CHECKS: HYDRAULIC ELEVATOR

- .1 Check the following items at least once each month:
 - .1 Piston gland packing;
 - .2 Oil recuperation system;
 - .3 Door operator;
 - .4 Door reopening device;
 - .5 Car ride and general operation;
 - .6 Levelling;
 - .7 Hall and car door operation;
 - .8 In-car stop switch (or emergency stop button);

- .9 Alarm button;
 - .10 Communication system;
 - .11 Door open button;
 - .12 Door force;
 - .13 Car door rollers and eccentrics;
 - .14 Car door clutch assembly;
 - .15 Position indicators and signal lamps;
 - .16 Car door contacts;
 - .17 Hoistway door interlocks.
- .2 Perform the following duties at least once each month:
- .1 Check the hydraulic fluid level and record it in the log book;
 - .2 Lubricate and clean car door tracks;
 - .3 Clean the pit;
 - .4 Clean the top of car;
 - .5 Clean machine and machine room floor.

2.7 QUARTERLY CHECKS

- .1 Perform the following duties at least once every three months:
- .1 Clean and vacuum the controller and examine the relays for wear;
 - .2 Check the circuitry and safety devices in the controller;
 - .3 Check the resistors for overheating and repair or correct the problem where necessary;
 - .4 Check the roller guides;
 - .5 Check the emergency lighting;
 - .6 If the cylinder is protected by a sealed plastic sleeve equipped with valves:

- .1 Detect and remove any liquid between the cylinder and sleeve using an air compressor as per the directives from the cylinder manufacturer;
- .2 Pressure test the system using an air compressor as per the directives from the cylinder manufacturer.

2.8 SEMI-ANNUAL CHECKS

- .1 Perform the following duties at least once every six months:
 - .1 Check the hall door operation;
 - .2 Check the door gibs and cable and sheaves for the door closer;
 - .3 Check and test the final limit switches;
 - .4 Check the special emergency service operation with the Owner present;
 - .5 Check the emergency power operation with the Owner present;
 - .6 Check the door open pause times;
 - .7 Check the load weighing device;
 - .8 Check the operating time and make any necessary changes;
 - .9 Check the door open pause time cancellation (i.e. monitor) circuit;
 - .10 Check the pumping unit;
 - .11 Check the hydraulic pressure relief valve;
 - .12 Check each hoistway door to ensure that the gibs, hangers, upthrust rollers and retainers are intact and properly fastened;
 - .13 Check the car door to ensure that the gibs, hangers, upthrust rollers and retainers are intact and properly fastened;
 - .14 Check that the gibs and retainers are in place by sliding a steel rule or other similar device beneath the door to make physical contact with the gib or retainer;
 - .15 Check the upthrust rollers of each hoistway door by racking the door to ensure that upthrust rollers are intact and properly adjusted;
 - .16 Check each hoistway door interlock to ensure that the lock is made up before the car can run;
 - .17 Check the car door to ensure that the car cannot run with the car door open;

- .2 Check the hydraulic system for leaks as follows:
 - .1 Run the elevator up to the stop ring and raise the pressure to the relief valve setting;
 - .2 Note the gauge pressure reading and record it in the log book;
 - .3 Leave the elevator under pressure on the stop ring for a minimum of twelve hours;
 - .4 After the twelve hours has passed, note the gauge pressure reading and record it in the log book;
 - .5 Set the elevator level with the bottom floor and note the hydraulic reservoir fluid level and record it in the log book;
 - .6 If any significant changes are noted that might indicate a leaking hydraulic cylinder, advise the Owner and take such steps as necessary to ensure the safety of the elevator (Do not add hydraulic oil to the system unless it has been determined that the loss of oil is through the gland packing).

2.9 YEARLY CHECKS

- .1 Perform the following duties at least once every year:
 - .1 Check the main motor contacts;
 - .2 Replace the filters on the controller air inlets;
 - .3 Check the operation of the overload devices;
 - .4 Check the car operating panels;
 - .5 Check door operator, clean and lubricate pivot points;
 - .6 Clean guide rails;
 - .7 Vacuum hoistways from top to bottom;
 - .8 Open the car operating station, clean and check for loose wires;
 - .9 Check hall buttons and their connections;
 - .10 Check travelling cables for wear;
 - .11 Check hangers and junction box connections;
 - .12 Check guide rail fastenings;

- .13 Clean and paint machine room floor;
- .2 Check components and fastenings that under failure might create a dangerous situation (e.g. sheave bolts and welds, gear bolts, car slings et cetera).

END OF SPECIFICATIONS

Part 1 General

1.1 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 and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .2 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .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.

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .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 trouble-shooting 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 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .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 1 set of reproducible mechanical drawings. Provide sets of 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 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.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass.

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

.4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

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 indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 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 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 SYSTEM CLEANING

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

3.3 FIELD QUALITY CONTROL

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

3.4 CLEANING

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

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 REFERENCE STANDARDS

- .1 National Fire Prevention Association (NFPA)
 - .1 NFPA 13, Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

1.2 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Provide spare sprinklers and tools in accordance with NFPA 13.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.

2.2 ABOVE GROUND PIPING SYSTEMS

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

2.3 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
 - .2 Copper tube: screwed, soldered, brazed, grooved.
 - .3 Provide threaded fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .4 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.

- .5 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
- .6 Fittings: ULC approved for use in wet pipe sprinkler systems.
- .7 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
- .8 Side outlet tees using rubber gasketed fittings are not permitted.
- .9 Sprinkler pipe and fittings: metal.
- .3 Pipe hangers:
 - .1 ULC listed for fire protection services in accordance with NFPA.

2.4 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type:
 - .1 Type upright bronze.
 - .2 Type pendant chrome glass bulb type.
 - .3 Type F: side wall.
- .3 Provide nominal 1.2 cm orifice sprinkler heads.
 - .1 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
 - .2 Ceiling plates: not more than 25 mm deep.
 - .3 Ceiling cups: not permitted.

2.5 PIPE SLEEVES

- .1 Provide pipe sleeves where piping passes through walls.
- .2 Secure sleeves in position and location during construction.
- .3 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.
 - .1 Firmly pack space with mineral wool insulation.
 - .2 Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to firm but pliable mass.
 - .3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.
- .4 Sleeves in Masonry and Concrete Walls:
 - .1 Provide cast-iron sleeves
 - .2 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.

2.6 ESCUTCHEON PLATES

- .1 Provide one-piece type metal plates for piping passing through walls in exposed spaces.
- .2 Provide polished stainless steel plates in finished spaces.

- .3 Provide paint finish on metal plates in unfinished spaces.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

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

3.3 PIPE INSTALLATION

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

3.4 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

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

END OF SECTION

Part 1 General

1.1 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 and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .2 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .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.

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .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 trouble-shooting 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 a copy 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 1 set of reproducible mechanical drawings. Provide sets of prints as required for each phase of work. Mark changes as work progresses and as changes occur.
 - .2 Transfer information 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.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 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 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 SYSTEM CLEANING

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

3.3 FIELD QUALITY CONTROL

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

3.4 CLEANING

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

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 REFERENCE STANDARDS

- .1 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada (NPC).

Part 2 Products

2.1 CLEANOUTS

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access Covers:

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialties and accessories installation in accordance with manufacturer's written instructions.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

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

3.4 CLEANOUTS

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

3.5 TESTING AND ADJUSTING

- .1 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.

- .2 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.

3.6 CLOSEOUT ACTIVITIES

- .1 Commissioning Reports: in accordance with Section 01 91 13 - General Commissioning Requirements reports, supplemented as specified.
- .2 Training: provide training in accordance with Section 01 91 13 - General Commissioning Requirements: Training of O&M Personnel, supplemented as specified.

3.7 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 NOT USED

Part 2 Products

2.1 SUMP PUMP SUBMERSIBLE (DUPLEX)

- .1 Capacity: 11.4 m³/h at 20 m head with NPS 50 discharge.
- .2 Construction: duplex CSA approved, housing epoxy coated cast iron, bronze fitted stainless steel shaft, non-clog bronze impeller, mechanical shaft seal.
- .3 Motor: 2 HP hermetically sealed, with automatic overload protection.
- .4 Control: External control panel with switches and control box for two pump type installation. High level alarm for connection to the building controller.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Make piping and electrical connections to pump and motor assembly and controls as indicated.
- .2 Ensure pump and motor assembly do not support piping.
- .3 Align vertical pit mounted pump assembly after mounting and securing cover plate.
- .4 Place 150 mm sand under sump pit tank.

3.3 START-UP

- .1 General:
 - .1 In accordance with Section 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS: General Requirements, supplemented as specified herein.
 - .2 Procedures:
 - .1 Check power supply.
 - .2 Check starter O/L heater sizes.
 - .3 Start pumps, check impeller rotation.
 - .4 Check for safe and proper operation.
 - .5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.

- .6 Test operation of hands-on-auto switch.
- .7 Test operation of alternator.
- .8 Adjust leakage through water-cooled bearings.
- .9 Adjust shaft stuffing boxes.
- .10 Adjust leakage flow rate from pump shaft stuffing boxes to manufacturer's recommendations.
- .11 Check base for free-floating, no obstructions under base.
- .12 Run-in pumps for 12 continuous hours.
- .13 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
- .14 Adjust alignment of piping and conduit to ensure full flexibility.
- .15 Eliminate causes of cavitation, flashing, air entrainment.
- .16 Measure pressure drop across strainer when clean and with flow rates as finally set.
- .17 Replace seals if pump used to degrease system or if pump used for temporary heat.
- .18 Verify lubricating oil levels.

