

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises the reconfiguration of two tenant spaces located on the 3rd floor at 303 Main Street, Winnipeg, Manitoba. Removal of a demising wall to combine two existing tenant spaces into one Regional Office for Global Affairs Canada that includes (2) meeting rooms, (1) telecom room, (1) lunchroom room, (1) private office and general open office area.

1.3 CONTRACT METHOD

- .1 Relations and responsibilities between Contractor and subcontractors and Owner are as defined in Conditions of Contract.

1.4 WORK BY OTHERS

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

1.5 WORK SEQUENCE

- .1 Co-ordinate Progress Schedule and coordinate with Departmental Representative.
- .2 Maintain fire/access control.

1.6 CONTRACTOR USE OF PREMISES

- .1 Co-ordinate use of premises under direction of the Departmental Representative.
- .2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .3 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .4 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by the Departmental Representative.
- .5 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.7 PRE-PURCHASED EQUIPMENT

- .1 Certain items of equipment have been pre-purchased by the Departmental Representative: Fridge, dishwasher, furniture (including chairs) and AV equipment.

- .2 Purpose for pre-purchasing this equipment is to ensure delivery to site within required project completion schedule. Obtain necessary shop drawings from Departmental Representative and proceed to co-ordinate details for installation, by Others.

1.8 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 elevators existing in building for moving workers and material.
 - .1 Protect walls of passenger elevators, to approval of Departmental Representative prior to use.
 - .2 Accept liability for damage, safety of equipment and overloading of existing equipment.

1.9 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 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .4 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.
- .6 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .8 Record locations of maintained, re-routed and abandoned service lines.
- .9 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.10 SECURITY REQUIREMENTS

- .1 On award of Contract the Departmental Representative will provide 'Personnel Screening Request and Authorization' form; 'Declaration Regarding Criminal Convictions' form and 'Security Screening Certificate and Briefing Form' to the Contractor.
- .2 These forms must be filled out for each person who will have access to the work area.

1.11 SERVICE PROVIDERS FACILITIES MANAGEMENT CONTROL PROCEDURES

- .1 The Contractor's activities shall be controlled and monitored to mitigate impact on the normal operation of the building, its systems and occupants.
- .2 Comply with the following procedures specific to the location of the Work of this Contract.
 - .1 Building hours of operation:
 - .1 Normal staff working hours are between 07:00 and 17:00 Monday to Friday. The building is open to the public between 7:00 and 18:00 Monday to Friday.
 - .2 Dependent on the time of year, there will be periods when the office activity will take place on weekends and/or until 23:00 Monday to Friday.
 - .2 Work schedules and requests for building access:
 - .1 All contractors requesting access to the building are required to fill out a weekly "BGIS Work Permit" and sent to RP1 Western email address. This should be submitted on Wednesday the week prior by 2:30pm. This form will be provided to the Contractor at the Start-up meeting.
 - .2 The BGIS work permit should clearly indicate hours and dates of operation, names of workers onsite, indicate the risks associated with specific tasks that week and associated controls (may result in issuance of further permits such as hot work permit, confined space permit, fire alarm bypass permit, etc.)
 - .3 Periods when entire building fire alarm panel is bypassed will require the Contractor to provide a fire panel watchman. Period when fire alarm panel is completely disabled (bells/strobes in building will not ring) will require a fire watchman or multiple watchman to patrol entire affected area or entire building hourly.
 - .4 72 hours notice is required for disruption of service. Disruption of utilities (water and electricity) will need to be done during after-hours period from 07:00 to 17:30 Monday to Friday or on Weekends. BGIS Work Permits to be submitted at least 3 days in advance and 5 days in advance during busy periods.
 - .5 Once the work permit is signed and approved by BGIS or their respective designate is to submit to the applicable affected tenant and Commissionaire representative for their information and record.
 - .6 Without the pre-approved BGIS Work Permit form the contractor will not be permitted access.
 - .7 Contractors wishing to access any area other than what has been previously approved will be required to fill out another Work Permit for approval through the same process as indicated above.
 - .8 No access will be provided to areas not designated on the BGIS Work Permit.
 - .9 Contractors personnel may utilize main entrance for everyday use.
 - .3 Visitors tags:
 - .1 Prior to entry of the facility, all contractors and workers are to report direct to 303 Main Street Commissionaire's Desk where the log will be located for contractor sign-in and where a visitor's tag for use when in the facility will be obtained.
 - .2 Visitors' Tags will be provided only after the BGIS Work Permit form has been completed, submitted and approved, unless under

- special circumstances and separately approved by the Property Manager.
- .3 It is important to note that the contractor must make the tag visible to eliminate any security concerns of tenants.
 - .4 Elevators
 - .1 Contractors must utilize loading dock for bringing up construction material.
 - .2 Freight elevator (situated adjacent to loading dock area) is only for the delivery of building materials or removal of construction debris. The freight elevator only provides access to the basement from the loading dock.
 - .3 Delivery of materials to 3rd Floor will require use of passenger elevators from basement.
 - .4 Access to the passenger elevators and other freight elevators situated inside the building for delivery of building materials or removal of construction debris will not be allowed unless special arrangements have been made through the Property Manager.
 - .5 All hours of requested use to be arranged through Commissionaire's desk at 303 Main Street. Contractor to advise of contact name and dates required to ensure there are no conflicts with other tenant deliveries.
 - .6 Elevator curtains will be provided to the contractor for protection of the walls. Contractor to provide protection as required for the elevator floor.
 - .7 Any damages to the elevator due to a contractor's negligence will be the contractor's responsibility to repair at no cost to the Departmental Representative.
 - .8 If using passenger elevator to bring materials up from the basement floor protection is required using mats. BGIS ops can erect the wall mats upon request. BGIS or commissionaire can put elevator in service for the contractor upon request.
 - .5 Parking
 - .1 Parking is not available within the facility grounds.
 - .2 The contractor will be allowed access to the loading dock area for the unloading of materials and tools.
 - .3 It is deemed to be the contractor's responsibility for locating parking off site.
 - .4 Any vehicle parking without authorization will be towed at the contractor's expense.
 - .6 Security
 - .1 All contractors must be security cleared and attain a "Reliability Status Clearance".
 - .2 All contractors carrying out work after business hours do not require an escort. An escort is only required if entering into other tenant spaces and is provided by the tenant. The commissionaire can provide access to the space after hours and provide cards to any cleared contractors.
 - .3 Clearance documents are required to be filled out and submitted for processing.
 - .4 Any costs incurred to the project as a result of the contractor neglecting to fill out clearance documents will be the responsibility of the contractor.
 - .7 Smoke Detectors
 - .1 Any contractor providing construction work within the range of smoke detectors, which could result in their being set off, are to

- ensure the Departmental Representative is notified to ensure deactivation of the applicable zones.
- .2 Failure to follow the deactivation process and causing a building evacuation, will cause the contractor to be held responsible for any incurred cost passed on from the building tenants. Examples of work are such as sweeping, dusting, welding, spray painting, etc.
- .8 Work Procedure
 - .1 The contractor shall complete and conform to the following appended forms for all electrical activities within the building:
 - .1 Hot work permit
 - .2 Electrical lockout tagout procedure.

1.12 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 Report, System Components List c/w Commissioning Verification Forms and Check Sheets and Commissioning Issues /Resolution Log
 - .9 Copy of Approved Work Schedule.
 - .10 Health and Safety Plan and Other Safety Related Documents.
 - .11 Other documents as specified.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Use only freight elevator existing in building for moving material.
 - .1 Accept liability for damage, safety of equipment and overloading of existing equipment.
- .6 Use only elevators existing in building for moving people.
 - .1 Protect walls of passenger elevators, to approval of Departmental Representative prior to use.
- .7 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations, occupants and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
- .2 Confirm all dimensions on site. Assume all risks associated with scaling of drawings.
- .3 Maintain integrity of exits at all times.
- .4 Maintain fire access/control.
- .5 Where security has been reduced by work of Contract, provide temporary means to maintain security.
- .6 Make good any damage to existing finishes or furniture caused by work under the contract. Making good means restoration to at least original condition in terms of strength, workmanship and appearance. Protect all furniture and belongings of tenants. Move furniture as necessary and relocate in original location upon completion of each day's work.
- .7 Where elevators, dumbwaiters, conveyors or escalators exist in building, only those assigned for Contractor's use may be used for moving personnel and material within building. Protect walls of passenger elevators, to approval of Departmental Representative before use. Accept liability for damage, safety of equipment and overloading of existing equipment.

- .8 Existing operations must remain in service without interruption during construction period.
- .9 Provide tacky mats (soil walk off type temporary carpets) to prevent traffic from carrying construction debris into other parts of the building.
- .10 Bag or otherwise protect all smoke detectors in the construction area during activities which create dust. Vacuum or otherwise clean smoke detectors on completion of each construction activity.
- .11 Provide plywood cover on carpet floors to remain. Protect these floors from damage and clear on completion.

1.4 EXISTING SERVICES

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 72 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.5 SPECIAL REQUIREMENTS

- .1 Noise generating work which may be disruptive to existing building tenants shall be performed outside the hours of 07:00 to 17:30.
- .2 Submit schedule in accordance with Section 01 32 16.07 – Construction Progress Schedules – Bar (GANTT) Chart.
 - .1 Contractor to submit weekly work schedules to Departmental Representative to facilitate arrangement of Commissionaires.
- .3 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .4 Keep within limits of work and avenues of ingress and egress.
- .5 Delivery of materials to be received at loading dock and transported to site by freight elevator (South end of building, located adjacent to loading dock). Loading dock and freight elevator should be booked with the Commissionaire's Desk at 303 Main Street.
 - .1 Delivery of goods should be limited to Phase One and Phase Two. Minimal deliveries should be required in Phase Three and can be brought to site at the beginning of shift start.

1.6 BUILDING SMOKING ENVIRONMENT

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

Part 2 Products

- .1 Not used.

Part 3 Execution

.1 Not used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 The Contractor shall:
 - .1 Schedule and administer project meetings throughout the progress of the work.
 - .2 Prepare agenda for meetings.
 - .3 Distribute written notice of each meeting four days in advance of meeting date.
 - .4 Provide physical space and make arrangements for meetings on-site if required (if on-site meeting is required is lieu of the regularly-scheduled virtual meeting).
 - .5 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
 - .6 Reproduce and distribute copies of minutes within two days after meetings and transmit to meeting participants and, affected parties not in attendance.
- .2 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING

- .1 Within 7 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Consultant, Engineering Consultants, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 The Contractor to arrange and chair meeting using Microsoft Teams (virtual). Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work.
 - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for temporary facilities, offices, storage and utilities in accordance with Section 01 52 00 - Construction Facilities.
 - .5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

- .7 Owner provided products.
- .8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

- .1 The Contractor shall:
 - .1 During course of Work and two weeks prior to project completion, shall schedule progress meetings every two weeks.
 - .2 Meetings to be held virtually using Microsoft Teams.
 - .3 Notify parties minimum 5 days prior to meetings.
 - .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 2 days after meeting.
- .2 Contractor, major Subcontractors involved in Work, Departmental Representative, Consultant, Engineering Consultants are to be in attendance.
- .3 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review changes for affect on construction schedule and completion date.
 - .12 Health and Safety.
 - .13 Other business.
- .4 Consultant to maintain Decision Log of milestones, track submittals, RFIs, and changes to project scope.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 Use a project management control system based Bar (GANTT) Chart technique.
- .2 Schedule reviews by Departmental Representative shall not mean approval of detail inherent in schedule, responsibility for which lies with Contractor.
- .3 Accept sole responsibility for coordinating, scheduling of work, and the sequencing of work components and tasks.

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 Sunday, inclusive, will provide a seven 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 / Consultant 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 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.
- .5 Notify Departmental Representative and Consultant about long delivery materials and provide regular updates on the status.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative / Consultant within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative / Consultant within 5 working days of receipt of acceptance of Master Plan.

1.5 PROJECT MILESTONES

- .1 Project milestones form interim targets for Project Schedule include:
 - .1 Initial Detailed Inspection;
 - .2 Shop Drawings;
 - .3 Site Mobilization;
 - .4 Demolition, Hoarding;
 - .5 Work;
 - .6 Interim Certificate (Substantial Completion) date;
 - .7 Final Certificate Completion.

1.6 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative / Consultant 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 the Master Plan and be used as baseline for updates.

1.7 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as a minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Interior Architecture (Walls, Floors and Ceiling).
 - .6 Plumbing.
 - .7 Lighting.
 - .8 Electrical.
 - .9 Piping.
 - .10 Controls.
 - .11 Heating, Ventilating, and Air Conditioning.
 - .12 Fire Systems.
 - .13 Testing and Commissioning.
 - .14 Supplied equipment long delivery items.
 - .15 Engineer supplied equipment required dates.

1.8 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on bi-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.

1.9 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.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Not Used.

1.3 ADMINISTRATIVE

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

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings, in pdf format, stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 10 days for Departmental Representative and Consultant's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative and Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative and Consultant prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.

- .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Departmental Representative review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit electronic copies (pdf) of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies (pdf) 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.
- .13 Submit electronic copies (pdf) of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies (pdf) of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

- .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, electronic 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.
- .21 The review of shop drawings by the Departmental Representative is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.5 SAMPLES

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

1.6 MOCK-UPS

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

1.7 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic (pdf) copy of colour digital photography, fine resolution, monthly with progress statement and as directed by Departmental Representative and/or Consultant.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Viewpoints and their location as determined by Departmental Representative and/or Consultant.
- .4 Frequency of photographic documentation: every two weeks or as directed by Departmental Representative and/or Consultant.
 - .1 Upon completion of: excavation, foundation, framing and services before concealment, of Work, and as directed by the Departmental Representative and/or Consultant.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Manitoba
 - .1 Workplace Safety and Health Regulation (Current as of Sept 27, 2019)

1.2 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 copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .4 Submit copies of incident and accident reports.
- .5 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 – Submittal Procedures.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within within .
- .7 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.
- .8 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.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 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.
- .3 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.4 SAFETY ASSESSMENT

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

1.5 MEETINGS

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

1.6 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with Section 01 41 00- Regulatory Requirements.

1.7 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.

1.8 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 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.

1.9 COMPLIANCE REQUIREMENTS

- .1 Comply with The Workers Compensation Act, Workplace Safety Regulation, Manitoba Reg.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.
- .3 Comply with any applicable Health and Safety Requirements from Provincial or Federal Regulations concerning COVID-19.