3.4 PV – SANITARY PUMPS

- .1 Application tolerances:
 - .1 Flow: plus 10 %; minus 0 %.
 - .2 Pressure: plus 10 %; Minus 5 %.
- .2 PV Procedures:
 - .1 Fill sump at rate slower than capacity of pump #1.
 - .2 Record levels at which pump #1 starts and stops. Determine flow rate by observing time taken to down water level.
 - .3 Fill sump at rate faster than capacity of pump #1 but slower than capacities of pumps #1 and #2 operating in parallel.
 - .4 Record levels at which pumps start and stop - water level rising and water level falling.
 - .5 Verify operation of alternator.
 - .6 Adjust water level controls as necessary.
 - .7 Fill sump at rate faster than capacities of pumps #1 and #2 operating in parallel.
 - .8 Record levels at pump starts and stops - water level rising and falling.
 - .9 Check operation of alternator.
 - .10 Adjust level controls as necessary.
 - .11 Check level at which high water level alarm starts and stops. Adjust as necessary.
- .3 Check removability of pumps for servicing without interfering with installation or operation of other equipment.
- .4 Verify non-clog capability and maximum size of solids, using procedures recommended by manufacturer.

3.5 REPORTS

- .1 In accordance with Section 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS: reports, supplemented as specified.
- .2 Include:
 - .1 PV results on approved PV Report Forms.
 - .2 Product Information report forms.
 - .3 Pump performance curves (family of curves) with final point of actual performance.

3.6 TRAINING

- .1 In accordance with Section 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS: Training of O&M Personnel, supplemented as specified.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM B32, Standard Specification for Solder Metal.
 - .2 ASTM B306, Standard Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C564, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 CSA Group (CSA)
 - .1 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
 - .2 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .3 CAN/CSA-B125.3, Plumbing Fittings.
- .3 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada 2015 (NPC).

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary 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: lead free

2.2 CAST IRON PIPING AND FITTINGS

- .1 Above ground sanitary and vent: to CAN/CSA-B70.
 - .1 Joints:
 - .1 Hub and spigot:
 - .1 Caulking lead: to CSA B67.
 - .2 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 TESTING

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

3.3 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify that cleanout rods can probe as far as the next cleanout, at least.
- .2 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM D2564, Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 CSA Group (CSA)
 - .1 CAN/CSA-Series B1800, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.
- .3 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada (NPC).

Part 2 Products

2.1 PIPING AND FITTINGS

- .1 For above ground DWV piping to:
 - .1 CAN/CSA B1800.

2.2 JOINTS

- .1 Solvent weld for PVC: to ASTM D2564.
- .2 Solvent weld for ABS: to ASTM D2235.

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 TESTING

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

3.3 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify cleanout rods can probe as far as the next cleanout, at least.

END OF SECTION

Part 1 General

1.1 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 and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .2 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .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.

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .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 trouble-shooting 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 1 copie 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 1 set of reproducible mechanical drawings. Provide sets of 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 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.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 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.

1.4 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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 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 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 SYSTEM CLEANING

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

3.3 FIELD QUALITY CONTROL

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

3.4 CLEANING

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

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 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A105/A105M, Standard Specification for Carbon Steel Forgings, for Piping Applications.

Part 2 Products

2.1 FLEXIBLE CONNECTION

- .1 Application: to suit motion.
- .2 Minimum length in accordance with manufacturer's recommendations to suit offset.
- .3 Inner hose: stainless steel corrugated.
- .4 Braided wire mesh stainless steel outer jacket.
- .5 Operating conditions:
 - .1 Working pressure: 1034 kPa.
 - .2 To match system requirements.
- .6 Three flexible grooved couplings placed in close proximity to vibration source for vibration attenuation and stress relief.

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 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B40.100, Pressure Gauges and Gauge Attachments.
 - .2 ASME B40.200, Thermometers, Direct Reading and Remote Reading.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-14.4, Thermometers, Liquid-in-Glass, Self Indicating, Commercial/Industrial Type.
 - .2 CAN/CGSB-14.5, Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

Part 2 Products

2.1 GENERAL

- .1 Design point to be at mid-point of scale or range.
- .2 Ranges: according to the networks.

2.2 DIRECT READING THERMOMETERS

- .1 Industrial, variable angle type, mercury-free, liquid filled, 125 mm scale length: to ASME B40.200.
 - .1 Resistance to shock and vibration.

2.3 THERMOMETER WELLS

- .1 Copper pipe: copper or bronze.
- .2 Steel pipe: stainless steel.

2.4 PRESSURE GAUGES

- .1 112 mm, dial type: to ASME B40.100, Grade 2A, stainless steel bourdon tube having 0.5% accuracy full scale unless otherwise specified.
- .2 Provide:
 - .1 Siphon for steam service.
 - .2 Snubber for pulsating operation.
 - .3 Gasketed pressure relief back with solid front.
 - .4 Bronze stop cock.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

3.2 GENERAL

- .1 Install thermometers and gauges so they can be easily read from floor or platform.
 - .1 If this cannot be accomplished, install remote reading units.
- .2 Install between equipment and first fitting or valve.

3.3 THERMOMETERS

- .1 Install in wells on piping. Include heat conductive material inside well.
- .2 Install in locations and on inlet and outlet of:
 - .1 Heat exchangers.
 - .2 Water heating and cooling coils.
 - .3 Water boilers.
 - .4 Chillers.
 - .5 Cooling towers.
 - .6 DHW tanks.
- .3 Use extensions where thermometers are installed through insulation.

3.4 PRESSURE GAUGES

- .1 Install in locations as follows:
 - .1 Upstream and downstream of control valves.
 - .2 Inlet and outlet of coils.
 - .3 In other locations as indicated.
- .2 Install gauge cocks for balancing purposes, elsewhere as indicated.
- .3 Use extensions where pressure gauges are installed through insulation.

3.5 NAMEPLATES

- .1 Install engraved lamicoïd nameplates in accordance with Section 23 05 53 - Identification For HVAC Piping and Equipment, identifying medium.

3.6 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
 - .1 ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).
 - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 ASTM International (ASTM)
 - .1 ASTM A276, Standard Specification for Stainless Steel Bars and Shapes.
 - .2 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .3 ASTM B283, Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
 - .4 ASTM B505/B505M, Standard Specification for Copper-Base Alloy Continuous Castings.
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
 - .1 MSS-SP-25, Standard Marking System for Valves, Fittings, Flanges and Unions.
 - .2 MSS-SP-80, Bronze Gate Globe, Angle and Check Valves.
 - .3 MSS-SP-110, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

Part 2 Products

2.1 MATERIALS

- .1 Valves:
 - .1 Except for specialty valves, to be single manufacturer.
 - .2 Products to have CRN registration numbers.
- .2 End Connections:
 - .1 Connection into adjacent piping/tubing:
 - .1 Steel pipe systems: screwed ends to ANSI/ASME B1.20.1.
 - .2 Copper tube systems: grooved ends to ANSI/ASME B16.18.
- .3 Ball Valves:
 - .1 NPS 2 and under:
 - .1 Body and cap: cast high tensile bronze to ASTM B62.
 - .2 Pressure rating: Class 125, 4140-kPa CWP.
 - .3 Connections: screwed ends to ANSI B1.20.1 and with hexagonal shoulders.
 - .4 Stem: tamperproof ball drive.

- .5 Stem packing nut: external to body.
- .6 Ball and seat: replaceable stainless steel solid ball and Teflon seats.
- .7 Stem seal: TFE with external packing nut.
- .8 Operator: removable lever handle.

Part 3 Execution

3.1 INSTALLATION

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Remove internal parts before soldering.
- .3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.1, Power Piping.
- .2 ASTM International (ASTM)
 - .1 ASTM A125, Standard Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A563, Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Factory Mutual (FM)
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .5 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada (NPC).
- .6 Underwriter's Laboratories of Canada (ULC)

Part 2 Products

2.1 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
 - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
 - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
 - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
 - .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

- .2 Performance Requirements:
 - .1 Design supports, platforms, catwalks, hangers to withstand seismic events as specified Section.

2.2 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP58 and ANSI B31.1.
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 PIPE HANGERS

- .1 Finishes:
 - .1 Pipe hangers and supports: galvanized after manufacture.
 - .2 Use hot dipped galvanizing process.
 - .3 Ensure steel hangers in contact with copper piping are epoxy coated.
- .2 Upper attachment to concrete:
 - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
 - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed to MSS SP69.
- .3 Hanger rods: threaded rod material to MSS SP58:
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
 - .3 Do not use 22 mm or 28 mm rod.
- .4 Pipe attachments: material to MSS SP58:
 - .1 Attachments for steel piping: carbon steel galvanized.
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.
- .5 Adjustable clevis: material to MSS SP69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
- .6 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
- .7 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
- .8 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.

2.4 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- .3 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .4 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.3 HANGER SPACING

- .1 Plumbing piping: to National Plumbing Code of Canada (NPC).
- .2 Fire protection: to applicable fire code.
- .3 Copper piping: up to NPS 1/2: every 1.5 m.
- .4 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- .5 Within 300 mm of each elbow.

Maximum Pipe Size: NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	
8	4.3 m	
10	4.9 m	
12	4.9 m	

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

3.4 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.
 - .2 CAN/CGSB-24.3, Identification of Piping Systems.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 13, Standard for the Installation of Sprinkler Systems.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

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

2.2 SYSTEM NAMEPLATES

- .1 Colours:
 - .1 Hazardous: red letters, white background.
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
 - .1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
 - .1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

- .2 Use maximum of 25 letters/numbers per line.
- .4 Identification for PSPC Preventive Maintenance Support System (PMSS):
 - .1 Use arrangement of Main identifier, Source identifier, Destination identifier.
 - .2 Equipment in Mechanical Room:
 - .1 Main identifier: size #9.
 - .2 Source and Destination identifiers: size #6.
 - .3 Terminal cabinets, control panels: size #5.
 - .3 Equipment elsewhere: sizes as appropriate.