1.10 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 Province 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 Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.11 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 working knowledge of occupational safety and health regulations.
 - .2 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.

- .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .4 Be on site during execution of Work.

1.12 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 Province having jurisdiction, and in consultation with Departmental Representative.

1.13 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.

1.14 POWDER ACTUATED DEVICES

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

1.15 WORK STOPPAGE

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

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code of Canada (NBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.3 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 immediately.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative immediately.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative immediately.

1.4 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and municipal by-laws.
- .2 Smoking and vaping are not permitted anywhere in the building.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 INSPECTION

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

1.3 INDEPENDENT INSPECTION AGENCIES

- .1 The General Contractor to engage independent Inspection/Testing Agencies for purpose of inspecting and/or testing portions of Work as indicated in the respective technical specification sections. Cost of such services will be borne by the General Contractor.
- .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 the Departmental Representative. Pay costs for re-testing and re-inspection.

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

1.7 REPORTS

- .1 Submit electronic copy of inspection and test reports to Departmental Representative / Consultant.
- .2 Provide copies to subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

1.8 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative & Consultant'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 / Consultant will assist in preparing schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative / Consultant.
- .7 Mock-ups may remain as part of Work if accepted by Departmental Representative / Consultant.
- .8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.9 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to Divisions 21, 22, 23, 26 and 28 for definitive requirements.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

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

1.4 WATER SUPPLY

- .1 Departmental Representative will make arrangements for continuous supply of potable water for construction use.
- .2 Departmental Representative will arrange for payment of utilities at prevailing rates.

1.5 TEMPORARY VENTILATION AND HEATING

- .1 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, especially the food services area.
 - .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.
- .2 Heating:
 - .1 Construction heaters used inside the building must be vented to outside or be flameless type. Solid fuel salamanders are not permitted.
 - .2 Pay costs for maintaining temporary heat. When using permanent heating system, Departmental Representative will pay utility charges when temporary heat source is existing building equipment.
- .3 Maintain strict supervision of operation of 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 Provide attendance and maintenance of, and fuel for, the temporary heating and ventilation required during construction.

1.6 TEMPORARY POWER AND LIGHT

- .1 Provide and maintain temporary lighting throughout project. Ensure level of illumination in affected area is not less than 162 lx.

1.7 TEMPORARY COMMUNICATION FACILITIES

- .1 If required, provide and pay for temporary telephone, fax, data hook up, lines and/or equipment necessary for own use. Costs to also include installation, maintenance and removal.
- .2 The Contractor shall obtain approval from the Warden or designate for the installation of internet connection. See 01 35 13, 1.8 Telephone.

1.8 FIRE PROTECTION

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

END OF SECTION

Part 1 General

1.1 SITE ACCESS

- .1 There is no room on site for:
 - .1 Construction office trailer.
 - .2 Materials/equipment storage.
 - .3 Materials stockpiling.
 - .4 Garbage bins.
- .2 Obtain, where applicable, City of Winnipeg "Use-of- Street Permit" for use of sidewalk / street as may be required.
 - .1 Meet requirements of "Use-of- Street Permit".
 - .2 Pay all associated fees and other charges.

1.2 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

1.4 SUBMITTALS

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

1.5 INSTALLATION AND REMOVAL

- .1 The General Contractor shall be responsible for providing a site office for the purposes of conducting the work.
- .2 Provide construction facilities in order to execute work expeditiously. Refer to the Site Plan for the Contractor's Work Area.
- .3 Indicate use of supplemental or other staging areas.
- .4 Remove from site all such work after use.

1.6 SCAFFOLDING

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 All scaffolding to be designed and approved by P. Eng.

1.7 HOISTING

- .1 Provide, operate and maintain zoom booms required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of zoom booms. Hoist cranes shall not be permitted on the site.

1.8 SITE STORAGE/LOADING

- .1 Material storage shall be limited to the General Contractor's Work Area.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 There is no space on site for a materials and equipment storage compound.
- .2 Locate materials to cause least interference with work activities.
- .3 Store remainder of materials and equipment off site.

1.10 SANITARY FACILITIES

- .1 The General Contractor to have limited use to building's existing facilities.

1.11 CONSTRUCTION SIGNAGE

- .1 No construction advertisement signs, other than health and safety, warning and instructional signs, are permitted on site.
- .2 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .3 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .2 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs.
- .3 Protect traveling public from damage to person and property.
- .4 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .5 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

- .6 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .7 Dust control: adequate to ensure safe operation at all times.
- .8 Provide snow removal during period of Work at project site.

1.13 CLEAN-UP

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

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Not used.

1.3 GENERAL

- .1 Enclose and shelter the work areas as required to protect the existing building, the existing building components, building occupants and contents, as well as the work in progress from damage due to weather, vermin, wind or other risks.

1.4 INSTALLATION AND REMOVAL

- .1 Provide temporary measures in order to execute Work expeditiously and prevent damage to the work and/to to the Building.
- .2 Remove from site all such work after use.

1.5 DUST TIGHT SCREENS

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

1.6 ACCESS TO SITE

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

1.7 EXIT ROUTES

- .1 Maintain access to exit for use by occupants and workers during construction.

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.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves the 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 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled content.
- .3 Where items are identified as reused or salvaged it's the Consultants understanding that these components are not defective and considered reasonable for reuse.
- .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 the 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.
- .8 Systems design and building components to be engineered to resist high wind loads in the Winnipeg geographic area. Shop drawings to be sealed by a professional engineer registered in the Province of Manitoba.

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 sheet materials and lumber on flat, solid supports and keep clear of ground.
- .5 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.
- .6 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .7 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 the 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 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.
- .4 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .5 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.

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/or building occupants and pedestrian and vehicular traffic.

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

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 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.
- .3 Match existing style and color and finishes for flashings and trim work where practical.

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 to be exposed by uncovering work; maintain excavations free of water.

1.5 EXECUTION

- .1 Execute cutting, fitting, and patching to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with Contract Documents requirements.
- .10 Fit Work and seal to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with ULC rated firestopping material the full thickness of the construction element.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.
- .14 Tie down and fasten components on or adjacent to roof securely anticipating potential risk of high wind.

1.6 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

1.7 RECORDS

- .1 Record locations of maintained, re-routed and abandoned service lines.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than 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 Whenever work occurs in the Occupied space, the space is required to be cleaned of any debris and/or dust for the completion of each shift. Cleaning of Occupied areas shall occur following the completion of each shift between Sunday and Thursday as space is not occupied from Friday 7pm until Monday 9am.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Dispose of waste materials and debris off site.
- .7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

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

- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regular intervals.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors and ceilings.
- .8 Clean lighting reflectors, lenses, and other lighting surfaces.
- .9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10 Remove debris and surplus materials from crawl areas, ceiling plenums and other accessible concealed spaces.
- .11 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds affected by the Work.
- .12 Remove dirt and other disfiguration from exterior surfaces.
- .13 Clean and sweep roofs, areaways and clean drainage system.
- .14 Sweep and wash clean paved areas affected by the Work.
- .15 Remove snow and ice from access to building affected by the Work.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor and subcontractors: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Departmental Representative inspection.
 - .2 Departmental Representative 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 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 have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by Manitoba Labour Board have been submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .6 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When items noted above are completed, request final inspection of Work by Departmental Representative and Consultant. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
 - .5 Declaration of Substantial Performance: when Owner, Departmental Representative and the Consultant consider deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance. Refer to Phasing Plan for outlined use of space by Owner for duration of construction.
 - .6 Commencement of Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period.
 - .7 Final Payment:

- .1 When Departmental Representative and Consultant consider final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned with Departmental Representative's comments.
- .4 Revise content of documents as required prior to final submittal
- .5 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative two (2) hard copies and two (2) electronic copies (USB drive or DVD) final copies of operating and maintenance manuals.
- .6 Provide spare parts, maintenance materials and special tools that are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .7 Provide evidence, if requested, for type, source and quality of products supplied.
- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.

1.3 ELECTRONIC SUBMITTALS

- .1 Submit number of hard copies specified for each type and format of submittal and in also submit in electronic format as pdf files and also in MS Word, Excel, Project as may be appropriate and in Autocad DWG files all on CD R/W or USB.

1.4 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, (3) 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
 - .1 Identify contents of each binder on spine.

- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by component 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.
 - .2 Provide drawings in pdf and dwg formats.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Label CD/DVD, binders "GAC Regional Office Fit-Up Winnipeg 2021". Include name of Contractor and date of submission.
- .2 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultants, Contractor, Sub-contractors and material suppliers with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
 - .4 Bookmark electronic copies of Project Record Documents with digital bookmarks.
- .3 Organize files into National Master Specification format (current edition) numbering system. Ensure all content is clearly legible.
- .4 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .5 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .6 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
 - .1 Provide typewritten text as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00.
- .7 Submit copies of executed guarantees and bonds.
- .8 Submit copies of approved shop drawings.
- .9 Submit copies of all Consultant Field Reports and all material and product Field Test Reports.
- .10 Training: refer to Section 01 79 00 - Demonstration and Training.

1.6 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative, one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field Test Report, System Components List C/W Commissioning Verification Forms and Check Sheets and Commissioning Issues/Resolution Log
 - .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.
- .6 Departmental Representative may furnish additional drawings and specifications to clarify Work.
 - .1 Such documents become part of Contract Document.
 - .2 Include such documents in As Built submission.
- .7 Submit to Departmental Representative one copy of drawings and specifications for review prior to final submission.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

- .1 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
- .2 Field changes of dimension and detail.
- .3 Changes made by change orders.
- .4 Details not on original Contract Drawings.
- .5 References to related shop drawings and modifications.
- .6 Provide dwg files for all modified shop drawings to show as-fabricated/constructed conditions.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.8 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.
- .15 Additional requirements: as specified in individual specification sections.

1.9 MATERIALS AND FINISHES

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

1.10 MAINTENANCE MATERIALS

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

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

1.11 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.12 WARRANTIES AND BONDS

- .1 Submit Manufacturer's warranty certificate indicating warranty coverage for a period of 12 months following Substantial Completion as certified by Departmental Representative.
- .2 Verify that documents are in proper form, contain full information and are notarized.
- .3 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .4 Develop warranty management plan to contain information relevant to Warranties Manufacturers' Guarantees and Bonds.
- .5 Submit warranty management plan, 60 days before planned pre-warranty conference, to Departmental Representative approval.
 - .1 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
 - .2 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .6 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.

- .7 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties, manufacturers' guarantees and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within 10 days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .8 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.
- .9 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.
 - .13 Contractor's plans for attendance of the various required post-construction warranty inspections.
 - .14 Procedure and status of tagging of equipment covered by extended warranties.
- .10 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

- .11 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .12 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.13 PRE-WARRANTY CONFERENCE

- .1 Meet with Departmental Representative, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Departmental Representative.
- .2 Departmental Representative will establish communication procedures for:
 - .1 Notification of construction warranty defects.
 - .2 Determine priorities for type of defect.
 - .3 Determine reasonable time for response.
- .3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.14 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag.
- .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.

END OF SECTION

Part 1 General

1.1 PRECEDENCE

- .1 For Federal Government Projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel.
- .2 The Departmental Representative will 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 testing, adjusting, and balancing has been performed and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times and location.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 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.

END OF SECTION

Part 1 General

1.1 TRAINEES

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes: Property 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 Departmental Representative 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 FPT Reports.

- .3 Project Manager, Commissioning Manager and Property 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:
 - .1 Multimedia presentations.
 - .2 Manufacturer's training videos.
 - .3 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 Contractor to be responsible for:
 - .1 Implementation of training activities,
 - .2 Coordination among instructors,
 - .3 Quality of training, training materials,
- .2 Departmental Representative and Commissioning Manager 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 1month prior to commencement of scheduled training.
- .2 On-Site training videos:
 - .1 Video recording on digital medium of training sessions for use during future training.
 - .2 To be performed after systems are fully commissioned.
 - .3 Organize into several short modules to permit incorporation of changes.
- .3 Production methods to be high quality.

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 ACRONYMS:

- .1 BMM - Building Management Manual.
- .2 Cx - Commissioning.
- .3 EMCS - Energy Monitoring and Control Systems.
- .4 O M - Operation and Maintenance.
- .5 SV - Static Verification.
- .6 FPT - Functional Performance Testing.
- .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 Functional Performance Testing 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.

1.3 COMMISSIONING OVERVIEW

- .1 Section 01 91 13.13 - Commissioning (Cx) Plan.
- .2 For Cx responsibilities refer to Section 01 91 13.13 - Commissioning (Cx) Plan.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 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 built 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.
- .6 Departmental Representative will issue Interim Acceptance Certificate when:

- .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
- .2 Equipment, components, systems, and integrated systems have been fully commissioned and functional as per design intent to meet contract specification and project functional and operational requirements.
- .3 Final O&M and Training Manual receive, review and approve by Departmental Representative for suitability.
- .4 Completion of Training session to Operational Maintenance Staffs:
 - .1 Successful completion of integrated system tests, life safety support systems tests and after meeting all requirements of the authority having jurisdiction.

1.4 NON-CONFORMANCE TO FUNCTIONAL PERFORMANCE TESTING 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 Departmental Representative 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 agent.
 - .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 5 weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 5 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 Section 01 91 13.16 - Commissioning (Cx) Forms: Installation Check Lists and Static Verification (SV) / Functional Performance Testing (FPT) Forms for requirements and instructions for use.
- .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.
- .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 50% 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 Cx Agent, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 50% 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 Departmental Representative to witness of start-up and testing.
- .3 Contractor's Cx Agent 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 Departmental Representative.
 - .3 Arrange for Departmental Representative to witness tests.
 - .4 Obtain written approval of test results and documentation from Departmental Representative 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 SV report forms.
- .2 Visual inspection of quality of installation.
- .2 Start-up: follow accepted start-up procedures.
- .3 Operational testing: document equipment performance.
- .4 System FPT: include repetition of tests after correcting deficiencies.
- .5 Post-substantial Functional Performance Testing: 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 FPT forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by 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 Departmental Representative.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.
 - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
 - .1 Rejected equipment to be removed 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 FPT produce unacceptable results, repair, replace or repeat specified starting and/or FPT 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 14 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and Functional Performance Testing 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 FUNCTIONAL PERFORMANCE TESTING

- .1 Carry out Cx:
 - .1 Under accepted simulated 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 Functional Performance Testing.