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 this section.

2.4 PIPING SYSTEMS GOVERNED BY CODES

- .1 Identification:
 - .1 Sprinklers: to NFPA 13.

2.5 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Pictograms:
 - .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend:
 - .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- .4 Arrows showing direction of flow:
 - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
 - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
 - .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous

operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Departmental Representative.

.2 Colours for legends, arrows: to following table:

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

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
HeatPump - Supply	Green	TP
HeatPump - return	Green	TP
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS

2.6 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.7 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.

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 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Identify systems, equipment to conform to PWGSC PMSS.

3.3 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

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

3.5 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.

END OF SECTION

Part 1 General

1.1 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.

1.2 PURPOSE OF TAB

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads
- .2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.3 EXCEPTIONS

- .1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.4 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.5 PRE-TAB REVIEW

- .1 Review Contract Documents before project construction is started 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.

1.6 START-UP

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

1.7 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.

1.8 START OF TAB

- .1 Notify Departmental Representative 7-days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
 - .3 Installation of ceilings, doors, windows, other construction affecting TAB.
 - .4 Application of weatherstripping, sealing, and caulking.
 - .5 Pressure, leakage, other tests specified elsewhere Division 23.
 - .6 Provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air systems:
 - .1 Filters in place, clean.
 - .2 Duct systems clean.

- .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
- .4 Correct fan rotation.
- .5 Fire, smoke, volume control dampers installed and open.
- .6 Coil fins combed, clean.
- .7 Access doors, installed, closed.
- .8 Outlets installed, volume control dampers open.
- .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.

1.9 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 10%, minus 0%.

1.10 ACCURACY TOLERANCES

- .1 Measured values accurate to within plus or minus 2% of actual values.

1.11 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.

1.12 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.

1.13 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.

1.14 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.

1.15 COMPLETION OF TAB

- .1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

1.16 AIR SYSTEMS

- .1 Standard: TAB to most stringent of TAB standards of AABC, SMACNA, ASHRAE and NEBB.
- .2 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .3 Locations of equipment measurements: to include as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
- .4 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.17 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

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE/IESNA 90.1, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 ASTM International (ASTM)
 - .1 ASTM B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C547, Standard Specification for Mineral Fiber Pipe Insulation.
 - .6 ASTM C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .7 ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .8 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .9 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .4 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36, Commercial Adhesives.
- .5 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
- .6 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 DEFINITIONS

- .1 For purposes of this section:
 - .1 “CONCEALED” - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 “EXPOSED” - means “not concealed” as previously defined.
 - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
- .2 TIAC Codes:
 - .1 CRD: Code Round Ductwork,
 - .2 CRF: Code Rectangular Finish.

Part 2 Products

2.1 FIRE AND SMOKE RATING

- .1 To CAN/ULC-S102:
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity (“k” factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).
- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C553.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum “k” factor: to ASTM C553.

2.3 JACKETS

- .1 Canvas:
 - .1 220 gm/m²cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: compatible with insulation.

2.4 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.

- .2 ULC Listed Canvas Jacket:
 - .1 220 gm/m²cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .3 Tape: self-adhesive, aluminum, reinforced, 75 mm wide minimum.
- .4 Contact adhesive: quick-setting
- .5 Canvas adhesive: washable.
- .6 Tie wire: 1.5 mm stainless steel.
- .7 Banding: 19 mm wide, 0.5 mm thick stainless steel.

Part 3 Execution

3.1 APPLICATION

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

3.2 PRE-INSTALLATION REQUIREMENTS

- .1 Pressure test ductwork systems complete, witness and certify.
- .2 Ensure surfaces are clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and as indicated.
- .3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.4 DUCTWORK INSULATION SCHEDULE

- .1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and recovery temperature supply air ducts	C-1	Yes	50
Round cold and recovery temperature supply air ducts	C-2	yes	50

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).
- .2 ASTM International (ASTM)
 - .1 ASTM B209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - .2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C533, Calcium Silicate Block and Pipe Thermal Insulation.
 - .6 ASTM C547, Mineral Fiber Pipe Insulation.
 - .7 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .8 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts
- .4 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings
 - .4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.2 DEFINITIONS

- .1 For purposes of this section:
 - .1 “CONCEALED” - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 “EXPOSED” - will mean “not concealed” as specified.
- .2 TIAC ss:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

Part 2 Products

2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity (“k” factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum “k” factor: to ASTM C547 and CAN/ULC-S702.
- .4 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum “k” factor: to CAN/ULC-S702 and ASTM C547.
- .5 TIAC Code A-6: flexible unicellular tubular elastomer.
 - .1 Insulation: with vapour retarder jacket.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum “k” factor.
 - .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.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.

- .4 Tie wire: 1.5 mm diameter stainless steel.
- .5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 VAPOUR RETARDER LAP ADHESIVE

- .1 Water based, fire retardant type, compatible with insulation.

2.5 INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.

2.6 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 Colours: white.
 - .3 Minimum service temperatures: -20 degrees C.
 - .4 Maximum service temperature: 65 degrees C.
 - .5 Moisture vapour transmission: 0.02 perm.
 - .6 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and this specification.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.5 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-3.
 - .1 Securements: Stainless Steel bands at 300 mm on centre.
 - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.
- .3 TIAC Code: A-6.
 - .1 Seals: lap seal adhesive, lagging adhesive.
 - .2 Installation: TIAC Code.
- .4 TIAC Code: C-2 with vapour retarder jacket.
 - .1 Seals: lap seal adhesive, lagging adhesive.
 - .2 Installation: TIAC Code: 1501-C.
- .5 Thickness of insulation as listed in following table.
 - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
 - .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp degrees C	TIAC code	Thickness (mm)
Mixed Water	60 - 94	A-3	25
Mixed Water	up to 59	A-1	25
Cooling Coil cond. drain	C-2	25	25

- .6 Finishes:
 - .1 Exposed indoors: PVC jacket.
 - .2 Exposed in mechanical rooms: PVC jacket.
 - .3 Concealed, indoors: canvas on valves, fittings. No further finish.
 - .4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
 - .5 Installation: to appropriate TIAC code CRF/1 through CPF/5.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).

Part 2 Products

2.1 CLEANING SOLUTIONS

- .1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.
- .2 Sodium carbonate: 0.40 kg per 100 L water in system.
- .3 Low-foaming detergent: 0.01 kg per 100 L water in system.

Part 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 CLEANING HYDRONIC AND STEAM SYSTEMS

- .1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.
- .2 Cleaning Agency:
 - .1 Retain qualified water treatment specialist to perform system cleaning.
- .3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete by water treatment specialist.
- .4 Cleaning procedures:
 - .1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:
 - .1 Cleaning procedures, flow rates, elapsed time.
 - .2 Chemicals and concentrations used.
 - .3 Inhibitors and concentrations.
 - .4 Specific requirements for completion of work.
 - .5 Special precautions for protecting piping system materials and components.
 - .6 Complete analysis of water used to ensure water will not damage systems or equipment.

- .5 Conditions at time of cleaning of systems:
 - .1 Systems: free from construction debris, dirt and other foreign material.
 - .2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.
 - .3 Strainers: clean prior to initial fill.
 - .4 Install temporary filters on pumps not equipped with permanent filters.
 - .5 Install pressure gauges on strainers to detect plugging.
- .6 Report on Completion of Cleaning:
 - .1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.
- .7 Hydronic Systems:
 - .1 Fill system with water, ensure air is vented from system.
 - .2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (does not apply to diaphragm type expansion tanks).
 - .3 Use water metre to record volume of water in system to +/- 0.5%.
 - .4 Add chemicals under direct supervision of chemical treatment supplier.
 - .5 Closed loop systems: circulate system cleaner at 60 degrees C for at least 36 h. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.
 - .6 Flush velocity in system mains and branches to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.
 - .7 Add chemical solution to system.
 - .8 Establish circulation, raise temperature slowly to maximum design. Circulate for 12 h, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38 degrees C. Drain as quickly as possible. Refill with clean water. Circulate for 6 hours at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).

3.3 START-UP OF HYDRONIC SYSTEMS

- .1 After cleaning is completed and system is filled:
 - .1 Establish circulation and expansion tank level, set pressure controls.
 - .2 Ensure air is removed.
 - .3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.
 - .4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.
 - .5 Clean out strainers repeatedly until system is clean.
 - .6 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.
 - .7 Repeat with water at design temperature.

- .8 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.
- .9 Bring system up to design temperature and pressure slowly.
- .10 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .11 Adjust pipe supports, hangers, springs as necessary.
- .12 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.
- .13 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.
- .14 Check operation of drain valves.
- .15 Adjust valve stem packings as systems settle down.
- .16 Fully open balancing valves (except those that are factory-set).
- .17 Check operation of over-temperature protection devices on circulating pumps.
- .18 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .2 American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.1, Grey Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - .2 ASME B16.3, Malleable Iron Threaded Fittings: Classes 150 and 300.
 - .3 ASME B16.5, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard.
 - .4 ASME B16.9, Factory-Made Wrought Butt welding Fittings.
 - .5 ASME B18.2.1, Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange. Loded Head and Lag Screws (Inch Series).
 - .6 ASME B18.2.2, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).
- .3 ASTM International (ASTM)
 - .1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
 - .3 ASTM A536, Standard Specification for Ductile Iron Castings.
 - .4 ASTM B61, Standard Specification for Steam or Valve Bronze Castings.
 - .5 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .4 CSA Group (CSA)
 - .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.
 - .2 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
- .5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS)
 - .1 MSS-SP-67, Butterfly Valves.
 - .2 MSS-SP-70, Grey Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71, Grey Iron Swing Check Valves Flanged and Threaded Ends.
 - .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
 - .5 MSS-SP-85, Grey Iron Globe and Angle Valves, Flanged and Threaded Ends.

Part 2 Products

2.1 PIPE

- .1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
 - .1 To NPS 6: Schedule 40.

2.2 PIPE JOINTS

- .1 NPS 2 and under: screwed fittings with lead-free pipe dope.
- .2 Roll grooved: rigid coupling to CSA B242.
- .3 Flanges: plain,.
- .4 Orifice flanges: slip-on raised face, 2100 kPa.
- .5 Flange gaskets: to ANSI/AWWA C111/A21.11.
- .6 Pipe thread: taper.
- .7 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.
- .8 Roll grooved coupling gaskets: type EPDM.

2.3 FITTINGS

- .1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.
- .2 Pipe flanges and flanged fittings:
 - .1 Cast iron: to ASME B16.1, Class 125.
 - .2 Steel: to ASME B16.5.

2.4 VALVES

- .1 Connections:
 - .1 NPS 2 and smaller: screwed ends.
- .2 Balancing, for TAB:
 - .1 Sizes: calibrated balancing valves, as specified this section.
 - .2 NPS 2 and under:
 - .1 Mechanical Rooms: globe, with plug disc.
- .3 Ball valves:
 - .1 NPS 2 and under: as specified Section 23 05 23.01 - Valves - Bronze.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hydronic systems installation in accordance with manufacturer's written instructions.

3.2 CIRCUIT BALANCING VALVES

- .1 Install flow measuring stations and flow balancing valves as indicated.
- .2 Remove handwheel after installation and when TAB is complete.
- .3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.3 CLEANING, FLUSHING AND START-UP

- .1 In accordance with Section 23 08 16 - Cleaning and Start-Up of HVAC Piping Systems.

3.4 TESTING

- .1 Test system in accordance with Section 23 05 00 - Common Work Results for HVAC.

3.5 BALANCING

- .1 Balance water systems to within plus or minus 5% of design output.
- .2 In accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A278/A278M, Standard Specification for Grey Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F (350 degrees C).
 - .3 ASTM A516/A516M, Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.
 - .4 ASTM A536, Standard Specification for Ductile Iron Castings.
 - .5 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.

Part 2 Products

2.1 AUTOMATIC AIR VENT

- .1 Standard float vent: brass body and NPS 1/8 connection and rated at 690 kPa working pressure.

2.2 PIPE LINE STRAINER

- .1 NPS 1/2 to 2: bronze body to ASTM B62, screwed connections, Y pattern.
- .2 Blowdown connection: NPS 1.
- .3 Screen: stainless steel with 1.19 mm perforations.
- .4 Working pressure: 860 kPa.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hydronic specialties installation in accordance with manufacturer's written instructions.

3.2 APPLICATION

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

3.3 GENERAL

- .1 Run drain lines to terminate above nearest drain.
- .2 Maintain adequate clearance to permit service and maintenance.

- .3 Check shop drawings for conformance of tappings for ancillaries and for equipment operating weights.

3.4 STRAINERS

- .1 Install in horizontal or down flow lines.
- .2 Ensure clearance for removal of basket.
- .3 Install ahead of each pump.

3.5 AIR VENTS

- .1 Install at high points of systems.
- .2 Install gate valve on automatic air vent inlet. Run discharge to nearest drain.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International (ASTM)
 - .1 ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A635/A635M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
 - .3 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual.
 - .3 IAQ Guideline for Occupied Buildings Under Construction.

Part 2 Products

2.1 SEAL CLASSIFICATION

- .1 Seal classification:
 - .1 Class B: longitudinal seams, transverse joints and connections made airtight with sealant and tape.

2.2 SEALANT

- .1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
 - .1 Rectangular: standard radius centreline radius: 1.5 times width of duct.
 - .2 Round: smooth radius, centreline radius: 1.5 times diameter.

- .3 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.

2.6 FIRE STOPPING

- .1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Fire Stopping.
- .2 Coordinate with 07 84 00 - Fire Stopping to ensure fire stopping materials and installation does not distort duct.

2.7 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA or ASHRAE.
- .3 Joints: to ASHRAE and SMACNA.

2.8 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
 - .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
 - .1 Maximum size duct supported by strap hanger: 500.
 - .2 Hanger configuration: to ASHRAE or SMACNA.
 - .3 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE, SMACNA or following table :

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.

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 metal duct installation in accordance with manufacturer's written instructions.

3.2 GENERAL

- .1 Do work in accordance with ASHRAE or SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
 - .1 Insulate strap hangers 100 mm beyond insulated duct.
- .3 Install breakaway joints in ductwork on sides of fire separation.

3.3 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.4 SEALING AND TAPING

- .1 Apply sealant in accordance with SMACNA.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

Part 2 Products

2.1 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m².

2.2 ACCESS DOORS IN DUCTS

- .1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.
- .2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.
- .3 Gaskets: neoprene.
- .4 Hardware:
 - .1 Up to 300 x 300 mm: two sash locks complete with safety chain.
 - .2 Hold open devices.

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 air duct accessories installation in accordance with manufacturer's written instructions.

3.2 INSTALLATION

- .1 Flexible Connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets to supply air units and fans.
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 As indicated.

- .2 Length of connection: 100 mm.
- .3 Minimum distance between metal parts when system in operation: 75 mm.
- .4 Install in accordance with recommendations of SMACNA.
- .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.
- .2 Access Doors and Viewing Panels:
 - .1 Size:
 - .1 200 x 200 mm for person size entry.
 - .2 As indicated.
 - .2 Locations:
 - .1 Fire and smoke dampers.
 - .2 Control dampers.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S112, Standard Test Method of Fire Test of Fire Damper Assemblies.
 - .2 CAN/ULC-S112.2, Standard Method of Fire Test of Ceiling Fire Stop Flap Assemblies.
 - .3 ULC-S505, Standard for Fusible Links for Fire Protection Service.

Part 2 Products

2.1 FIRE DAMPERS

- .1 Fire dampers: arrangement appropriate type, listed, bear label of ULC and meet requirements of authorities having jurisdiction. Fire damper assemblies fire tested in accordance with CAN/ULC-S112.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
 - .1 Fire dampers: 1-1/2 hour fire rated unless otherwise indicated.
 - .2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.
- .3 Top hinged: offset, round or square; guillotine type, sized to maintain full duct cross section.
- .4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .5 40 x 40 x 3 mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.
- .6 Equip fire dampers with steel sleeve or frame installed disruption ductwork or impair damper operation.
- .7 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.
- .8 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.
- .9 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition or floor slab depth or thickness.

- .10 Unless otherwise indicated, the installation details given in SMACNA Install Fire Damp HVAC and in manufacturer's instructions for fire dampers shall be followed.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for fire and smoke damper installation in accordance with manufacturer's written instructions.

3.2 INSTALLATION

- .1 Install in accordance with NFPA 90A and in accordance with conditions of ULC listing.
- .2 Maintain integrity of fire separation.
- .3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .4 Install access door adjacent to each damper. See Section 23 33 00 - Air Duct Accessories.
- .5 Coordinate installation of fire stopping with Section 07 84 00 - Fire Stopping.
- .6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.
- .7 Install break-away joints of approved design on each side of fire separation.

END OF SECTION

Part 1 General

1.1 NOT USED.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Performance Requirements:

- .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

2.2 GENERAL

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames and as specified.
 - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators.
- .4 Colour: standard as directed by Departmental Representative.

2.3 MANUFACTURED UNITS

- .1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

2.4 SUPPLY GRILLES AND REGISTERS

- .1 General: with opposed blade dampers.

2.5 RETURN AND EXHAUST GRILLES AND REGISTERS

- .1 General: with opposed blade dampers.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for diffuser, register and grille installation in accordance with manufacturer's written instructions.

3.2 INSTALLATION

- .1 Install in accordance with manufacturers instructions.

- .2 Install with flat head screws in countersunk holes where fastenings are visible.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute/Air-Conditioning and Refrigeration Institute (ANSI/ARI)
 - .1 ANSI/ARI 210/240, Unitary Air Conditioning and Air-Source Heat Pump Equipment.
 - .2 American National Standards Institute/American Society of Heating, Refrigeration and Air-Conditioning Engineers (ANSI/ASHRAE)
 - .1 ANSI/ASHRAE Standard 15, Safety Standard for Refrigeration Systems.
 - .3 Air-Conditioning and Refrigeration Institute (ARI)
 - .1 ARI 320, Standard for Water-Source Heat Pumps.
 - .2 ARI 325, Standard for Ground Water - Source Heat Pumps.
 - .4 CSA Group (CSA)
 - .1 CAN/CSA-C656, Performance Standard for Split-System and Single Package Central Air Conditioners and Heat Pumps.
 - .2 CAN/CSA-C13256, Water-Source Heat Pumps-Testing and Rating for Performance, Part 1 Water-to-Air and Brine-to-Air Heat Pumps.

Part 2 Products

2.1 DRAIN PANS

- .1 Design and construct condensate drain pans under indoor coils so that no water can accumulate and install to allow for easy cleaning.