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 Since access into secure or sensitive areas will be very difficult after occupancy, it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

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 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 25% 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 either Departmental Representative's or Consultant'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 00.13 – 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 FPT if:
 - .1 Accuracy complies with these specifications.
 - .2 Calibration certificates have been deposited with Departmental Representative.
- .2 Where permitted by the Departmental Representative, calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.35 FUNCTIONAL PERFORMANCE TESTING 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 +/- 10% of specified values, unless otherwise noted.
- .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 +/- 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

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 202-2013, Commissioning Process for Buildings and Systems.
 - .2 ASHRAE Guideline 0-2005, Commissioning Process.
- .2 Canadian Standards Association (CSA)
 - .1 CSA Z320-11, Building Commissioning Standard and Check Sheets.
- .3 Underwriters' Laboratories of Canada (ULC)

1.2 GENERAL

- .1 Provide a fully functional facility:
 - .1 Systems, equipment, and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
 - .2 Facility user and O M personnel have been fully trained in aspects of installed systems.
 - .3 Optimized life cycle costs.
 - .4 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 Use this Cx Plan as master planning document for Cx:
 - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
 - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
 - .3 Sets out deliverables relating to O M, process and administration of Cx.
 - .4 Describes process of verification of how built works meet design requirements.
 - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
 - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
 - .1 Overview of Cx.
 - .2 General description of elements that make up Cx Plan.
 - .3 Process and methodology for successful Cx.
- .4 Acronyms:
 - .1 Cx - Commissioning.
 - .2 BMM - Building Management Manual.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 MSDS - Material Safety Data Sheets.
 - .5 SV - Static Verification.
 - .6 FPT - Functional Performance Testing.
 - .7 TAB - Testing, Adjusting and Balancing.
 - .8 WHMIS - Workplace Hazardous Materials Information System.

- .5 Commissioning terms used in this Section:
 - .1 Bumping: Short-term start-up to prove ability to start and prove correct rotation.
 - .2 Deferred Cx: Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.3 DEVELOPMENT OF 100% CX PLAN

- .1 Consultant Cx Plan to be 95% completed before added into Project Specifications.
- .2 Consultant Cx Plan to be 100% completed within 8 weeks of award of contract, and to take into account:
 - .1 Approved shop drawings and product data.
 - .2 Approved changes to contract.
 - .3 Contractor's project schedule.
 - .4 Cx schedule.
 - .5 Contractor's, sub-contractor's, suppliers' requirements.
 - .6 Project construction team's and Cx team's requirements.
- .3 Submit 100% completed Consultant Cx Plan to Departmental Representative (DR) for further review and obtain written acceptance.

1.4 REFINEMENT OF CX PLAN

- .1 During construction phase, revise, refine and update Cx Plan to include:
 - .1 Changes resulting from Client program modifications.
 - .2 Approved design and construction changes.
- .2 Revise, refine and update every 6 weeks during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.
- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.5 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
 - .1 Departmental Representative Design Quality Review Team: During construction, will conduct periodic site reviews to observe general progress.
 - .2 Departmental Representative Quality Assurance Commissioning Manager: Ensures Cx activities are carried out to ensure delivery of a fully operational project including:
 - .1 Review of Cx documentation from operational perspective.
 - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
 - .3 Protection of health, safety and comfort of occupants and O M personnel.
 - .4 Monitoring of Cx activities, training, development of Cx documentation.

- .5 Work closely with members of Cx Team.
- .3 Departmental Representative is responsible for:
 - .1 Organizing Cx.
 - .2 Monitoring operations Cx activities.
 - .3 Witnessing, certifying accuracy of reported results.
 - .4 Witnessing and certifying TAB and other tests.
 - .5 Developing BMM.
 - .6 Ensuring implementation of final Cx Plan.
 - .7 Performing verification of performance of installed systems and equipment.
 - .8 Implementation of Training Plan.
- .4 Construction Team: Contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:
 - .1 Testing.
 - .2 TAB.
 - .3 Performance of Cx activities.
 - .4 Delivery of training and Cx documentation.
 - .5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.
- .5 Contractor's Cx agent implements specified Cx activities including:
 - .1 Demonstrations.
 - .2 Training.
 - .3 Testing.
 - .4 Preparation, submission of test reports.
- .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
 - .1 Receiving facility.
 - .2 Day-to-day operation and maintenance of facility.

1.6 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
 - .1 Installation contractor/subcontractor:
 - .1 Equipment and systems except as noted.
 - .2 Equipment manufacturer: Equipment specified to be installed and started by manufacturer.
 - .1 To include Functional Performance Testing.
 - .3 Specialist subcontractor: Equipment and systems supplied and installed by specialist subcontractor.
 - .4 Specialist Cx agency:
 - .1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.
 - .5 Client: Responsible for intrusion and access security systems.
 - .6 Ensure that Cx participant:
 - .1 Could complete work within scheduled time frame.

- .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O M personnel, including:
 - .1 Modify ventilation rates to meet changes in off-gassing.
 - .2 Changes to heating or cooling loads beyond scope of EMCS.
 - .3 Changes to EMCS control strategies beyond level of training provided to O M personnel.
 - .4 Redistribution of electrical services.
 - .5 Modifications of fire alarm systems.
 - .6 Modifications to voice communications systems.
- .7 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

1.7 EXTENT OF CX

- .1 Cx Structural and Architectural Systems:
 - .1 Architectural and structural:
 - .1 Accessibility and operational safety:
 - .1 Door hardware.
 - .2 Partition wall.
 - .2 Commission mechanical systems and associated equipment:
 - .1 HVAC and exhaust systems:
 - .1 HVAC systems – All new & existing VAV boxes and transfer fans within the scope of work.
 - .2 Plumbing systems – sump pumps and new sink/fixtures.
 - .3 Controls – Testing of all new and existing pneumatic thermostats within the scope of work
 - .3 Commission electrical systems and equipment:
 - .1 Lighting systems:
 - .1 Lighting equipment.
 - .1 Lighting Level.
 - .2 Lighting switches and control.
 - .2 Emergency lighting systems, including battery packs.
 - .3 Fire exit emergency signage.
 - .2 Fire alarm systems, equipment:
 - .1 Annunciators.
 - .2 Control panels.
 - .3 Devices.
 - .1 Smoke detectors.
 - .2 FA Speakers
 - .3 FA Strobes
 - .3 Other systems and equipment:
 - .1 Intrusion system.
 - .2 Sound masking system.

1.8 DELIVERABLES RELATING TO O M PERSPECTIVES

- .1 General requirements:
 - .1 Compile English documentation.
 - .2 Documentation to be computer-compatible format ready for inputting for data management.
- .2 Provide deliverables:
 - .1 Warranties.
 - .2 Project record documentation.
 - .3 Inventory of spare parts, special tools, and maintenance materials.
 - .4 Maintenance Management System (MMS) identification system used.
 - .5 Preventative maintenance program.
 - .6 Standard Operating Procedures (SOP).
 - .7 WHMIS information.
 - .8 MSDS data sheets.
 - .9 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

1.9 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
 - .1 Start-up, testing, and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and Functional Performance Testing tests.
- .3 Deliverables: provide:
 - .1 Cx Specifications.
 - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .3 Completed Static Verification (SV) report forms.
 - .4 Completed Functional Performance Testing (FPT) report forms.
 - .5 Results of Functional Performance Testing Tests and Inspections.
 - .6 Description of Cx activities and documentation.
 - .7 Description of Cx of integrated systems and documentation.
 - .8 Tests performed by Departmental Representative and/or / Tenant.
 - .9 Training Plans.
 - .10 Cx Reports.
 - .11 Prescribed activities during warranty period.
- .4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.
- .5 Departmental Representative to participate.

1.10 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Items listed in this Cx Plan include the following:

- .1 Pre-Start-Up inspections: by Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.
- .2 Departmental Representative to use approved check lists.
- .3 Departmental Representative will monitor some of these pre-start-up inspections.
- .4 Include completed documentation with Cx report.
- .5 Conduct pre-start-up tests: Conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.
- .6 Departmental Representative will monitor [some] of these inspections and tests.
- .7 Include completed documentation in Cx report.
- .2 Pre-Cx activities - ARCHITECTURAL AND STRUCTURAL:
 - .1 Doors, windows, related hardware:
 - .1 Door hardware:
 - .1 Test all door hardware operation.
 - .3 Pre-Cx activities - MECHANICAL:
 - .1 Plumbing systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 Complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - .2 HVAC equipment and systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 At this time, complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - .4 Perform TAB on systems. TAB reports to be approved by Departmental Representative.
 - .3 Controls systems:
 - .1 Test to ensure pneumatic supply is provided appropriately to each device.
 - .2 At this time, complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
- .4 At this time, complete Pre-Cx activities - ELECTRICAL:
 - .1 Lighting systems:
 - .1 Emergency lighting systems:
 - .1 Tests to include verification of lighting levels and coverage, initially by disrupting normal power.
 - .2 Fire alarm systems: Test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. Departmental Representative has witnessed and certified report, demonstrate devices and zones to Departmental Representative.

- .3 Intrusion alarm systems: to include verification by Departmental Representative.

1.11 START-UP

- .1 Start up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:
 - .1 Plumbing Pumps
 - .2 Pneumatic Controls
 - .3 Air Terminal Units
 - .4 Lighting Controls
 - .5 Sound Masking
- .3 Departmental Representative to monitor some of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of Departmental Representative.
- .4 Functional Performance Testing (FPT) Forms:
 - .1 Approved Cx Agent to perform.
 - .1 Repeat when necessary until results are acceptable to Departmental Representative.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 Departmental Representative to witness and certify reported results using approved SV and FPT forms.
 - .4 Departmental Representative to approve completed FPT reports and provide to Departmental Representative.
 - .5 Departmental Representative reserves right to verify up to 30% of reported results at random.
 - .6 Failure of randomly selected item shall result in rejection of FPT report or report of system start-up and testing.

1.12 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Perform Cx by specified Cx agency using procedures developed by Departmental Representative and approved by Departmental Representative.
- .2 Departmental Representative to monitor Cx activities.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved FPT forms.
- .4 Departmental Representative to witness, certify reported results of, Cx activities and forward to Departmental Representative.
- .5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.13 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

- .1 Cx to be performed by specified Cx specialist, using procedures developed by Departmental Representative and approved by Departmental Representative.
- .2 Tests to be witnessed by Departmental Representative and documented on approved report forms.
- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by Departmental Representative and submitted to Departmental Representative for review.

- .4 Departmental Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include:
 - .1 HVAC and associated systems forming part of integrated HVAC systems: VAV boxes.
 - .2 Emergency lighting systems.
 - .3 Fire alarm system.
- .6 Identification:
 - .1 In later stages of Cx, before hand-over and acceptance Consultant and Cx Manager to co-operate to complete inventory data sheets and provide assistance to PWGSC in full implementation of MMS identification system of components, equipment, sub-systems, systems.

1.14 STATIC VERIFICATION (SV) REPORT FORMS

- .1 Refer to Section 01 91 13.16 - Commissioning (Cx) Forms: Installation Check Lists and Static Verification (SV) / Functional Performance Testing (FPT) Forms.

1.15 FUNCTIONAL PERFORMANCE TESTING (FPT) REPORT

- .1 Refer to Section 01 91 13.16 - Commissioning (Cx) Forms: Installation Check Lists and Static Verification (SV) / Functional Performance Testing (FPT) Forms.

1.16 DELIVERABLES RELATING TO ADMINISTRATION OF CX

- .1 General:
 - .1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

1.17 CX SCHEDULES

- .1 Prepare detailed critical path Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:
 - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
 - .1 Design criteria, design intents.
 - .2 Pre-TAB review: 28 days after contract award, and before construction starts.
 - .3 Cx agents' credentials: 60 days before start of Cx.
 - .4 Cx procedures: 3 months after award of contract.
 - .5 Cx Report format: 3 months after contract award.
 - .6 Discussion of heating/cooling loads for Cx: 3 months before start-up.
 - .7 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
 - .8 Notification of intention to start TAB: 21 days before start of TAB.
 - .9 TAB: After successful start-up, correction of deficiencies and verification of normal and safe operation.
 - .10 Notification of intention to start Cx: 14 days before start of Cx.
 - .11 Notification of intention to start Cx of integrated systems: After Cx of related systems is completed 14 days before start of integrated system Cx.
 - .12 Identification of deferred Cx.

- .13 Implementation of training plans.
 - .14 Cx of smoke management/control systems: After Cx of related systems is completed and 7 days before proposed date of Cx these systems.
 - .15 Cx reports: Immediately upon successful completion of Cx.
 - .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Departmental Representative.
 - .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
 - .3 Consultant, Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.

1.18 CX REPORTS

- .1 Submit reports of tests, witnessed and certified by Departmental Representative to Departmental Representative who will verify reported results.
- .2 Include completed and certified FPT reports in properly formatted Cx Reports.
- .3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

1.19 ACTIVITIES DURING WARRANTY PERIOD

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
 - .1 Fine tuning of HVAC systems.
 - .2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.

1.20 TRAINING PLANS

- .1 Refer to Section 01 79 00.13 – Demonstration And Training For Building Commissioning.

1.21 FINAL SETTINGS

- .1 Upon completion of Cx to satisfaction of Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

Part 2 Products

Not used.

Part 3 Execution

Not used.

END OF SECTION

Mechanical & Electrical Systems Commissioning Plan

Regional Office Fit-Up For Global Affairs Canada

303 Main Street
Winnipeg, MB

CLIENT

Global Affairs Canada

PWGSC Project: R104185

Version Date: 2020-11-30

Version Number: 0

CONSULTANT

EPP SIEPMAN ENGINEERING INC.

TABLE OF CONTENTS

- A. Importance of the Commissioning Plan..... 1
- B. Roles and responsibilities..... 1
- C. Revisions to this Commissioning Plan 2
- D. Risk assessment..... 2
- E. Objectives of commissioning..... 3
- F. Extent of commissioning..... 3
- G. Deliverables relating to O&M perspectives 3
- H. Deliverables relating to the commissioning process..... 4
- I. Deliverables relating to the administration of commissioning..... 6
- J. Payments for commissioning..... 6
- K. Commissioning process 6
- L. Training Plan..... 6

A. Importance of the Commissioning Plan

The Commissioning Plan is the master planning, management and communications tool relating to commissioning, setting out scope, standards, roles and responsibilities, expectations, deliverables, etc., and is addressed to all members of the Commissioning Team. It provides an overview of commissioning, and sets out the process and the methodology for successful commissioning of the above-mentioned project.

B. Roles and responsibilities

The Commissioning Plan is intended to be used by the:

PWGSC Project Manager: who has the overall responsibility for the project and is the sole point of contact between the Client, the Designer, the PWGSC Commissioning Manager and all other members of the project team.

Departmental Representative: a designate as appointed by the PWGSC Project Manager to provide confirmation of the commissioning documents and processes. The designate may be more than one person based on the type of work to commission.

PWGSC design Quality Review Team: conducts detailed reviews during all stages of the design to ensure appropriate design criteria, design intents, design solutions, that designs are well-developed, commissioning specifications are appropriate to this laboratory, transmits technical design information to the Designer. During construction, may conduct periodic site reviews to observe general progress.

PWGSC Commissioning Manager: ensures that all commissioning activities are carried out so as to ensure the delivery of a fully operational project complete in every respect.. This includes reviews of all commissioning documentation, reviews for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under all conditions of operation, protection of health, welfare, safety and comfort of occupants and O&M personnel.

Designer (i.e. Consultant): designs the facility to meet the Client's functional and operational requirements and budget, prepares all working documents, including incorporation of commissioning specifications in to construction specifications, monitoring commissioning activities, witnessing and certifying the accuracy of reported results, witnessing and certifying TAB and other tests, commissioning checklist forms, develops the Building Management Manual, ensures the implementation of this Commissioning Plan, performing verification of performance of all installed systems, implementation of Training Plan.

Construction Team: consists of Contractor, sub-contractors, suppliers and other support disciplines, and is responsible for construction/installation in accordance with the contract documents, including testing and the delivery of training, required documentation.

Contractor's Commissioning Agent: to implement all commissioning activities required by the specifications, including demonstrations, training, testing, preparation and submission of test reports.. This is a responsibility that is distinct from that of the Contractor's site supervisor. Commissioning Agent to be available for emergency and troubleshooting service during the first year of occupancy by the User for adjustments and modifications outside the responsibility of the O&M personnel.

Commissioning Agencies: will include:

The installing contractor or installing sub-contractor.

Equipment manufacturer: e.g.. elevators, emergency generators.

Specialist sub-contractor: e.g.. EMCS.

Specialist commissioning agency: e.g., environmental space conditions, indoor air quality and other installations providing environments which are essential to the Client's program but are outside the scope or expertise of other Commissioning Agencies on this project. If not specified in the commissioning specifications, the identity of this specialist will be provided at a later date.

TAB agency: equipment and systems involving the measurement and adjusting of flow rates and pressures to meet indicated or specified values (e.g. ducted air and hydronic systems, fans, pumps).

All Commissioning Agencies will be available for emergency service during the first year of occupancy by the User for adjustments and modifications outside the responsibility of the O&M personnel. These include changes to ventilation rates to meet changes in off-gassing, changes to heating or cooling loads beyond the ranges of the EMCS, and changes to EMCS control strategies beyond the training level provided to the O&M personnel.

The names of commissioning personnel, details of the instruments which will be used and commissioning procedures which will be followed will be provided at least three months prior to the scheduled starting date so as to permit proper review and approvals.

Client's move: the move from the existing accommodation into the new location, although not part of commissioning should be given serious consideration by the Designer so as to ensure only very minor interruption in his program activities.

Property Manager: has responsibility for receiving the renovated facility and is responsible for day-to-day operation and maintenance of the facility and represents the lead role in the Operation Phase and onwards.

C. Revisions to this Commissioning Plan

This Commissioning Plan will be reviewed, revised, refined and updated as detailed design and production of the Working Documents proceeds and, if required, during construction.

Each time it is revised, the revision number and date will also be revised. The revised Commissioning Plan shall be submitted to the PWGSC Project Manager and PWGSC Commissioning Manager for review and approval.

D. Risk assessment

There is an inherent risk that certain penalties are likely to result from a poorly commissioned facility. The Owner/Investor, represented by the Project Leader, must weigh the costs of good practices against the risks of inadequate commissioning. Such risks and penalties might include:

1. Impact on heritage character of historical buildings
2. Unclear design criteria and design intents
3. User discontent
4. High O&M costs
5. Inappropriate maintenance practices
6. Possible injury
7. Expensive corrective measures

E. Objectives of commissioning

Commissioning will provide a fully functional facility:

1. whose systems, equipment and components have been proven to meet all Client's functional requirements before the date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under all normal loads.
2. in which the Client and O&M personnel will have been fully trained in all aspects of all installed systems,
3. having complete documentation relating to all installed equipment and systems.

F. Extent of commissioning

Systems to be commissioned shall include:

Architectural and Structural

1. Door hardware
2. Millwork hardware
3. Interior finishes

Mechanical

1. Fan systems
2. VAV systems including thermostats.
3. Fire suppression and fire protection systems **
4. Plumbing systems – New sink faucet and new undercounter sump.

Electrical

1. Low voltage (below 750 V) distribution systems – Disconnects, panel boards, circuit breakers
2. Emergency lighting **
3. Lighting equipment and distribution systems **
4. Fire exit emergency signage **
5. Fire alarm systems, enunciators **
6. Voice communications and audio/video systems **
7. Electronic data and communications information systems
8. Intrusion and access security and safety systems **

** These systems are identified as life safety systems.

G. Deliverables relating to O&M perspectives

The following list of deliverables is a brief overview. Deliverables will include duplicate discs and two hard copies. All documentation shall be required to be transferred to the Property Manager in a computer-compatible format that can be readily inputted for data management.

Building Management Manual: This will provide comprehensive information relating to the design, implementation, operation and maintenance of the entire project. It will include, but not necessarily limited to the following:

1. **Standard Operating Procedures (SOP) Manual:** To include description of each system together with a description of all operating modes. It will be produced by the Designer as the design develops. It shall be 90% complete prior to Tender Call.

During the commissioning phase, revisions and refinements will be incorporated by the Designer, so that it will be 100% complete prior to issuance of the Interim Certificate. It will be further refined during the Warranty Period when all systems undergo fine tuning, set-point adjustments are made, etc.
2. **Operating and Maintenance (O&M) Manual:** This will be produced by the Contractor as construction/installation proceeds and reviewed by the Designer. It will be 90% complete prior to start-up inspections. During the commissioning stage, all missing data will be added, so that it will be 100% complete prior to issuance of the Interim Certificate. During the Warranty Period, it will be refined as required. This manual will be organized so that keeping it up-to-date will require minimum time and resources.
3. **Warranties:** A complete inventory will be provided by the Contractor to the Designer who will review same before submission to the PWGSC Commissioning Manager who, in turn, recommends acceptance by the PWGSC Project Manager.
4. **"As-built" Drawings and Specifications:** These will be produced by the Designer from the project record documents maintained on the site and kept up-to-date with all changes marked thereon by the Contractor. Accuracy will be verified by the Designer and the PWGSC Commissioning Manager before preparation and after submission by the Designer. They shall be completed in time to be used during pre-start-up inspections.
5. **Training:**

Training will be under the direction of the Designer and monitored by the PWGSC Commissioning Manager.

H. Deliverables relating to the commissioning process

Description of pre-commissioning activities and production of related documentation: For every item, the extent of involvement of the members of the Commissioning Team will be determined (e.g. who reviews, performs, monitors, certifies). This schedule will be prepared by the Designer with input from the PWGSC Commissioning Manager and will include items such as:

1. **Pre-start-up tests:** These will include pressure, static, flushing, cleaning, "bumping", etc. conducted during construction and will be performed by the Contractor and witnessed and certified by the Designer. The completed documentation will be included in the Commissioning Report.
2. **Pre-start-up inspections** conducted by the Designer prior to start-up and rectification of deficiencies, using approved installation check lists. The completed documentation will be included with the Commissioning Report.
3. **Start-up:** This will be by the Contractor, equipment manufacturer, supplier and/or installing specialist sub-contractor under the direction of the Designer. It will also include rectification of all start-up deficiencies by the Contractor to the satisfaction of the Designer and PWGSC Commissioning Manager.
4. **TAB and Functional Performance Testing** will be performed by the approved Commissioning Agencies, repeated where necessary until results are acceptable to the Designer. Procedures may have to be modified to suit project requirements.

Schedule of commissioning of integrated systems and production of related documentation will be prepared conjointly by the Designer and the PWGSC Commissioning Manager. It will also identify integrated systems to be commissioned over and above those listed herein:

1. Fire alarm systems
2. Voice communications systems
3. Emergency lighting systems
4. Environmental space condition and IAQ
5. Fire suppression systems

Commissioning will be performed by the Contractor or specified Commissioning Agencies, using procedures developed by the Designer and approved by the PWGSC Commissioning Manager. They will be witnessed by, and results certified by, the Designer. Reported results will be witnessed and certified by the Designer using approved PV forms. Upon satisfactory completion, the Commissioning Agency performing the tests will prepare the required Commissioning Report which will be certified by the Designer and forwarded to the PWGSC Commissioning Manager who reserves the right to verify a percentage of all reported results at no cost to the contract.

Identification: The PWGSC Commissioning Manager, in cooperation with the Property Manager, will establish an identification system for all systems and equipment which will reflect final MMS (Maintenance Management System) identification requirements. This will be reflected in the identification system used in the working documents by the Designer.

Commissioning specifications: Commissioning specifications will be developed and submitted at the same time as the Design Development Report. Final versions will be prepared by the Designer during the working document stage and inserted into the project specifications. PWGSC generic commissioning specifications will be provided and will be edited by the Designer so as to become project- specific. They may have to be supplemented by project-specific commissioning specifications prepared by the Designer, reviewed by the PWGSC Project Manager and approved by the PWGSC Commissioning Manager. They will also include samples of commissioning check list forms.

Installation Start-up Check Lists: These are required to inform the PWGSC Commissioning Manager of those systems which are ready for commissioning. A generic list is provided by the PWGSC Commissioning Manager to the Designer, who will tailor them to meet the requirements of the project.. Where these are not available, they will be developed by the Designer and approved by the PWGSC Commissioning Manager.

Static Verification report forms: All product information relating to equipment and components supplied and installed on this project will be reported on approved Static Verification report forms similar to the samples attached to the commissioning specifications. Forms to be based on the CSA Z320-11 standard. Some Static Verification report forms already exist. Others will be prepared by the Designer, reviewed by the discipline specialists and approved by the PWGSC Commissioning Manager no later than 8 weeks after approval of shop drawings for the equipment concerned. Instructions for use will be included in the commissioning specifications. All completed Static Verification report forms will be certified by the Designer. After review and verification by the PWGSC Commissioning Manager, these report forms will be included in the Building Management Manual.

Functional Performance Testing report forms: All results of tests and commissioning will be entered on approved Functional Performance Testing report forms similar to the samples attached to the commissioning specifications. Forms to be based on the CSA Z320-11 standard. Others will be prepared by the Designer, reviewed by the discipline specialists and approved by the PWGSC Commissioning Manager no later than 8 weeks after approval of shop drawings for the equipment concerned.

Instructions for use will be included in the commissioning specifications. All completed PV report forms will be certified by the Designer. After review and verification by the PWGSC Commissioning Manager, these report forms will be included in the relevant Commissioning Reports.

Commissioning Reports: The completed Functional Performance Testing report forms will be included in properly formatted Commissioning Reports. Before any reports are accepted, all reported results will be subject to verification by the PWGSC Commissioning Manager.

I. Deliverables relating to the administration of commissioning

The Commissioning checklists will be revised to include provisions for testing all parameters to the full range of operating conditions and to check responses of all such equipment and systems under all conditions. This is required because the operation of all systems are of paramount importance to health, safety, comfort and welfare of occupants and users.

The completion of the renovations to the existing facilities within the stipulated time frame is essential to the continuance of Client's operations with minimum interruption.

Since access into secure or sensitive areas will be difficult after take-over, it is necessary to complete commissioning of occupancy equipment and systems in these areas before the building is occupied.

Commissioning Schedules: Commissioning will be organized so that there will be no delays in the review and approvals process. The required milestones in the review, approval and commissioning process will be included in the commissioning specifications.

Commissioning activities scheduling: A detailed critical path schedule will be prepared by the Commissioning Agent and submitted to the Designer, PWGSC Commissioning Manager and PWGSC Project Manager for review and approval at the same time as the Construction and Completion Schedule. After approval, it will be incorporated into the Contractor's Construction and Completion Schedule. The Designer, Commissioning Agent, Contractor and PWGSC Commissioning Manager will monitor progress of commissioning against this schedule.

A separate detailed schedule in day-by-day format will be provided by the Commissioning Agent for commissioning of all systems and equipment. This schedule will include a detailed training schedule so as to demonstrate that there will be no conflicts with testing.

J. Payments for commissioning

The Contractor's commissioning will be included in the Contractor's base price.

K. Commissioning process

General: The Contractor shall perform the role of Commissioning Agent. This includes the responsibility for managing the commissioning process including monitoring, training, warranties, etc. The Project Commissioning Team and the Designer will be involved in the process, during their regular reviews, comment on the acceptability of the installations as they are installed, and in particular, witnessing tests of completed systems. The Commissioning Agent is not empowered to determine acceptability of installations. Contractor testing remains the responsibility of the individual sub-trades. However, tests will be witnessed by the Commissioning Agent and the Departmental Representative at their discretion. Acceptance of equipment and or systems lies solely with the parties normally granted this authority within the contract.

As defined in the specifications, there are a number of phases to commissioning - documentation, installation, testing and verification of the installed equipment and systems. Static, or pre-start, tests are defined for all equipment. These include duct and pipe pressure test and "megger" testing. Sign-off of the equipment by way of pre-start check sheets is outlined in the specifications. Once individual pieces of equipment or systems have been checked for conformance, start-up will be able to commence.

Systems to be tested as required by codes: Where testing is required as part of a regulatory process and where commissioning procedures are fully developed and are appropriate to the project, the PWGSC Commissioning Manager shall ensure that all tests as required by such codes are performed. The PWGSC Commissioning Manager will witness these tests as part of the Quality Assurance role.

Systems to be commissioned:

1. **Architectural**

- a. **Millwork**
- b. **Flooring**
- c. **Doors & Door Hardware**

2. **Mechanical**

- a. **HVAC System Testing:** It is envisaged that each piece of HVAC equipment will be initially started up, "bumped", in their "stand-alone" mode, i.e. without mechanical control and fire alarm interfaces being complete. During this period, pre-start checks will be completed and the relevant documentation completed. In the case of hydronic systems, after the pumps have been bumped and the pre-start checks completed, the cleaning process can commence. Items covered at this stage will be those which might have a detrimental effect on the operation of the particular item of equipment, such as noise and vibration, it is realized that the system balancing can have an effect on some parameters. Once individual pieces of equipment have been started up, the systems will be checked out in parallel with the control systems. System documentation will be completed by the Commissioning Agent before verification or training begins.
- b. **Controls:** Testing and commissioning is specified in the specifications, and the acceptance of the control system is well defined. It is envisaged that the contractor testing i.e. point-by-point testing will be performed in parallel with contractor start up. A complete point-by-point verification will be done as part of system verification and will be witnessed by the Designer and PWGSC Commissioning Controls Specialist. The PWGSC Commissioning Manager may elect to participate.