2.2 INCREMENTAL WATER SOURCE HEAT PUMP

- .1 General:
 - .1 Horizontal type, as indicated, consisting of factory-assembled package containing fan, air-to-refrigerant coil, compressor, 4-way reversing valve, water-to-refrigerant heat exchanger, controls for use with R410a.
- .2 Performance:
 - .1 Certified in accordance with CAN/CSA-C13256.
 - .2 Ratings in accordance with CAN/CSA-C13256.
- .3 Capacity
 - .1 10 kW of sensible cooling with water at 32 degC. Water flow rate of 0.19 L/s and airflow of 311 L/s at 50 Pa at medium speed.
 - .2 Electrical connection 208-230/60/1 with phase protection and factory mounted disconnect switch.

- .4 Basic unit:
 - .1 Compressor: welded hermetic type with internal vibration isolation. Controls to prevent compressor short cycling.
 - .2 Air-to-refrigerant coil: aluminum plate fins mechanically bonded to copper tubing with joints brazed and with controls factory installed.
 - .3 Water-to-refrigerant heat exchanger: circular tube-in-tube type with steel outer tube, 2 copper.
 - .4 Refrigerant piping: factory assembled, tested charged with R410a sealed, with thermal expansion valve, pilot operated refrigerant reversing valve, high pressure and low temperature safety cut-outs.
 - .5 Water piping within unit: factory assembled and tested to 1.4 MPa minimum.
 - .6 FPT connections: gate valve tested to 1.4 MPa minimum WOG (on supply line) and ball valve tested to 2.8 MPa minimum WOG (on return line), flexible hose with threaded swivel connections on supply and return lines to heat exchanger.
 - .7 Piping connections: arranged so that only one supply and return connections to hydronic system is required on site.
 - .1 Integrated flow regulator.
 - .8 Fan: centrifugal forward curved with double inlet, statically and dynamically balanced driven from multi-speed, PSC type, factory lubricated motor.
 - .9 Filters: 25 mm thick replaceable media in aluminum frame.
 - .10 Unit cabinet: constructed of heavy gauge die-formed galvanized steel with welded corner bracing, complete with provision for connection to return ductwork, hanger brackets and vibration isolators.
 - .1 Console cabinet acoustically insulated.
 - .2 Grilles: rigid bar type with vanes factory set to deflect supply air into room.
 - .11 Provide for field connection of water and electrical services.
 - .12 Condensate drain: manufactured from aluminum, pan and piping designed to ensure complete removal of water.
 - .1 Drain connections: minimum NPS 3/4.
 - .13 Controls: wall mounted with OFF-COOL-HEAT and HIGH-LOW fan speed selectors, manually adjustable thermostat with remote bulb in return air.
 - .14 Outside air connection: complete with foam type gasketting.

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 heat pumps installation in accordance with manufacturer's written instructions.

3.2 DRAIN PANS

- .1 Install so that no water can accumulate. Arrange easy access for cleaning.

- .2 Include internal or external trap for proper draining.

3.3 START-UP AND COMMISSIONING

- .1 Have manufacturer certify installation.
- .2 Have manufacturer present during start-up and certify performance.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.
- .2 AEL: ratio between total test period less any system downtime accumulated within that period and test period.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01330 - Submittal Procedures.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide documentation, O&M Manuals, and training of O&M personnel for review of Departmental Representative before interim acceptance in accordance with Section 01 78 00 - Closeout Submittals.

1.4 COMMISSIONING

- .1 Do commissioning in accordance with Section 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS.
- .2 Inform, and obtain approval from, Departmental Representative in writing at least 14 days prior to commissioning or each test. Indicate:
 - .1 Location and part of system to be tested or commissioned.
 - .2 Testing/commissioning procedures, anticipated results.
 - .3 Names of testing/commissioning personnel.
- .3 Correct deficiencies, re-test in presence of Departmental Representative until satisfactory performance is obtained.
- .4 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.
- .5 Load system with project software.
- .6 Perform tests as required.

1.5 COMPLETION OF COMMISSIONING

- .1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by Departmental Representative and PWGSC Commissioning Manager.

1.6 ISSUANCE OF FINAL CERTIFICATE OF COMPLETION

- .1 Final Certificate of Completion will not be issued until receipt of written approval indicating successful completion of specified commissioning activities including receipt of commissioning documentation.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 PROCEDURES

- .1 Test each system independently and then in unison with other related systems.
- .2 Commission each system using procedures prescribed by the Commissioning Manager and Departmental Representative.
- .3 Commission integrated systems using procedures prescribed by Departmental Representative.
- .4 Debug system software.
- .5 Optimize operation and performance of systems by fine-tuning PID values and modifying CDLs as required.
- .6 Test full scale emergency evacuation and life safety procedures including operation and integrity of smoke management systems under normal and emergency power conditions as applicable.

3.2 ADJUSTING

- .1 Final adjusting: upon completion of commissioning as reviewed by Departmental Representative, set and lock devices in final position and permanently mark settings.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .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, Inc. (ASHRAE).
 - .1 ASHRAE STD 135, BACNET - Data Communication Protocol for Building Automation and Control Network.
- .4 CSA Group (CSA).
 - .1 CAN/CSA-Z234.1, Canadian Metric Practice Guide.
- .5 Consumer Electronics Association (CEA).
 - .1 CEA-709.1, Control Network Protocol Specification.
- .6 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .7 Electrical and Electronic Manufacturers Association (EEMAC).
 - .1 EEMAC 2Y-1, Light Grey Colour for Indoor Switch Gear.
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Safety Data Sheets (SDS).
- .9 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.2 ABBREVIATIONS AND ACRONYMS

- .1 Acronyms used in EMCS:
 - .1 AEL - Average Effectiveness Level
 - .2 AI - Analog Input
 - .3 AIT - Agreement on International Trade
 - .4 AO - Analog Output
 - .5 BACnet - Building Automation and Control Network.
 - .6 BC(s) - Building Controller(s).
 - .7 BECC - Building Environmental Control Centre.

- .8 CAD - Computer Aided Design.
- .9 CDL - Control Description Logic.
- .10 CDS - Control Design Schematic.
- .11 COSV - Change of State or Value.
- .12 CPU - Central Processing Unit.
- .13 DI - Digital Input.
- .14 DO - Digital Output.
- .15 DP - Differential Pressure.
- .16 ECU - Equipment Control Unit.
- .17 EMCS - Energy Monitoring and Control System.
- .18 HVAC - Heating, Ventilation, Air Conditioning.
- .19 IDE - Interface Device Equipment.
- .20 I/O - Input/Output.
- .21 ISA - Industry Standard Architecture.
- .22 LAN - Local Area Network.
- .23 LCU - Local Control Unit.
- .24 MCU - Master Control Unit.
- .25 NAFTA - North American Free Trade Agreement.
- .26 NC - Normally Closed.
- .27 NO - Normally Open.
- .28 OS - Operating System.
- .29 O&M - Operation and Maintenance.
- .30 OWS - Operator Work Station.
- .31 PC - Personal Computer.
- .32 PCI - Peripheral Control Interface.
- .33 PCMCIA - Personal Computer Micro-Card Interface Adapter.
- .34 PID - Proportional, Integral and Derivative.
- .35 RAM - Random Access Memory.
- .36 SP - Static Pressure.
- .37 ROM - Read Only Memory.
- .38 TCU - Terminal Control Unit.
- .39 USB - Universal Serial Bus.
- .40 UPS - Uninterruptible Power Supply.
- .41 VAV - Variable Air Volume.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 MANUFACTURER'S RECOMMENDATIONS

.1 Installation: to manufacturer's recommendations.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA).
 - .1 CSA C22.1, The Canadian Electrical Code, Part I (19th Edition), Safety Standard for Electrical Installations.

1.2 DEFINITIONS

- .1 For acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

Part 2 Products

2.1 NAMEPLATES FOR PANELS

- .1 As existing.

Part 3 Execution

3.1 NAMEPLATES AND LABELS

- .1 Ensure that manufacturer's nameplates, CSA labels and identification nameplates are visible and legible at all times.

3.2 EXISTING PANELS

- .1 Correct existing nameplates and legends to reflect changes made during Work.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressures Fittings.
 - .2 ANSI C2, National Electrical Safety Code.
 - .3 ANSI/NFPA 70, National Electrical Code.
- .2 CSA Group (CSA)
 - .1 CSA C22.1,
 - .2 CAN/CSA-C22.3 No. 7, Underground Systems.
 - .3 CAN/CSA C22.2 No. 45.1, Electrical Rigid Metal Conduit.
 - .4 CAN/CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .5 CAN/CSA C22.2 No. 83, Electrical Metallic Tubing.
 - .6 CAN/CSA-C22.3 No. 1, Overhead Systems.

1.2 EXISTING CONDITIONS

- .1 Cutting and Patching: refer to Section 01 73 00 - Execution supplemented as specified herein.
- .2 Repair all surfaces damaged during execution of work.
- .3 Centralize the operation of the equipment to the building controller.

1.3 EXISTING SUPPLIER

- .1 Existing Supplier: AC Controls.

Part 2 Products

2.1 WIRING

- .1 As per requirements of Division 26.

2.2 CONDUIT

- .1 As per requirements of Division 26.

Part 3 Execution

3.1 INSTALLATION

- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

3.2 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, 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.

3.3 IDENTIFICATION

- .1 Refer to Section 25 05 54 - EMCS: Identification.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI).
 - .1 ANSI C12.7, Requirements for Watthour Meter Sockets.
 - .2 ANSI/IEEE C57.13, Standard Requirements for Instrument Transformers.
- .2 ASTM International (ASTM)
 - .1 ASTM B148, Standard Specification for Aluminum-Bronze Sand Castings.
- .3 National Electrical Manufacturer's Association (NEMA).
 - .1 NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
- .4 Air Movement and Control Association, Inc. (AMCA).
 - .1 AMCA Standard 500-D, Laboratory Method of Testing Dampers For Rating.
- .5 CSA Group CSA Group
 - .1 CSA-C22.1, Canadian Electrical Code, Part 1 (19th Edition), Safety Standard for Electrical Installations.