Demonstration of the controls systems will be witnessed by both the EMCS Commissioning Agent and the Contractor's Commissioning Agent prior to the thirty day Final Acceptance test. The final Commissioning is considered to be performed during these two stages and the only additional testing required at the end of the "Final Operational Test" would be the off seasonal test.

System documentation will be completed by the Commissioning Agent and submitted for review before verification or training begins.

3. **Electrical**

- a. **Low Voltage Systems:** These systems, including Communication Systems, and low voltage lighting controls, will be checked out in accordance with the contract documents. Designer to witness system test.

- b. **Alternate Power Systems:** Emergency lighting level outlined in the specification will be initially checked by switching off normal power fights and checking coverage. Power availability will be checked at all required equipment requiring emergency power (e.g.. Lights).
- c. **Electrically connected equipment:** Designer to witness all systems test.
- d. **Fire Alarm Systems:** Fire Alarm System cannot be fully verified until all aspects of the life safety and security are completed. Contractor testing will include a complete verification in accordance with ULC-CAN-SS37-M90. Once the commissioning Agent has submitted a certification report all devices and zones will be demonstrated as to ULC 536. Designer and PWGSC Commissioning Manager to witness all tests.

Designer's commissioning verification: The Designer is to witness all system and integrated system tests.

Documentation:

1. Building Management Manual will be compiled as separate manuals in English and French. The Designer will review and accept manuals.
2. Record drawings will be provided for the Designer to produce "As Built" drawings. These drawings will comprise a combination of marked up contracts print information and updated contractor working drawings.
3. Spare parts and maintenance materials: A comprehensive list of all spare parts and maintenance material provided under the contract is to be provided. This will become more detailed as recommended parts/tools are identified by the various manufacturers.

Training: A comprehensive training plan will be provided by the Commissioning Agent to the operations staff in the final stages of commissioning. Specific requirements are to be included in the specification.

Warranty/Service Contracts: A comprehensive list of all warranties and service contracts will be provided by the Contractor. This list will include standard one year warranties and any non-standard warranties. Information on service contracts will provide a complete description of all items included in the contract.

Commissioning Schedule: A critical path Commissioning Schedule to be provided by the Commissioning Agent within one (1) months after award of contract and incorporated in the main construction schedule. It will monitor progress of installation and the sequence of testing, commissioning, documentation, and training. A separate detailed schedule in day by day format to be provided by the Commissioning Agent for commissioning of all equipment and systems. Training should be indicated on this schedule to ensure that that training does not conflict with testing.

- End of Document -

Part 1 General

1.1 INSTALLATION/START-UP CHECK LISTS

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.
- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.2 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's approval.

1.3 STATIC VERIFICATION (SV) REPORT FORMS

- .1 Static Verification (SV) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2 Prior to Functional Performance Testing (FPT) of systems complete items on SV forms related to systems and obtain Departmental Representative's and Commissioning Manager approval.

1.4 FUNCTIONAL PERFORMANCE TESTING (FPT) FORMS

- .1 FPT forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
- .2 FPT report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

- .3 Prior to FPT of integrated system, complete FPT forms of related systems and obtain Departmental Representative's and Commissioning Managers approval.

1.5 SAMPLES OF COMMISSIONING FORMS

- .1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.
 - .1 VAV Box.
 - .2 Exhaust Fans.
 - .3 Plumbing Fixture.
 - .4 Drainage System.
 - .5 Grounded Power Distribution System Panelboards.
 - .6 Lighting & Controls.
 - .7 Sound Marking Systems.
- .2 Revise items on Commissioning forms to suit project requirements.
- .3 Samples of Commissioning forms and a complete index of produced to date will be attached to this section.

1.6 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS

- .1 When additional forms are required, but are not available from Departmental Representative develop appropriate verification forms and submit to Departmental Representative for approval prior to use.
 - .1 Additional commissioning forms to be in same format as provided by Departmental Representative.

1.7 COMMISSIONING FORMS

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
 - .1 Departmental Representative provides Contractor project-specific Commissioning forms with Specification data included.
 - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .3 Confirm operation as per design criteria and intent.
 - .4 Identify variances between design and operation and reasons for variances.
 - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
 - .6 Record analytical and substantiating data.
 - .7 Verify reported results.
 - .8 Form to bear signatures of recording technician and reviewed and signed off by Departmental Representative.
 - .9 Submit immediately after tests are performed.
 - .10 Reported results in true measured SI unit values.
 - .11 Provide Departmental Representative with originals of completed forms.
 - .12 Maintain copy on site during start-up, testing and commissioning period.
 - .13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual.

1.8 LANGUAGE

.1 To suit the language profile of the awarded contract.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Commissioning Issue Log

REVISION #: _____

NAME: Travis Defoort
COMPANY: Epp Siepman Engineering
ADDRESS: 400-136 Market Avenue
Winnipeg, MB – R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canada Office Fit-Up
FILE NUMBER: 20077
DATE: _____

Item #	Sub Item #	Date	Item Description	Action	Responsibility	Action Taken	Status

VAV BOX

Static Verification, Start-Up, Performance Verification



REVISION #: 0

NAME: Travis Defoort
 COMPANY: Epp Siepman Engineering
 ADDRESS: 400-136 Market Avenue
 Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
 PROJECT: CGC Canada Office Fit-Up
 FILE NUMBER: 20077
 DATE: 22-Oct-20

NOTE: THIS CX FORM IS AN EXAMPLE ONLY AND IS TO BE FILLED OUT FOR EACH VAV IN THE EMPTY COLOUMNS PROVIDED. SEE SCHEDULES.

VARIABLE AIR VOLUME BOX				
STATIC VERIFICATION	VAV-1			
MODEL MATCHES SPECS (AIRFLOW, PRESSURE DROP)				
HANDNESS CONFIRMED				
DUCT SIZE CONFIRMED AND ATTENUATOR PROPERLY CONNECTED TO VAV, WHERE APPLICABLE				
MAXIMUM AND MINIMUM AIRFLOW CONFIRMED				
VAV BOX UNDAMAGED				
VAV BOX LABELLED				
VAV BOX SUPPORTED CORRECTLY				
DUCT WORK PROPERLY INSTALLED UP TO VAV				
ELECTRICAL AND DDC CONTROLS CONNECTED				
START-UP	VAV-1			
ENABLE CONTROL OF VAV				
CONFIRM AIRFLOW ON AIR BALANCE REPORT IS SUITABLE FOR VAV				
PERFORMANCE VERIFICATION	VAV-1			
NO EXCESSIVE NOISE				
CLOSE VAV USING THERMOSTAT- CONFIRM DAMPER IS CLOSED				
OPEN VAV USING THERMOSTAT- CONFIRM DAMPER IS OPEN				

GENERAL COMMENTS:

VAV BOX

Static Verification, Start-Up, Performance Verification



REVISION #: 0

NAME: Travis Defoort
COMPANY: Epp Siepman Engineering
ADDRESS: 400-136 Market Avenue
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canada Office Fit-Up
FILE NUMBER: 20077
DATE: 22-Oct-20

POSITION/TITLE	SIGNATURE	DATE
Building Operations and Maintenance Staff		
Cx Authority/ Commissioning Provider		
Contractors/Subcontractor		

EXHAUST FANS

Static Verification



REVISION #: 0

NAME: Travis Defoort
 COMPANY: Epp Siepman Engineering
 ADDRESS: 400-136 Market Avenue
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
 PROJECT: CGC Canada Office Fit-Up
 FILE NUMBER: 20077
 DATE: 22-Oct-20

EXHAUST FAN	SPECIFIED	SHOP DRAWINGS	INSTALLED
EQUIPMANT MARK			
MANUFACTURER			
MODEL NO.			
SERIAL NO.			
TYPE/ SIZE			
AIRFLOW			
STATIC PRESSURE AIR			
FAN POWER			
VOLTAGE / PHASE / FREQUENCY			

EVALUATION

EXHAUST FAN	STATUS	COMMENTS
FAN SUPPORTED AND SECURED		
INLET/OUTLET DUCTS ATTACHED		
DUCT SIZE CORRECT		
POWER CONNECTED		
RELAYS FOR CONTROL AND MONITORING OF FAN THROUGH DDC SYSTEM INSTALLED		
DAMPER INTERLOCKS INSTALLED		
ELECTRICAL DISCONNECTS INSTALLED WHERE REQUIRED		
FIRE DAMPERS AND FIRESTOPPING INSTALLED WHERE REQUIRED		
DIFFUSERS / GRILLES INSTALLED		

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE
Building Owner/Representative		
Building Operations and Maintenance Staff		
Cx Authority/ Commissioning Provider		
Design Consultants		
Contractors/Subcontractor		

EXHAUST FANS

Start-Up



REVISION #: 0

NAME: Travis Defoort
COMPANY: Epp Siepman Engineering
ADDRESS: 400-136 Market Avenue
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canada Office Fit-Up
FILE NUMBER: 20077
DATE: 22-Oct-20

EXHAUST FAN	STATUS	COMMENTS
CHECK FAN FOR NOISE AND VIBRATIONS		
CONFIRM OPERATION OF FAN INTERLOCKS		
CONFIRM MONITORING, CONTROL, AND RUN SCHEDULE THROUGH DDC SYSTEM		

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE
Building Owner/Representative		
Building Operations and Maintenance Staff		
Cx Authority/ Commissioning Provider		
Design Consultants		
Contractors/Subcontractor		

EXHAUST FANS
Functional Performance Testing



REVISION #: 0

NAME: Travis Defoort
 COMPANY: Epp Siepman Engineering
 ADDRESS: 400-136 Market Avenue
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
 PROJECT: CGC Canada Office Fit-Up
 FILE NUMBER: 20077
 DATE: 22-Oct-20

START-UP	STATUS	COMMENTS
AIR BALANCING COMPLETE		
AIR BALANCE REPORT ATTACHED		
GENERAL COMMENTS:		

POSITION/TITLE	SIGNATURE	DATE
Building Owner/Representative		
Building Operations and Maintenance Staff		
Cx Authority/ Commissioning Provider		
Design Consultants		
Contractors/Subcontractor		

PLUMBING FIXTURE

Static Verification



REVISION #: _____

NAME: Travis Defoort
COMPANY: Epp Siepman Engineering
ADDRESS: 400-136 Market Avenue
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canada Office Fit-Up
FILE NUMBER: 20077
DATE: 22-Oct-20

NAMEPLATE			
MANUFACTURER		EQUIPMENT NO.	
SERVICE		LOCATION	

START-UP	SPECIFIED	COMMENTS
INSTALLED AS PER DRAWINGS & SPECIFICATIONS		
INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS		
COLD WATER FEED CLEAN		
COLD WATER FEED PRESSURE		
HOT WATER FEED CLEAN		
HOT WATER FEED PRESSURE		
FIXTURE CLEAN		
PIPE ARRANGEMENT & SUPPORT		
NO LEAKAGE FROM SEALS		
FIXTURE WORKS CORRECTLY		

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE

PLUMBING FIXTURE

Start-Up



REVISION #: _____

NAME: Travis Defoort
COMPANY: Epp Siepman Engineering
ADDRESS: 400-136 Market Avenue
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canada Office Fit-Up
FILE NUMBER: 20077
DATE: 22-Oct-20

SHEET INTENTIONALLY LEFT BLANK FOR INDIVIDUAL TO POPULATE AS NEEDED

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE

PLUMBING FIXTURE

Functional Performance Testing



REVISION #: _____

NAME: Travis Defoort
COMPANY: Epp Siepman Engineering
ADDRESS: 400-136 Market Avenue
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canada Office Fit-Up
FILE NUMBER: 20077
DATE: 22-Oct-20

SHEET INTENTIONALLY LEFT BLANK FOR INDIVIDUAL TO POPULATE AS NEEDED

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE

DRAINAGE SYSTEM

Start-Up



REVISION #: _____

NAME: Travis Defoort
COMPANY: Epp Siepman Engineering
ADDRESS: 400-136 Market Avenue
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canada Office Fit-Up
FILE NUMBER: 20077
DATE: 22-Oct-20

	STATUS	COMMENTS
CONFIRM NO LEAKS		
CONFIRM OPERATION OF ALL PLUMBING FIXTURE		
CONFIRM FLOW DIRECTION		
TEST VALVE OPERATION		
NO DEBRIS COLLECTION IN BACKWATER VALVE		

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE

DRAINAGE SYSTEM
Functional Performance Testing



REVISION #: _____

NAME: Travis Defoort
 COMPANY: Epp Siepman Engineering
 ADDRESS: 400-136 Market Avenue
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
 PROJECT: CGC Canada Office Fit-Up
 FILE NUMBER: 20077
 DATE: 22-Oct-20

	STATUS	COMMENTS
CHECK ALL SYSTEM DISCHARGING CORRECTLY; BY INDIVIDUAL OR BY GROUP		
CHECK FLOOR DRAIN/TRAP WATER SEAL		
TEST SELF-SIPHONAGE SYSTEM BY FILLING UP TO OVERFLOWING LEVEL AND REMOVING THE PLUG		
DISCHARGE A SELECTION OF SANITARY SYSTEM CONNECTED TO SAME STACK SIMULTANEOUSLY		

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE

GROUNDING POWER DISTRIBUTION PANELBOARD



Start-Up

REVISION #: _____

NAME: Zaw Aungkyaw
COMPANY: Epp Siepman Engineering
ADDRESS: 400-136 Market Ave
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canada Office Fit-Up
FILE NUMBER: 20077
DATE: DD / MM / YYYY

SHEET INTENTIONALLY LEFT BLANK FOR INDIVIDUAL TO POPULATE AS NEEDED

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE
Building Owner/Representative		
Cx Authority/ Commissioning Provider		
Contractors/Subcontractor		
Manufacturer's Representatives		