1.2 DEFINITIONS

- .1 Acronyms and Definitions: refer to Section 25 05 01 - EMCS: General Requirements.

Part 2 Products

2.1 TEMPERATURE SWITCHES

- .1 By Division 23.

2.2 WIRING

- .1 In accordance with Section 26 27 26 - Wiring Devices.
- .2 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. Other cases use FT4 wiring.
- .3 Wiring must be continuous without joints.
- .4 Sizes:
 - .1 Field wiring to digital device: #18AWG.

Part 3 Execution

3.1 INSTALLATION

- .1 Install equipment and components provided by division 23.

3.2 TESTING AND COMMISSIONING

- .1 Calibrate and test field devices for accuracy and performance in accordance with Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

- .1 At minimum detailed narrative description of Sequence of Operation of each system including ramping periods and reset schedules.

1.2 SEQUENCING

.1 Sequencing of operations for heatpump and duplex drainage pumps

- .1 Sequence internal to the equipment.
- .2 Centralize to the building controller
 - .1 Alarms
 - .2 Setpoint
 - .3 Operating condition

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

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 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 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, 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.
- .4 Certificates:
 - .1 Provide CSA certified material and equipment.
 - .2 Where CSA certified material or equipment is not available, submit such equipment 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, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

- .5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .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.

1.5 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 indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, 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 French.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Equipment to be CSA certified. Where CSA certified equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of Departmental Representative.
- .2 Porcelain enamel signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
 - .1 Nameplates: plastic laminate 3 mm thick plastic engraving sheet, black face, core mechanically attached with self tapping screws.
 - .2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters

Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .3 Allow for minimum of twenty-five (25) letters per nameplate.
- .4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .5 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO."; as directed by Departmental Representative.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 Terminal cabinets and pull boxes: indicate system and voltage.

2.7 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.8 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.

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.9 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint indoor switchgear and distribution enclosures light gray to standard.

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

- .1 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1400 mm.
 - .2 Wall receptacles:
 - .1 General: 450 mm.
 - .2 In mechanical rooms: 1400 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 450 mm.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.8 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Circuits originating from branch distribution panels.
 - .2 Lighting and its control.
 - .3 Motors and associated control equipment including sequenced operation of systems where applicable.
 - .4 Systems: fire alarm.
 - .5 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

- .5 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - 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.

3.9 SYSTEM STARTUP

- .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.

3.10 CLEANING

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for selective demolition and removal of electrical components including removal of conduit, junction boxes, and panels to source (home run removal) and incidentals required to complete work described in this Section ready for new construction.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350 M1980, Code of Practice for Safety in Demolition of Structures

1.3 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide in accordance with Section 01 33 00- Submittal Procedures before starting work of this Section:
 - .1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19- Waste Management and Disposal.
 - .2 Landfill Records: Indicate receipt and acceptance of selective demolition waste.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.
- .2 Scheduling: Account for Owner's continued occupancy requirements during selective demolition and schedule staged occupancy and worksite activities as a defined Critical Path in Section 01 32 16.19 - Construction Progress Schedule – Bar chart (Gantt).

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with:
 - .1 Government of Canada, Labour Program: Workplace Safety.

1.7 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition at time of site examination before tendering.
- .2 Existing Hazardous Substances: Departmental Representative performed a hazardous substances assessment and it is not expected that hazardous substances will be encountered in Work.
 - .1 Hazardous substances will be removed by a hazardous abatement specialist engaged by Departmental Representative before start of Work.
- .3 Existing Hazardous Substances: Departmental Representative has performed a hazardous substances assessment and identified materials requiring abatement as follows:
 - .1 Hazardous substances are as defined in Hazardous Products Act.
 - .2 Hazardous substances will be removed by Contractor as a part of Contract before starting Work in accordance with work results described in Related Requirements listed above.
- .4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform following activities:
 - .1 Refer to Section 01 41 00 - Regulatory Requirements for directives associated with specific material types.
 - .2 Hazardous substances will be as defined in Hazardous Products Act.
 - .3 Stop work in area of suspected hazardous substances.
 - .4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
 - .5 Hazardous substances will be removed by Departmental Representative under a separate contract or as a change to Work.
 - .6 Proceed only after written instructions have been received from Departmental Representative.

1.8 SALVAGE AND DEBRIS MATERIALS

- .1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Owner's property.
- .2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials in accordance with Section 02 42 00- Removal and Salvage of Construction Materials.
 - .1 Leave main electrical distribution panel in place; panel can be used for temporary construction power for this and subsequent contracts; coordinate temporary power connections with Owner.
 - .2 Leave main telephone terminal backboard in place; panel can be used for temporary construction telephone system for this and subsequent; coordinate temporary telephone connections with Owner.

Part 2 Products

2.1 MATERIALS

- .1 General Patching and Repair Materials: Refer to Section 02 41 00.08 – Demolition – Small works to removal or demolition of components associated with work of this Section.
- .2 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed.
- .3 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.

- .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
- .3 Prevent debris from blocking drainage inlets.
- .4 Protect mechanical systems that will remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Departmental Representative and users is minimized and as follows:
 - .1 Prevent debris from endangering safe access to and egress from occupied buildings.
 - .2 Notify Departmental Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

- .1 Demolition and removal: Coordinate requirements of this Section with information contained in Section 02 41 00.08 – Demolition-Small works and as follows:
 - .1 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.
 - .2 Remove existing luminaires, electrical devices and equipment including associated conduits, boxes, wiring, and similar items.
 - .3 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
 - .4 Disconnect panel feeders back to main distribution panel and re label respective circuit breaker as “SPARE”.
 - .5 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.
 - .6 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.
 - .7 Grind off conduits and make flush with surface of concrete where conduits are cast into concrete; seal open ends of conduit with silicone sealant and leave in place.
 - .8 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

3.4 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new construction in accordance with Section 02 42 00 - Removal and Salvage of Construction Materials.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .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 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with 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 indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse of crates, pallets, as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - 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 Clamps or connectors for flexible conduit, armoured cable, TECK cable as required to: CAN/CSA-C22.2 No.18.

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and cables:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
 - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Thermoplastic insulated conductors conform to CSA standard C22.2 No. 75.
- .2 XLPE insulated conductors conform to CSA standard C22.2 No. 38.
- .3 Armoured cable conform to CSA standard C22.2 No. 51.
- .4 Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA)
 - .1 TIA/EIA-568-B.1-(2001), Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.
 - .2 TIA/EIA-568-B.2-(2001), Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.

1.2 PRODUCT DATA

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

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse by manufacturer of packaging materials and pallets in accordance with Section 01 74 19 - Waste Management and Disposal.

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 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.

2.2 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.

2.3 CONTROL CABLES

- .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket.
- .2 Type: low energy 300 V control cable: solid annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: PVC.

- .2 Shielding: braid over conductors.
- .3 Overall covering: PVC jackets.

2.4 AUXILIARY SERVICES CABLES

- .1 According to the directives and instructions of the communication system supplier.

2.5 TELEPHONY AND COMMUNICATION CABLES

- .1 Distribution cables: four twisted pairs, category 6, unshielded, 24 AWG rating, blue jacket color, ANSI certified, according to standard TIA / EIA-568-B.2-1.

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 Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .3 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .4 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.
- .5 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.
- .6 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.
 - .2 In surface and lighting fixture raceways in accordance with Section 26.

3.4 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible on channels.

3.5 INSTALLATION OF CONTROL CABLES

- .1 Install control cables conduit or cable troughs.
- .2 Ground control cable shield.

3.6 INSTALLATION OF AUXILIARY SERVICE CABLES

- .1 In conduits in accordance with standards and recommendations of the system supplier.

3.7 INSTALLATION OF TELEPHONY AND COMMUNICATION CABLES

- .1 All Category 6 copper wiring serving a workspace must comply with the following rules:
 - .1 Any copper cable course, category 6, must be a total length greater than 90m.
 - .2 If a cable is longer than 90m, it must be reported to the customer's representative. These situations will be dealt with individually.
 - .3 In no case shall the cables be in contact with hot surfaces, electrical power cables, machinery or conduits for other services (steam, hot water pipes, lighting accessories, motors, transformers, etc.).

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1-F18, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No.41-F13, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
 - .3 CSA C22.2 No.65-F13, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

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

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for connectors and terminations for incorporation into manual.

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 indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect connectors and terminations from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

- .1 Compression connectors to CSA C22.2 No.65 as required sized for conductors.
- .2 Contact aid for aluminum cables where applicable.

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 connectors and terminations installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2 No.41.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.1-F18, Canadian Electrical Code, Part 1, 22th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 DELIVERY, STORAGE AND HANDLING

- .1 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 19 - Waste Management and Disposal.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 For single or multiple recessed mounting of wiring devices in steel studded gypsum board walls, having minimum dimensions 76 mm x 51 mm x 51 mm (3" x 2" x 2") or as shown. 102 mm x 102 mm (4" x 4") boxes with extension when more than one conduit penetrate one side with plaster ring where required.
- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 Extension and plaster rings for flush mounting devices in finished plaster walls.

2.3 CONDUIT BOXES

- .1 Cast FD or FS boxes with factory-threaded hubs and mounting feet for surface wiring of devices for switches and receptacles.

2.4 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.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .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. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .3 CSA C22.2 No. 83-M1985 (R2003), Electrical Metallic Tubing.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.

2.2 CONDUITS

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83.

- .2 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .3 Rigid metal conduits: conform to CSA C22.2 No. 45, in galvanized steel.
- .4 Conduits and tubes will be a minimum of 21 mm in diameter, unless otherwise indicated.