Gounded Power Distirbution System Panelboards
Functional Performance Testing



REVISION #: _____

NAME: Zaw Aungkyaw
 COMPANY: Epp Slepman Engineering
 ADDRESS: 400-136 Market Ave
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
 PROJECT: CGC Canada Office Fit-Up
 FILE NUMBER: 20077
 DATE: 22-Oct-20

SHEET INTENTIONALLY LEFT BLANK FOR INDIVIDUAL TO POPULATE AS NEEDED

GENERAL COMMENTS:

Comments:

POSITION/TITLE	SIGNATURE	DATE
Building Owner/Representative		
Cx Authority/ Commissioning Provider		
Contractors/Subcontractor		
Manufacturer's Representatives		

Lighting Controls

Static Verification



REVISION #: _____

NAME: Zaw Aungkyaw
 COMPANY: Epp Siepman Engineering
 ADDRESS: 400-136 Market Ave
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
 PROJECT: CGC Canada Office Fit-Up
 FILE NUMBER: 20077
 DATE: DD / MM / YYYY

FIXTURE NAMEPLATE			
LIGHT FIXTURE NUMBER:			
MANUFACTURER		Model Number	
SERIAL NO.		Voltage:	
Color:		Wattage	

	Yes	NO	N/A	
Wall Mount				
Ceiling Mount				
Suspended Down				
Nameplate Match Spec				
Mfgr's test sheets complete				
Wiring Complete				
Test Sheets Attached				

* ACCEPTANCE TESTING ONLY

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE
Building Owner/Representative		
Cx Authority/ Commissioning Provider		
Contractors/Subcontractor		
Manufacturer's Representatives		

Lighting Controls



Start-Up

REVISION #: _____

NAME: Zaw Aungkyaw
COMPANY: Epp Siepman Engineering
ADDRESS: 400-136 Market Ave
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canada Office Fit-Up
FILE NUMBER: 20077
DATE: DD / MM / YYYY

SHEET INTENTIONALLY LEFT BLANK FOR INDIVIDUAL TO POPULATE AS NEEDED

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE
Building Owner/Representative		
Cx Authority/ Commissioning Provider		
Contractors/Subcontractor		
Manufacturer's Representatives		

Sound Masking

Start-Up



REVISION #: _____

NAME: Zaw Aungkyaw
COMPANY: Epp Siepman Engineering
ADDRESS: 400-136 Market Ave
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canda Office Fit-Up
FILE NUMBER: 20077
DATE: DD / MM / YYYY

SHEET INTENTIONALLY LEFT BLANK FOR INDIVIDUAL TO POPULATE AS NEEDED

GENERAL COMMENTS:

POSITION/TITLE	SIGNATURE	DATE
Building Owner/Representative		
Cx Authority/ Commissioning Provider		
Contractors/Subcontractor		
Manufacturer's Representatives		

Sound Masking
Functional Performance Testing



REVISION #: _____

NAME: Zaw Aungkyaw
COMPANY: Epp Slepman Engineering
ADDRESS: 400-136 Market Ave
Winnipeg, MB - Manitoba R3B 0P4

CUSTOMER: _____
PROJECT: CGC Canada Office Fit-Up
FILE NUMBER: 20077
DATE: _____ DD / MM / YYYY

Cx Authority/ Commissioning Provider		
Contractors/Subcontractor		
Manufacturer's Representatives		

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A10.8 2011, Safety Requirements for Scaffolding
- .2 American Society for Testing and Materials (ASTM):
 - .1 ASTM C475/C475M-15, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
- .3 CSA Group (CSA)
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures
- .4 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
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 241 13, Standard for Safeguarding Construction, Alteration, and Demolition Operations

1.2 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative.
- .3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.
- .5 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 the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Departmental Representative for the material ownership as follows:
 - .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Departmental Representative 's property, demolished materials shall become Contractor's property and shall be removed from Project site.
 - .2 Coordinate selective demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.
 - .3 Existing building material to be salvaged is to be delivered to 12th Floor, Mezzanine

1.4 ACTION AND INFORMATION SUBMITTALS

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

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:
 - .1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the Authority Having Jurisdiction.
 - .2 Municipal Requirements: Perform hauling and disposal operations in accordance with regulations of Authority Having Jurisdiction.
- .2 Qualifications: Provide proof of qualifications when requested by Departmental Representative:
 - .1 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project:
 - .1 Conform to the provincial Occupational Health and Safety Act and Regulation.
 - .2 Conform to Workers' Compensation Board Regulations.
 - .3 Conform to City of Winnipeg bylaws and regulations governing this type of work.

1.6 SITE CONDITIONS

- .1 Departmental Representative will occupy portions of building immediately adjacent to selective demolition area:
 - .1 Conduct selective demolition so that Departmental Representative 's operations will not be disrupted.
 - .2 Provide not less than 72 hours notice to Departmental Representative of activities that will affect Departmental Representative's operations.

- .2 Maintain access to existing means of egress, walkways, corridors, exits, and other adjacent occupied or used facilities:
 - .1 Do not close or obstruct means of egress, walkways, corridors, exits, or other occupied or used facilities without written acceptance from authorities having jurisdiction.
- .3 Departmental Representative assumes no responsibility for condition of areas to be selectively demolished:
 - .1 Conditions existing at time of Pre Bid Site Review will be maintained by Departmental Representative as far as practical.
- .4 Refer to Asbestos Survey Report in Appendix A

Part 2 Products

2.1 DESCRIPTION

- .1 This section of the Work includes, but is not necessarily limited to, the following:
 - .1 Demolition, removal completely from site, and disposal of all identified components, materials, equipment and debris
 - .2 Selective demolition to allow new walls, bulkheads, ceilings and other materials to meet existing construction as indicated
 - .3 All material from demolition shall be removed from site immediately with no salvage, selling, sorting or burning permitted on site
 - .4 Retain items indicated on drawings for re use in new construction
 - .5 Demolition, partial cutting or making holes through the load carrying structural materials to be approved by Structural Engineer, P. Eng, registered in Manitoba.
 - .6 Salvaged items from existing tenant space as outlined in the drawings and deliver to 12th floor Mezzanine:
 - .1 All 1524mm wide, full (not partially cut) acoustic ceiling tiles. All tiles with special cuts to be demolished
 - .2 All LED tubes and ballasts- box all tubes for storage
 - .3 (4) 1219mm wide light fixtures
 - .4 Occupancy Sensors

2.2 DEBRIS

- .1 Make all arrangements for transport and disposal of all demolished materials from the site.

2.3 EQUIPMENT

- .1 Provide all equipment required for safe and proper demolition of the building interiors indicated.

2.4 REPAIR MATERIALS

- .1 Use repair materials identical to existing materials:

- .1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
- .2 Use a material whose installed performance equals or surpasses that of existing material.
- .3 Comply with material and installation requirements specified in individual Specification Sections.
- .2 Floor Patching and Levelling Compounds: Cement based, trowelable, self levelling compounds compatible with specified floor finishes; gypsum based products are not acceptable for work of this Section.
- .3 Gypsum Board Patching Compounds: Joint compound to ASTM C475/C475M, bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes.
- .4 Hoarding and Dust Screens: Refer to Section 01 56 00.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that utilities have been disconnected and capped.
- .2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- .3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- .4 Notify the Departmental Representative where existing mechanical, electrical, or structural elements conflict with intended function or design:
 - .1 Investigate and measure the nature and extent of conflict and submit a written report to Departmental Representative.
 - .2 Departmental Representative will issue additional instructions or revise drawings as required to correct conflict.
- .5 Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- .1 Coordinate existing services indicated to remain and protect them against damage during selective demolition operations
- .2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
 - .1 Arrange to shut off affected utilities with utility companies.
 - .2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
 - .3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

- .4 Cut off pipe or conduit to a minimum of 25 mm below slab, and remove concrete mound. Patch concrete using cementitious grout .
- .3 Coordinate with Mechanical and Electrical Divisions for shutting off, disconnecting, removing, and sealing or capping utilities.
- .4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- .1 Identify and mark all equipment and materials identified to be retained by Departmental Representative or to be re used in subsequent construction. Separate and store items to be retained in an area away from area of demolition and protect from accidental disposal.
- .2 Post warning signs on electrical lines and equipment that must remain energized to serve other areas during period of demolition.
- .3 Confirm that all electrical and telephone service lines entering buildings are not disconnected.
- .4 Do not disrupt active or energized utilities crossing the demolition site.
- .5 Provide and maintain barricades, warning signs, protection for workmen and the public during the full extent of the Work. Read drawings carefully to ascertain extent of protection required.
- .6 Mark all materials required to be re used, store in a safe place until ready for re installation.
- .7 Adjust all junction boxes, receptacles and switch boxes flush with new wall construction where additional layers to existing construction are indicated.
- .8 Remove permanent marker lines used or found on exposed surfaces and at surfaces indicated for subsequent finish materials. Mechanically remove permanent marker lines and associated substrates where permanent marker lines occur and patch surface. Sealing or priming over permanent marker lines is not acceptable.

3.4 SELECTIVE DEMOLITION

- .1 Demolish and dismantle work in a neat and orderly manner and in strict accordance with all regulations.
- .2 At end of each day's work, leave Work in safe condition so that no part is in danger of toppling or falling.
- .3 Demolish in a manner to minimize dusting and to prevent migration of dust.
- .4 Selling or burning of materials on the site is not permitted.
- .5 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.
- .6 Demolish existing carpet, resilient flooring and adhesive remnants as follows:
 - .1 Vacuum existing carpet thoroughly, prior to removal, using vacuum equipped with power head/sweeper.
 - .2 Apply fine mist water spray to carpet as required to minimize dust generation during removal. Avoid spraying near electrical outlets.

- .3 Demolish existing carpet, remove and dispose of off site.
- .4 Remove adhesive to the greatest extent possible using scrapping tools and as follows:
 - .1 Do not use solvent based cleaners to remove adhesive remnants.
 - .2 Lightly shot blast or grind floor using machine designed for purpose to remove adhesive remnants.
 - .3 Vacuum floor ready for application of skim coating.
 - .4 Repair all slab depressions and damage with cementitious patching compound.
 - .5 Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials.
- .5 Floor substrate shall be smooth, free from ridges and depressions, and adhesive remnants that could telegraph through resilient flooring materials and carpets.
- .7 Demolish completely all ceiling panels and grid as indicated.
- .8 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.
- .9 Patch and repair all radiation cabinets, mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

3.5 PATCHING AND REPAIRING

- .1 Floors and Walls:
 - .1 Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space.
 - .2 Provide a level and smooth surface having uniform finish colour, texture, and appearance.
 - .3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.
 - .4 Patch with durable seams that are as invisible as possible.
 - .5 Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - .6 Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 - .7 Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- .2 Ceilings: patch, repair, or re hang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.6 PROTECTION

- .1 Prevent debris from blocking drainage inlets and systems and ground draining, and protect material and electrical systems and services that must remain in operation.
- .2 Arrange demolition and shoring work so that interference with the use of adjoining areas by the Departmental Representative and users is minimized.
- .3 Maintain safe access to and egress from occupied areas adjoining.
- .4 Provide and maintain fire prevention equipment and alarms accessible during demolition.

3.7 CLEANING

- .1 Waste Management: Separate waste materials for recycling and as follows:
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .2 Divert excess materials from landfill to site approved Departmental Representative.
- .3 Promptly as the Work progresses, and on completion, clean up and remove from the site all rubbish and surplus material. Remove rubbish resulting from demolition work daily.
- .4 Maintain access to exits clean and free of obstruction during removal of debris.
- .5 Keep surrounding and adjoining roads, lanes, sidewalks, municipal rights of way clean and free of dirt, soil or debris that may be a hazard to vehicles or persons.
- .6 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

General

1.1 PROJECT

- .1 Global Affairs Canada, Winnipeg Regional Office Fit-Up – Hazardous Materials Abatement.

1.2 PROJECT INFORMATION

- .1 The Contractor is responsible to confirm, for their own purposes, all quantities of hazardous materials identified by the Consultant in the identified work areas.
- .2 The abatement must meet the schedule provided by the Building Owner and the Architect.
- .3 Only hazardous abatement contractors qualified and approved by the Building Owner and Architect will be able to submit a bid.

1.3 EXISTING CONDITIONS – HAZARDOUS MATERIALS ABATEMENT

- .1 Remove and dispose of all asbestos-containing materials as detailed below. The corresponding specification section reference is provided detailing the procedures for abatement.

Table 1 – Asbestos-containing Materials Identified within the Global Affairs Canada, Winnipeg Regional Office Fit-Up Project

Hazardous Material	Location(s)	Approximate Quantity	Unit	Specification Reference
Asbestos Containing Black Mastic	Inside Wall Heaters Insulated Ducting at Seams	As Required	ft	Section 02 82 13.19
Asbestos Containing Joint Compound	All Walls	As Required	ft ²	Section 02 82 33.03

1.4 EXISTING CONDITIONS – NOTES

- .1 Additional materials may be present in areas not described in the table above. If similar materials are discovered during renovations, work should be halted to confirm asbestos content and removal procedures.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA Group
 - .1 CSA G40.20-13 /G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA S16-14, Design of Steel Structures.
 - .4 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.
- .3 Environmental Choice Program
 - .1 CCD-047-98(R2005), Architectural Surface Coatings.
 - .2 CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.
- .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.

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 and include product characteristics, performance criteria, physical size, finish and limitations., in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 33 00 and Section 01 35 29.06- Health and Safety Requirements for finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
- .3 Shop Drawings:

- .1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.3 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.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W.
- .2 Steel pipe: to ASTM A53/A53M standard weight, galvanized finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A307.
- .6 Flattened Metal Mesh: To EMMA 557-99.
- .7 Stainless steel tubing: to ASTM A269, Type 302 commercial grade, seamless welded with AISI No. 4 finish.
- .8 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof screws on items requiring assembly by screws or as indicated. Use type suited for application.

- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FLATTENED METAL MESH ON STEEL STUD WALLS

- .1 Supply to Section 09 21 99 for installation on outside face of steel studs for entire length of wall, where indicated on Drawings.
- .2 Metal Mesh, #10 gauge expanded steel, Mesh to be style ¾-9F, nominal strand thickness of 3mm (0.120") with diamond opening of 14.3mm x 42.875mm (0.563" x 1.688").

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for metal fabrications 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 remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION - GENERAL

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S16 Weld field connection.