2.3 CONDUIT SYSTEMS FOR TELECOMMUNICATION, ACCESS CONTROL AND DATA.

- .1 Conduits shall be electric metallic tubing (EMT) as described in article "Conduits". Conduits shall have plastic grommets at both ends. Use of "LB, LL or LR" types elbow is prohibited.
- .2 Conduit diameter for telecommunication (data and telephone) shall not be smaller than the requirements of the following table:

Conduit size	Maximum quantity of cable
21 mm (¾")	3
27 mm (1")	6
35 mm (1¼")	10
41 mm (1½")	14
53 mm (2")	20
63 mm (2½")	30
78 mm (3")	40

- .3 Except otherwise specified, for telecommunication (data and telephone) install one conduit between the outlet and the telecommunication room.
- .4 Outlet boxes for telecommunication shall be single gang for a maximum of four (4) cables and double gang for five (5) to eight (8) cables. When boxes are used, they shall have a minimum depth of 64 mm (2½"), two (2) gangs.
- .5 Verify bending radius of cable and install conduits in respect to the cable manufacturer requirement.

2.4 CONDUIT FASTENINGS

- .1 One-hole malleable iron straps to secure surface conduits 50 mm and smaller.
 - .1 Two-hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.5 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.
Coating: same as conduit.

- .2 Ensure factory "ells" where 90 degree bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.6 FISH CORD

- .1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in unfinished areas or in mechanical and electrical service rooms.
- .3 Use electrical metallic tubing (EMT) except in cast concrete.
- .4 Use flexible metal conduit for work in movable metal partitions and connection to motors in dry areas.
- .5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .6 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
- .7 Minimum conduit size for lighting and power circuits: 19 mm.
- .8 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Mechanically bend steel conduit over 19 mm diameter.
- .10 Install fish cord in empty conduits.
- .11 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .12 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 INSTALLATION OF COMMUNICATION CABLES

- .1 Category 3, 5, 5^e, 6 or 6A communication cables shall be hanged on "J" type suspension devices as specified and according to the proposed configuration.
- .2 Do not exceed the number of cables in the "J" type supports or their spacing as required by the manufacturers of the supports or cables.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - 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 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No.42-R2015, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA C22.2 No.42.1-F00 (C2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55-FM1986 (R2008), Special Use Switches.
 - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province, Canada.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with 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 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.
- .4 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 SWITCHES

- .1 15 A, 120 V, single pole, switches to: CSA C22.2 No.55 and CSA C22.2 No.111.
- .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 Toggle: colour as indicated by Departmental Representative.
- .3 Switches of one manufacturer throughout project.

2.2 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 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.

2.3 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
- .2 Cover plates:
 - .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

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 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide fuse performance data characteristics for each fuse type. Performance data to include: average melting time-current characteristics.
- .3 Shop Drawings:
 - .1 Provide shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in switchboard.
- .3 Store fuses in original containers in moisture free location.
- .4 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 FUSES - GENERAL

- .1 Fuse type references L1, L2, J1 and J2, etc. have been adopted for use in this specification.
- .2 Fuses: product of one manufacturer.

2.2 FUSE TYPES

- .1 Class L fuses (HRC-L).
 - .1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
 - .2 Type L2, fast acting.
 - .3 Breaking capacity of 200 kA.
- .2 Class J fuses (HRC1-J).
 - .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum for transformers and motors.
 - .2 Type J2, fast acting for primary circuits.

- .3 Breaking capacity of 200 kA.

Part 3 Execution

3.1 INSTALLATION

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.
- .3 Ensure correct fuses fitted to assigned electrical circuit.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No. 5-2016, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
 - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
 - .1 Production certificate of origin must be submitted to Departmental Representative for approval.
 - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
 - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
 - .4 Production certificate of origin must contain:
 - .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
 - .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.
 - .3 Contractor's name and address and person responsible for project.
 - .4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.
 - .5 Name and address of building where circuit breakers will be installed:

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store circuit breakers indoors, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Moulded-case circuit breakers: to CSA C22.2 No. 5.
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 Circuit breakers to have interrupting capacity rating as indicated.

2.2 THERMAL MAGNETIC BREAKERS

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.
- .2 Breakers must have 10kA symmetrical breaking capacity for circuits 120 or 208V, according to plan indications.

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Install circuit breakers as indicated.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA C22.2 No.144-FM91 (R2006), Ground Fault Circuit Interrupters.
- .2 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA PG 2.2-1999 (R2009), Application Guide for Ground Fault Protection Devices for Equipment.

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 ground fault circuit interrupters 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 Test and Evaluation Reports: submit test report for field testing of ground fault

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 ground fault circuit interrupters for incorporation into manual.

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 indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect ground fault circuit interrupters from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA C22.2 No.144.
- .2 Components comprising ground fault protective system to be of same manufacturer.
- .3 Self-contained with 15 A, 120 V circuit interrupter and duplex receptacle complete with:
 - .1 Solid state ground sensing device.
 - .2 Facility for testing and reset.
 - .3 CSA Enclosure 1, surface mounted with stainless steel face plate.

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 ground fault circuit interrupters installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Do not ground neutral on load side of ground fault relay.
- .2 Pass phase conductors including neutral through zero sequence transformers.
- .3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Arrange for field testing of ground fault equipment by Contractor before commissioning service.
- .3 Demonstrate simulated ground fault tests.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CAN/CSA-C22.2 No.4-F04 (R2009), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).
 - .2 CSA C22.2 No.39-F13, Fuseholder Assemblies.

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 disconnect switches - fused and non-fused and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect disconnect switches - fused and non-fused from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 DISCONNECT SWITCHES

- .1 Non-fusible, fusible, disconnect switch in CSA 1 enclosure to CAN/CSA-C22.2 No.4 size as indicated.
- .2 Provision for padlocking in off switch position by 3 locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.

- .5 Fuseholders: relocatable and to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.
- .8 Heavy-duty construction.
- .9 Safety switches for elevator controllers shall be fitted with one type C auxiliary contact. Connect this contact to the elevator controller with two (2) No. 14 AWG conductor inside a 16 mm (½") conduit.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 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.
- .2 CSA Group (CSA)
- .3 ICES-005-07, Radio Frequency Lighting Devices.
- .4 Underwriters' Laboratories of Canada (ULC)
- .5 Illuminating Engineering Society (IES).
 - .1 Photometric Tests IES LM-79 Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products.
 - .2 Light depreciation determined by IES LM-80 Approved Method: Measuring Lumen Maintenance of LED Light Sources.
 - .3 Long-term light depreciation determined by IES TM-21 Projecting Long Term Lumen Maintenance of LED Light Sources.
- .6 UL 8750 Light Emitting Diode Equipment for Use in Lighting Products.
- .7 UL 1310 Class 2 Power Units or equivalent CSA

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Departmental Representative.
 - .3 Photometric data to include: spacing criterion.
- .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.

1.3 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 reuse in accordance with Section 01 74 19 - 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.

Part 2 Products

2.1 APPAREILS À DIODES ÉLECTROLUMINESCENTES (DEL)

- .1 All LED devices and their components must, at minimal meet all reference standards listed above.
- .2 Each fixture must be equipped with a compatible factory installed driver. Everything must be approved for plenum use.
- .3 Supply units shall be equipped with colour connectors determined in accordance with the standard requirements ANSI C82.11.
- .4 Driver technical data:
 - .1 120 V \pm 5 %, 60 Hz.
 - .2 Power factor: 90 % minimum.
 - .3 Total harmonic distortion: 20 % maximum.
 - .4 Class A nominal sound volume.
 - .5 Operation ambient temperature: 10 to 40 °C, 90 % R.H.
 - .6 The housing temperature: 0 at 62 °C, 90 % R.H.
 - .7 Must tolerate without damage a condition of open circuit or short circuit without use of fuses or other external protection devices.
 - .8 Must not contain any PCB.

2.2 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.3 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.4 LUMINAIRES

- .1 As indicated in luminaire schedule.

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.

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 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 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 communication raceway systems and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 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 communication raceway systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 SYSTEM DESCRIPTION

- .1 Empty telecommunications raceways system consists of outlet boxes, cover plates, cabinets, conduits, pull boxes, sleeves and caps, fish wires and service fittings.
- .2 Overhead cable tray distribution system.

2.2 MATERIAL

- .1 Conduits: metal electrical tubes type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Outlet boxes and fittings: in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes And Fittings.
- .3 Fish wire: polypropylene 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 communication raceway systems installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install empty raceway system, including overhead distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable tray, service poles, miscellaneous and positioning material to constitute complete system.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by pathways for communications systems installation.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Conseil national de recherches Canada (CNRC)
 - .1 Code national du bâtiment – Canada 2015 (CNB).
- .2 CAN/CSA C22.10 : Code de l'électricité du Québec.
- .3 Underwriters' Laboratories (UL)
- .4 UL 294-1999, Standard for Safety for Access Control System Units.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 70, Article 517, National Electric Code.
 - .2 NFPA 101, Life Safety Code.
 - .3 Safety Data Sheets (SDS).
- .6 Electronic Industries Association (EIA)
 - .1 REC 12749, Power Supplies.
 - .2 TIA/EIA 569-B (CSA T530), Commercial Building Standards for Telecommunications Pathways and Spaces, including addendum 1 to 7.
 - .3 TIA/EIA 568-B, Commercial Building Telecommunications Cabling Standard.
 - .4 TIA/EIA 607 (CSA T527), Grounding and Bonding Requirements for Telecommunication in Commercial Buildings.
 - .5 TIA/EIA 606-A (CSA T528), Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - .6 TIA/EIA TSB-67, UTP End-to-End System Performance Testing

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for access controls and equipment and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit:
 - .1 Functional description of equipment.
 - .2 Technical data for all devices.
 - .3 Device location plans and cable lists.
 - .4 Devices mounting location detail drawings.
 - .5 Typical devices connection detail drawings.
- .2 Shop Drawings:
 - .1 Shop drawings to indicate project layout, including details.
 - .1 Shop drawings to indicate, mounting heights and locations, wiring diagrams.

- .2 Submit zone layout drawing indicating number and location of zones and areas covered.
- .3 Submit wiring diagrams.
- .4 Submit complete equipment list.
- .3 Test and Evaluation Reports:
 - .1 Submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
 - .4 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.3 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for access controls and equipment for incorporation into manual.
 - .1 Include:
 - .1 System configuration and equipment physical layout.
 - .2 Functional description of equipment.
 - .3 Instructions of operation of equipment.
 - .4 Illustrations and diagrams to supplement procedures.
 - .5 Operation instructions provided by manufacturer.
 - .6 Cleaning instructions.

1.4 QUALITY ASSURANCE

- .1 Qualification
 - .1 Installer: a company or person specializing in the installation of access control systems, approved by the manufacturer.

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 and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect access controls and equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 The conducts, wiring and accessories will be supplied and installed by the Electricity Division.
- .2 Access control equipment must meet customer and existing facilities standards.
- .3 The existing system comes from the manufacturer Siemens. The existing Sphinx controller (Level C, Local 302) has a free entry for card reader. Provide extension cards if required for elevator control.
- .4 Model card reader: HID R40 or equivalent.
- .5 Wiring according to manufacturer's recommendations:
 - .1 Card reader: 3 pairs #20 AWG.
 - .2 Elevator control: 4 pairs #20 AWG.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for access control system installation in accordance with manufacturer's written instructions.

3.2 INSTALLATION: SECURITY ACCESS

- .1 Install components in accordance with manufacturer's written installation instructions to locations, heights and surfaces shown on reviewed shop drawings.
- .2 Install components secure to walls, ceilings or other substrates.
- .3 Install required boxes in inconspicuous accessible locations.
- .4 Conceal conduit and wiring.
- .5 Install the wiring until the junction box in the elevator machine room. Division 14 will provide the elevator cab wiring.
- .6 Install the card reader in the cabin, with the coordination of the elevator contractor.
- .7 Refer to Customer Representative for installation data programming.
- .8 Make the programming of the installations on the existing access control server, all of which must be operational.

3.3 SITE TEST AND INSPECTION

- .1 Perform verification inspections and test in presence of Departmental Representative.
 - .1 Provide all necessary tools, ladders and equipment.
 - .2 Ensure appropriate subcontractors are present for verification.
- .2 Performance testing:

- .1 Functional testing.
- .2 Documentation review:
 - .1 This review will determine if information provided is sufficient to meet requirements of this specification.
 - .2 Provide for review all System manuals, as installed drawings, pretest forms.
- .3 Visual verification: objective is to assess quality of installation and assembly and overall appearance to ensure compliance with Contract Documents. Visual inspection to include:
 - .1 Sturdiness of equipment fastening.
 - .2 Non-existence of installation related damages.
 - .3 Compliance of device locations with reviewed shop drawings.
 - .4 Compatibility of equipment installation with physical environment.
 - .5 Inclusion of all accessories.
 - .6 Device and cabling identification.
 - .7 Application and location of ULC approval decals.
- .4 Technical verification: purpose to ensure that all systems and devices are properly installed and free of defects and damage. Technical verification includes:
 - .1 Validate sensitivity of readers and applicability and application of cards.
 - .2 Connecting joints and equipment fastening.
 - .3 Compliance with manufacturer's specification, product literature and installation instructions.
- .5 Operational verification: purpose to ensure that devices and systems' performance meet or exceed established functional requirements. Operational verification includes:
 - .1 Operation of each device individually and within its environment.
 - .2 Operation of each device in relation with programmable schedule and or/specific functions.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
 - .1 Remove protective coverings from accessories and components.
 - .2 Clean housings and system components, free from marks, packing tape, and finger prints, in accordance with manufacturer's written cleaning recommendations.
 - .3 Clean components free from dirt and fingerprints.
- .3 Waste Management: separate waste materials for recycling.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for fire alarm systems.
 - .2 Automatic alarm initiating devices.
 - .3 Addressable relay modules.

1.2 REFERENCE STANDARDS

- .1 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-2014, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S529-2016, Smoke Detectors for Fire Alarm Systems.
 - .3 CAN/ULC-S536-2013, Inspection and Testing of Fire Alarm Systems.
 - .4 CAN/ULC-S537-2013 Verification of Fire Alarm Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Shop drawings: stamped and signed by professional engineer registered or licensed in Province, Canada.
 - .2 Include:
 - .1 Layout of equipment.
 - .2 Zoning.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .3 Manufacturer's Field Reports: manufacturer's field reports specified.
- .4 Closeout Submittals:
 - .1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals in accordance with ANSI/NFPA 20.

- .2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.
- .3 Submit to Authority of Jurisdiction 2 sets of approved submittals and drawings immediately after approval but no later than 15 working days to prior to final inspection.
- .4 Submit following:
 - .1 Manufacturer's Data for:
 - .1 Open-area smoke detectors.
 - .2 Wiring.
 - .3 Conduit.
 - .4 Outlet boxes.
 - .5 Fittings for conduit and outlet boxes.
 - .6 Mark data which describe more than one type of item to indicate which type will be provided.
 - .7 Submit 1 original for each item and clear, legible, first-generation photocopies for remainder of specified copies.
 - .2 System wiring diagrams:
 - .1 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.
 - .2 Show modules, relays, switches and lamps in control panel.
 - .3 Design data: Power Calculations:
 - .1 Submit design calculations [new work specified] [for existing system] to substantiate that battery capacity exceeds supervisory and alarm power requirements.
 - .2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.
 - .3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output.
 - .4 Instructions for operation:
 - .1 Projected beam smoke detector.
 - .5 Schedules:
 - .1 Conductor wire marker schedule.
 - .6 Test Reports:
 - .1 Open-area 2-wire smoke detectors.
 - .2 Preliminary testing:
 - .1 Final acceptance testing.
 - .2 Submit for inspections and tests specified under Field Quality Control.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in fire alarm system installations approved by manufacturer.
 - .2 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.

1.5 DELIVERY, STORAGE, AND HANDLING

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

Part 2 Products

2.1 MATERIALS

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Control unit: to CAN/ULC-S527.
- .3 Smoke detectors: to CAN/ULC-S529.

2.2 EXISTING SYSTEM

- .1 The building's fire alarm system is existing, addressable type and a single signal. The fire alarm control panel (FACP) is a NFS-320 from Notifier. The new components will need to be ULC- compatible and cross-referenced with this system.

2.3 PHOTOELECTRIC SMOKE DETECTOR

- .1 The addressable photoelectric smoke detector composed of a maze detection chamber functioning on the photodiode with light dispersion and a LED light indicator. It shall be self-adjusting against environment, humidity pressure and temperature change.
- .2 The photoelectric detector shall self adjust to aging and dirt accumulation and shall be fully supervised against component failure.
- .3 The detector shall be dynamically tested and uniquely identifiable by the control panel. The detector sensitivity voltage should shift beyond an acceptable level a discrete detector trouble signal and display shall appear at the control panel.

- .4 The detector shall have the capability of operating one (1) remote alarm or auxiliary relay. The remote alarm indicator or auxiliary relay is normally operated by the associated detector. However, the system shall be capable of being programmed to operate the alarm indicator or relay independently of the associated detector. All detectors and/or relays connected to the circuit can be in alarm or activated simultaneously.
- .5 Locate detectors minimum 450 mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.
- .6 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by NFPA 70, are approved for such locations.
- .7 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.4 ADDRESSABLE INTERFACE MODULE

- .1 Addressable interface module shall provide supervision of devices with short-circuiting contacts.
- .2 Addressable interface modules can be for a single supervision, double or up to 10 supervisory contacts.

2.5 ADDRESSABLE RELAY MODULE

- .1 Control relays used to interface the fire alarm system with other systems shall have 2 A minimum, 120 Vac/24 Vdc dry type C contacts.

2.6 CONDUIT

- .1 Electrical Metallic Tubing (EMT).

2.7 WIRING

- .1 All conductors shall comply with the first part of the applicable Electrical Code and provincial regulations in force. When specified, conductors shall be twisted and/or shielded with an aluminum ribbon and a tinned copper drain wire. Conductors shall be insulated for at least 300 V. Minimum requirements shall be:
 - .1 Detection circuits: 16 AWG twisted pairs;
 - .2 Interface circuits with ventilation control cabinets and ventilation motor starters: No. 14 AWG.
- .2 Cable type FAS105 :
 - .1 In suspended ceilings, drywalls and dry areas.
 - .2 For the connection of fire alarm detection devices.
 - .3 Allowed usage from a pull box for a maximum distance of 3 m (10').
 - .4 Equal gage to the conductors.

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 systems in accordance with CAN/ULC-S524.
- .2 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 450 mm radius clear space on ceiling, below and around detectors.
- .3 Installer aux endroits indiqués les modules de relais adressable destinés au rappel de secours de l'ascenseur.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests:
 - .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and CAN/ULC-S537.
 - .2 Fire alarm system:
 - .1 Test each device and alarm circuit to ensure manual stations, smoke detectors transmit alarm to control panel and actuate general alarm.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm circuits to ensure proper operation of system.
 - .4 Class B circuits.
 - .1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
 - .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 TRAINING

- .1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of new devices and sequence.

END OF SECTION