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 in accordance with Section 01 74 19 – Construction 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 metal fabrications installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

1. ASTM International
 1. ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 2. ASTM A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 3. ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
2. CSA Group
 1. CSA G40.20-13 /G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 2. CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 3. CSA S16-14, Design of Steel Structures.
 4. CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 5. CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.
3. Environmental Choice Program
 1. CCD-047-98(R2005), Architectural Surface Coatings
 2. CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.
4. Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 1. Material Safety Data Sheets (MSDS).
5. The Master Painters Institute (MPI)
 1. Architectural Painting Specification Manual - current edition.

1.2 ACTION AND INFORMATION 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., in accordance with Section 01 33 00 - Submittal Procedures.
 2. Submit two copies of WHMIS MSDS in accordance with Section 01 33 00 and Section 01 35 29.06- Health and Safety Requirements for finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
3. Shop Drawings:
 1. Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.3 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.

1.4 DELIVERY, STORAGE, AND HANDLING

1. Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
2. Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
3. Storage and Handling Requirements:
 1. Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 2. Replace defective or damaged materials with new.
 3. Handle components to avoid denting or scratching of finished surfaces.
 4. Do not use markers on protective PVC film. Some types of ink will permeate the film and mark the material surface.

1.5 PROJECT CONDITIONS

1. Maintain a constant temperature range of 65°F to 85°F (18°C to 24°C), with stable relative humidity, for at least 48 hours prior to, throughout the installation period and maintained consistently thereafter.
2. Installation locations must be enclosed, weatherproofed and climate controlled prior to commencing installation.
3. Do not install if relative humidity is greater than 80%.

1.6 WARRANTY

1. Provide manufacturers warranty against defects in material and workmanship.

Part 2 Products

2.1 METALS

1. Perforated Aluminum Panel
 1. .063" Aluminum: Type 5052 alloy complying with ASTM B209
 2. Sizes: Refer to Door Type Elevation on ID02
 3. Perforated Size: 3/16" diameter, 5/16" staggered centres, 33% open area
 4. Edge: Provide 1/2" solid margin around panel, coordinate with door supplier
 5. Color to be selected by Architect from manufacturer's standard range
 6. Finish: Powdercoated, both sides
 1. Smooth finish

Part 3 Execution

3.1 EXAMINATION

1. Examine product, substrates and installation conditions.
2. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation.
3. Do not proceed with work until conditions have been corrected.

3.2 SURFACE PREPARATION

1. Prior to installation, clean surface to remove dirt, debris and loose particles. Perform additional preparation procedures as required per the manufacturer's instructions.
2. Protection: Take all necessary precautions to prevent damage to materials during installation.

3.3 INSTALLATION

1. Install the work of this section in strict accordance with manufactures written Technical Information and workability guidelines

3.4 CLEANING

1. Remove protective coverings and clean decorative metal to remove adhesives and tape residue. Test all solvents on non-exposed surfaces prior to use.
 1. For painted surfaces, use a mild detergent solution on a soft cloth.
 2. For stainless steel, use a glass cleaner and a soft cloth.
 3. For other surfaces, contact manufacturer for proper cleaning procedures.
 4. For heavy cleaning and removal of grease, use oil based mineral spirits or naphtha. Low concentration ammonia-based cleaning agents such as glass cleaners may also be used.
 5. Minor scuffs can be polished out by hand with a #6 to #9 type finishing polish or wax.
 6. Do not treat with rubbing compounds or lacquer thinner as this may dissolve or etch the coating.
2. Visually inspect all exposed surfaces for scratches or blemishes.
3. Protect Decorative Metal from damage during remainder of construction period.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA International
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .2 CSA O121-08, Douglas Fir Plywood.
 - .3 CAN/CSA-O141-05, Softwood Lumber.
 - .4 CSA O151-09, Canadian Softwood Plywood.
 - .5 CAN/CSA-O325.0-07, Construction Sheathing.
- .2 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber (latest edition).

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 rough carpentry work and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 MAINTENANCE MATERIALS SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19 mm thick plywood on 19 x 38 mm furring around spacing, perimeter and at maximum 300 mm intermediate

1.4 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

1.5 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 MATERIALS

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:
 - .1 S2S is acceptable for concealed roof curbs.
 - .2 Board sizes: "Standard" or better grade.
 - .3 Dimension sizes: "Standard" light framing or better grade.
 - .4 Post and timbers sizes: "Standard" or better grade.
- .3 Panel Materials:
 - .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
 - .1 Urea-formaldehyde free.
 - .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
 - .1 Urea-formaldehyde free.
 - .3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.
 - .1 Urea-formaldehyde free.
- .4 Primers / Paints / Coatings: in accordance with manufacturer's recommendations for surface conditions:
 - .1 Primer: VOC limit 100 g/L maximum to GS-11.
 - .2 Paint: VOC limit 150 g/L maximum to GS-11.
 - .3 Coating: VOC limit 100 g/L maximum to GS-11.

2.2 ACCESSORIES

- .1 Fasteners: to CAN/CSA-G164, for exterior work or interior highly humid areas.
- .2 Nails, spikes and staples: to CSA B111.
- .3 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .4 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for rough carpentry 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 Comply with requirements of NBC, supplemented by the following paragraphs.
- .2 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .3 Align and plumb faces of furring and blocking to tolerance of [1:600].
- .4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .5 Install sleepers as indicated.
- .6 Use caution when working with particle board. Use dust collectors and high-quality respirator masks.
- .7 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .8 Countersink bolts where necessary to provide clearance for other work.

3.3 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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-latest edition, Particleboard.
 - .2 ANSI A208.2-0, latest edition, Medium Density Fibreboard (MDF) for Interior Applications.
 - .3 ANSI/HPVA HP-1-latest edition, American National Standard for Hardwood and Decorative Plywood.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 Architectural Woodwork Quality Standards, 1st edition, latest edition.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
- .4 CSA International
 - .1 CSA B111-74 (latest edition), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA G164-M92 (latest edition), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA O121- (latest edition), Douglas Fir Plywood.
 - .4 CSA O141- (latest edition), Softwood Lumber.
 - .5 CSA O151- (latest edition), Canadian Softwood Plywood.
 - .6 CSA O153-M1980 (latest edition), Poplar Plywood.
- .5 National Lumber Grades Authority (NLGA)
 - .1 NLGA Standard Grading Rules for Canadian Lumber (latest edition).
- .6 Underwriters Laboratories of Canada (ULC)
 - .1 CAN4-S104-80 (latest edition), Standard Method for Fire Tests of Door Assemblies.
 - .2 CAN/ULC-S105 (latest edition), Standard Specification for Fire Door Frames.

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 plywood, MDF and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Shop Drawings:

- .1 Indicate details of construction, profiles, jointing, fastening and other related details.
- .2 Indicate materials, thicknesses, finishes and hardware.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.

1.3 QUALITY ASSURANCE

- .1 Lumber by grade stamp of agency certified by Canadian Lumber Standards Accreditation Board (CLSAB).
- .2 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.
- .3 Wood fire rated frames and panels: listed and labelled by an organization accredited by Standards Council of Canada to CAN4-S104 and CAN/ULC-S105.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: 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 wood products from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Softwood lumber: S4S, moisture content 19% or less in accordance with following standards:
 - .1 CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 AWMAC premium grade, moisture content as specified.
 - .4 Machine stress-rated lumber is acceptable.
 - .5 Hardwood lumber: moisture content 7 % or less in accordance:
 - .1 National Hardwood Lumber Association (NHLA).
 - .2 AWMAC premium grade, moisture content as specified.
- .2 Panel Material: Urea-formaldehyde free
 - .1 Douglas fir plywood (DFP): to CSA O121, standard construction.

- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .3 Hardwood plywood: to ANSI/HPVA HP-1.
- .4 Poplar plywood (PP): to CSA O153, standard construction.
- .5 Particleboard: to ANSI A208.1.
- .6 Hardboard: to CAN/CGSB-11.3.
- .7 Medium density fibreboard (MDF): to ANSI A208.2, density 640-800 kg/m³.
- .8 Low density fibreboard: to CSA-A247M.

2.2 ACCESSORIES

- .1 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber.
- .2 Wood screws: type and size to suit application.
- .3 Splines: type to suit application.
- .4 Adhesive and Sealants: in accordance with Section 07 92 00 - Joint Sealants.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood products 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 finish carpentry to Premium Quality Standards of (AWMAC).
- .2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.
- .3 Form joints to conceal shrinkage.
- .4 Provide date stamps on all newly installed wood baseboards to allow for the identification of original heritage baseboards and new replica-style baseboards.

3.3 CONSTRUCTION

- .1 Fastening:
 - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
 - .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
 - .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
 - .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.
- .2 Interior door frames:
 - .1 Set frames with plumb sides and level heads / sills and secure.
- .3 Hardware:
 - .1 Install all interior door hardware on wood doors. Coordinate with Section 08 71 00.

3.4 CLEANING

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

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM E84-09c - Test Method for Surface Burning Characteristics of Building Materials.
- .2 ASTM C97/C97M-09 - Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
- .3 ASTM D3884-09 - Standard Guide for Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method).
- .4 ASTM D4705-00(2010) - Standard Test Method for Stitch Tear Strength of Leather, Double Hole.
- .5 BHMA A156.9-2003 - Cabinet Hardware.
- .6 CAN/CGSB-11.3-M87 - Hardboard.
- .7 CSA-O141-05 - Softwood Lumber.
- .8 CSA-O121-08 - Douglas Fir Plywood.
- .9 CSA-O80 Series-08 - Wood Preservation.
- .10 CSA O112.4 Series, Standards for Wood Adhesives.
- .11 CSA O112.5 Series, Urea Resin Adhesives for Wood (Room and High Temperature Curing).
- .12 CSA O112.7 Series, Resorcinol and Phenol Resorcinol Resin Adhesives for Wood (Room and Intermediate Temperature Curing).
- .13 CSA O151, Canadian Softwood Plywood.
- .14 CSA O153, Poplar Plywood.
- .15 HPVA HP-1, Standard for Hardwood and Decorative Plywood.
- .16 NPA A208.1-2009 - Particleboard.
- .17 NPA A208.2-2009 - Medium Density Fibreboard (MDF) for Interior Applications.
- .18 National Hardwood Lumber Association (NHLA) - Rules for the Measurement and Inspection of Hardwood and Cypress.
- .19 National Lumber Grades Authority (NLGA) - Standard Grading Rules for Canadian Lumber.
- .20 AWS (AWMAC Architectural Woodwork Standards) – 1st Edition, 2009.

- .21 NEMA (National Electrical Manufacturers Association) LD3-2005 - High-Pressure Decorative Laminates.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: Convene one (1) week before starting work of this section.
- .2 Site installation to be quoted to the Contractor separately on the same bid form. The Architectural Woodwork Subcontractor is to supply, fabricate and Site install the work specified in this Section.

1.3 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Submittals of manufacturer's data, installation instructions, and samples are required upon Contract Administrator's request.
- .3 Shop Drawings: Indicate materials, component profiles and elevations, layout, ends, cross sections, service run spaces, and location of services assembly methods, joint and anchorage details and locations, fastening methods, accessory listings, hardware location and schedule of finishes.
 - .1 Include layout of units with relation to surrounding walls, doors, windows and other building components. Site confirm and indicate on the drawings critical dimensions.
 - .2 Co-ordinate shop drawings with other work involved.
 - .3 Scales: profiles full size, details half full size.
 - .4 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.
- .4 Product Data: Provide data for hardware accessories.

1.4 CLOSEOUT SUBMITTALS

- .1 Section 01 78 00: Closeout Submittals.

1.5 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Perform work to AWMAC/AWS Premium quality.
- .3 Maintain one copy of AWMAC/AWS Manual on Site.
- .4 Fabricator Qualifications: Company in good standing with AWMAC/AWS and specializing in fabricating Products specified in this section.
- .5 Installer Qualifications: Company specializing in performing the work of this section and have experience in this size and type of project.

1.6 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Protect units from moisture damage as specified in AWMAC/AWS QSI Section 1700.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

1.8 WARRANTY

- .1 All materials and workmanship covered by this Section will carry a one (1) year warranty from date of acceptance.

Part 2 Products

2.1 LUMBER MATERIALS

- .1 Lumber: To the requirements of AWMAC/AWS grades specified.
- .2 Hardwood Lumber: to NHLA "FAS" Grade.
 - .1 Birch species, plain sawn, maximum moisture content of 7%; with vertical grain, of quality suitable for transparent finish. Finger jointing not permitted.
- .3 Softwood Lumber: to CSA 0141 1970.
 - .1 Douglas Fir species, plain sawn, maximum moisture content of 6%; with grain, of quality suitable for transparent finish; to AWMAC premium grade.

2.2 SHEET MATERIALS

- .1 Refer to drawings for locations.
- .2 Sheet Materials: To the requirements of AWMAC/AWS grade specified.
- .3 Hardwood Plywood: CSA 0121; Veneer core; Douglas Fir Birch face species, rotary cut; of quality suitable for opaque finish.
- .4 Softwood Plywood: to CSA 0151 M1978; Veneer core; Douglas Fir to CSA 0121 face species, rotary cut; of quality suitable for opaque finish.
- .5 Particleboard: NPA A208.1; medium density; of grade to suit application; sanded faces.
- .6 Medium Density Fibreboard (MDF): NPA A208.2; composed of wood fibres, medium density, moisture resistant (when in plumbing cabinetry); of grade to suit application; sanded faces.

- .7 Plastic Laminate (PL-1) for upper millwork doors: basic high pressure laminate for cabinets and vertical applications to ANSI/NEMA LD3 and SEFA 8, multi layers of kraft (core) papers impregnated with phenolic resins, covered by a melamine impregnated decorative surface.
 - .1 Thickness: 1.00 mm.
 - .2 Colour: White, through-colour
 - .3 Finish: High Gloss
- .8 Plastic Laminate (P-L2) for lower millwork doors and drawers: basic high pressure laminate for horizontal countertop applications to ANSI/NEMA LD3 and SEFA 8, multi layers of kraft (core) papers impregnated with phenolic resins, covered by a melamine impregnated decorative surface.
 - .1 Thickness: 1.00 mm.
 - .2 Colour: Charcoal, through-colour
 - .3 Finish: High Gloss
- .10 Plastic Laminate (PL-3) for countertop: basic high pressure laminate for horizontal countertop applications to ANSI/NEMA LD3 and SEFA 8, multi layers of kraft (core) papers impregnated with phenolic resins, covered by a melamine impregnated decorative surface.
 - .1 Thickness: 1.00 mm.
 - .2 Colour: white with multi-tonal, quartz-style aggregate
 - .3 Finish: High Gloss

2.3 ACCESSORIES

- .1 Adhesive Type recommended by AWMAC/AWS to suit application
- .2 Fasteners: Size and type to suit application as recommended by AWMAC/AWS.
- .3 Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; zinc finish in concealed locations and stainless steel finish in exposed locations.
- .4 Concealed Joint Fasteners: Threaded steel.
- .5 Tape: Aluminum foil, insulating and heat dissipating tape.
- .6 Adhesive: To manufactures recommendations.

2.3 CUSTOM FABRICATED WOODWORK

- .1 Shop assemble work where applicable in sizes that can be easily transportable to the Site. Custom cabinetry integrated with building walls and structure to be Site constructed.
- .2 Provide cutouts for plumbing fixtures, electrical services, kitchen appliances and other equipment and fixtures built.
- .3 Refer to Drawings for custom fabricated woodwork details, materials and finishes.

.1 KITCHEN MILLWORK:

- .1 Refer to Drawings and Schedules.
- .2 Fabricate to AWS Premium quality grade.
- .3 Fasteners to be concealed as indicated on drawings.
- .4 Install countertop support hardware per drawings and hardware manufacturer's written instructions.

.2 MILLWORK HARDWARE:

Note: Hardware substitutions are acceptable on written request and approval by Departmental Representative. Confirm prior to shop drawing submission.

- .1 Hinges: 110 degree semi-concealed, complete with spring closure, mounting, 3-way adjustment and lifetime warranty.
 - .1 Doors 800 – 1500mm high: provide three (3) hinges
 - Doors 1500 – 2000mm high: provide four (4) hinges
- .2 Shelf Supports: Recessed steel shelving pilasters with shelf support clips with 19mm vertical adjustability.
- .3 Drawer Slides: Heavy-duty, full-extension slides for all drawers:
 - .1 Kitchen drawers: 100 lbs. capacity.
- .5 Cabinet Bar Pull Handles: Bar Pull, 96mm center to center distance, 178mm overall length.

.3 CLOSET MILLWORK:

- .1 14 ga. Brushed aluminum, fixed closet rod, 33mm diameter installed with heavy-duty pole sockets.
- .2 Provide white, melamine shelf, 508mm deep x length of closet secured to wall with melamine cleat. All exposed edges to have 3mm PVC edge banding.

2.4 FABRICATION

- .1 Shop prepare and identify components for matching during Site assembly.
- .2 Shop assemble for delivery to Site in units easily handled and to permit passage through building openings.
- .3 When necessary to cut and fit on Site, provide materials with ample allowance for Site cutting and scribing.
- .4 Inspect material for defects prior to fabrication.
- .5 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.

- .6 Ensure adjacent parts of continuous work match in colour and pattern.
- .7 Provide cutouts for service penetrations. Verify locations of cutouts from on-Site dimensions. Finish cut edges as indicated.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify adequacy of backing, substrates, and support framing.
- .2 Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

- .1 Install Work to AWMAC/AWS Premium Grade.
- .2 Install to manufactures recommendations.
- .3 Set and secure casework in place; rigid, plumb, and level.
- .4 Use attachments in concealed locations for wall mounted components.
 - .1 Attachments to fasten into structural wall elements. Use coarse threaded screw with minimum 25mm (1inch) penetration through studs. Fasteners to be located at 400mm (16inch) o.c. horizontally and 300mm (1') o.c. vertically.
- .5 Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- .6 Co-ordinate painting requirements with 09 91 99.

3.3 ADJUSTING

- .1 Test installed work for rigidity and ability to support loads.
- .2 Adjust moving or operating parts to function smoothly and correctly.
- .3 Fill and retouch nicks, chips, and scratches. Replace damaged items that cannot be repaired.

3.4 PROTECTION AND CLEANING

- .1 Section 01 74 00: Cleaning installed work.
- .2 Protect finished surfaces as per manufactures recommendations.
- .3 Protect woodwork from damage until final inspection.
- .4 Remove excess glue from surfaces.

- .5 Remove masking and excessive adhesives and sealants. Clean exposed surfaces.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C553-02, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .2 ASTM C665-01e1, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .3 ASTM C1320-05, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S604-M1991, Type A Chimneys.
 - .2 CAN/ULC-S702-1997, Standard for Mineral Fibre Insulation.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 DELIVERY, STORAGE AND HANDLING

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

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

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove and recycle waste materials to appropriate facilities.

Part 2 Products

2.1 INSULATION

- .1 Non-combustible acoustical and fire batt insulation for walls assemblies to CAN/ULC S702, Type 1.
 - .1 Fire performance:
 - .1 Non-combustibility: To CAN/ULC S114.
 - .2 Surface Burning Characteristics: To CAN/ULC S102.
 - .1 Flame spread: 0.
 - .2 Smoke developed: 0
 - .3 Smoulder resistance: 0.09% to CAN/ULC S129.
 - .2 Acoustical Performance:
 - .1 Airborne sound transmission loss: To ASTM E90.
 - .2 Rating sound insulation: To ASTM E413.
 - .3 Sound absorption co-efficients: To ASTM C423.

Sound Absorption Co-efficiencies at Frequencies

Thickness (mm)	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	NRC
25	0.14	0.25	0.65	0.90	1.01	1.01	0.70
38	0.18	0.44	0.94	1.04	1.02	1.03	0.85
50	0.28	0.60	1.09	1.09	1.05	1.07	0.95
76	0.52	0.96	1.18	1.07	1.05	1.05	1.05
102	0.86	1.11	1.20	1.07	1.08	1.07	1.10

- .4 Impedance and absorption of acoustic materials: To ASTM E1050.
- .3 Air erosion velocity: 5.08 m/s maximum to UL 181.
- .4 Thermal resistance: To ASTM C518.
- .5 Corrosive resistance: To ASTM C665, Corrosive to steel - Pass.
- .6 Stainless steel stress corrosion: To ASTM C795.
- .7 Density: To ASTM C612, 45 kg/m³.

2.2 ACCESSORIES

- .1 Acoustical sealant in accordance with Section 07 92 00 - Joint Sealants.
- .2 Firestopping materials in accordance with Section 07 84 00 - Firestopping.
- .3 Nails: galvanized steel, length to suit insulation plus [25] mm, to CSA B111.
- .4 Staples: 12 mm minimum leg.
- .5 Tape: as recommended by manufacturer.

2.3 SOURCE QUALITY CONTROL

- .1 Ensure insulation components and accessories are supplied or approved in writing by single manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSULATION INSTALLATION.

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

3.3 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 National Research Council Canada (NRC)
 - .1 National Building Code of Canada [2015] (NBC).
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-1995 , Fire Tests of Fire stop Systems.

1.2 DEFINITIONS

- .1 Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between fire rated wall and floor assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Section 01 33 00.
- .3 Manufacturer's engineering judgment identification number and drawing details when no ULC or cUL system is available for an application. Engineered judgment must include both project name and contractor's name who will install firestop system as described in drawing.
- .4 Submit material safety data sheets provided with product delivered to job-site.

1.4 QUALITY ASSURANCE

- .1 A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.
- .2 Fire-Test-Response Characteristics: Provide through-penetration fire stop systems and fire-resistive joint systems that comply with specified requirements of tested systems.
- .3 Firestop System installation must meet requirements of CAN/ULC-S115-11 or UL 2079 tested assemblies that provide a fire rating as shown in Section 2.03 Clauses R, S & T below.
- .4 Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

- .5 Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.
- .6 For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council.

1.5 INSTALLER QUALIFICATIONS

- .1 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary training to install manufacture's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- .2 Installation Responsibility: assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.
- .3 The work is to be installed by a contractor with at least one of the following qualifications:
 - FM 4991 Approved Contractor
 - UL Approved Contractor
 - Accredited Fire Stop Specialty Contractor certified by Fire Stop Supplier

1.6 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, ULC markings.
 - .4 Do not use damaged or expired materials.
- .2 Storage and Protection:
 - .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.

1.8 PROJECT CONDITIONS

- .1 Do not use materials that contain flammable solvents.
- .2 Scheduling:

1. Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
2. Schedule installation of Drop-In firestop devices after placement of concrete but before installation of the pipe penetration. Diameter of sleeved or cored hole to match the listed system for the device
3. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.
- .3 Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- .4 Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- .5 During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

- .1 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
2. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- .3 Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post installed." Provide cast-in-place firestop devices prior to concrete placement.
- .4 Provide a round fire-rated cable management device whenever cables penetrate fire rated walls, where frequent cable changes and additions may occur. The fire-rated cable management device shall consist of a corrugated steel tube with zinc coating, contain and inner plastic housing, intumescent material rings, and inner fabric smoke seal membrane. The length of the sleeve shall be 12.4 inches. The fire-rated cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The fire-rated cable management device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating requirements of the barrier type. Install device per the manufacturer's published installation instructions.
- .5 Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11.
 - .1 F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.
- .6 Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11.

- .1 F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
- .2 T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
- .3 W-Rating (if applicable): Class 1 rating in accordance with water leakage test per UL 1479.
- .7 Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.
- .8 Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of 0 as determined by ASTM G21.
- .9 Rain and water resistance: provide perimeter joint sealant tested in accordance with ASTM D 6904 with less than 1 hour tack free time as tested in accordance with ASTM C 679.

2.2 MATERIALS

- .1 Use only firestop products that have been ULC or cUL tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
- .2 Approved firestop product assemblies to include all materials, sealants, foams, mineral wool and other devices, which are purpose-made for all firestop conditions, including but not limited to:
 - .1 Cable penetrations (all types)
 - .2 Pipe penetrations (all types)
 - .3 Ductwork penetrations (all types)
 - .4 Combustible material penetrations (all types)
 - .5 Construction joints (all types)
 - .6 Metal deck profile closures
 - .7 Structurally separated walls and floor assemblies
 - .8 Electrical box enclosures
- .3 For penetrations through a Fire Separation wall provide a firestop system with a "F" Rating as determined by ULC or cUL as indicated below:

Fire Resistance Rating of Separation	Required ULC or cUL "F" Rating of Firestopping Assembly
30 minutes	20 minutes
45 minutes	45 minutes
1 hour	45 minutes
1.5 hours	1 hour
2 hours	1.5 hours
3 hours	2 hours
4 hours	3 hours

For combustible pipe penetrations through a Fire Separation provide a firestop system with a "F" Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

- .4 For penetrations through a Fire Wall or horizontal Fire Separation provide a firestop system with a "FT" Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.
- .5 Provide a firestop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction joint assembly.

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 Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion. Verify penetrations are properly sized and in suitable condition for application of materials.
- 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
- 3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
- 4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
- 5. Do not proceed until unsatisfactory conditions have been corrected.

3.3 COORDINATION

- 1. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.
- 2. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- .3 Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.
- .4 Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector.

3.4 INSTALLATION

- .1 Regulatory Requirements: Install firestop materials in accordance with ULC Fire Resistance Directory or UL Products Certified for Canada (cUL) Directory or Omega Point Laboratories Directory.
- 2. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.
 - 1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of ULC or cUL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
3. Protect materials from damage on surfaces subjected to traffic.

3.5 FIELD QUALITY CONTROL

- .1 Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- .2 Keep areas of work accessible until inspection by applicable code authorities.
- .3 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.
- .4 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- .5 Manufacturer's Field Services: During Installation, provide periodic destructive testing inspections to assure proper installation/application. After installation is complete, submit findings in writing indicating whether or not the installation of the tested system identified was installed correctly.

3.6 IDENTIFICATION & DOCUMENTATION

- .1 The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project.
- .2 The Documentation Form for through penetrations is to include:

A Sequential Location Number
The Project Name
Date of Installation
Detailed description of the penetrations location
Tested System or Engineered Judgment Number
Type of assembly penetrated
A detailed description of the size and type of penetrating item
Size of opening
Number of sides of assemblies addressed
Hourly rating to be achieved
Installers Name

- .3 The Documentation Form for Construction Joints is to include:

A Sequential Location Number
The Project Name
Date of Installation
Detailed description of the Construction Joints location
Tested System or Engineered Judgment Number
Type of Construction Joint
The Width of the Joint
The Lineal Footage of the Joint
Number of sides addressed
Hourly rating to be achieved
Installers Name

- .3 Copies of these documents are to be provided to the general contractor at the completion of the project.
- .4 Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 1. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's Name, address, and phone number.
 3. Through-Penetration firestop system designation of applicable testing and inspection agency.
 4. Date of Installation.
 5. Through-Penetration firestop system manufacturer's name.
 6. Installer's Name.
- .5 Permanently attach identification labels to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove or change penetrating items or firestopping.

3.7 ADJUSTING AND CLEANING

- .1 Remove equipment, materials and debris, leaving area in undamaged, clean condition.
- .2 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.
- .3 Perform cleaning in accordance to Section 01 74 11 – Cleaning.

3.7 LABOR USE TO INSTALL FIRESTOP SYSTEMS

- .1 If firestopping is not assigned to a single-source firestop specialty contractor, the installation of each scope of work is to be performed jurisdictionally correct per existing trade agreement.

END OF SECTION

Part 1 General

1.1 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 General Services Administration (GSA) - Federal Specifications (FS)
 - .1 FS-SS-S-200-E(2)1993 , Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005 , Adhesives and Sealants Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for 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 MSDS 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.

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 incorporation into manual.

1.4 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 in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

1.5 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.

1.6 ENVIRONMENTAL REQUIREMENTS

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

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 SELECTIONS

- .1 Type 1: Sealant for all locations except where another type is specified in this section. Multi-component, polyepoxide urethane sealant. To meet specified requirements of CGSB Specification CAN2.19-24-M80.
- .1 Type 2: Sealant for construction joints in lieu of Type 1 where pre-approved by Department Representative. One part elastomeric sealants: to meet specified requirements of NSC/CGSB 25-B-N moisture curing hybrid polyurethane.
- .2 Type 3: Sealant for glass to glass, sloped glazing systems, glass to metal, and metal to metal joints. One part low modulus silicone elastomeric sealant to meet specified requirements of NSC/CGSB Specification CAN2-19.13-M82.
- .3 Type 4: Polyurethane sealant for interior horizontal traffic joints.
- .4 Type 6: Use at all perimeter joints and openings in sound rated drywall systems and sealing polyethylene air/vapour barriers. One part acoustical sealant to meet specified requirements of CGSB Specification 19-GP-21M.
- .5 Type 7: Sealant for finishing interior construction joints subject to minimal movement and not otherwise specified in this section. One part paintable latex.
- .6 Type 8: Acoustic sealant for finishing interior construction joints subject to minimal movement and not otherwise specified in this section. One part paintable latex.

2.3 ACCESSORIES

- .1 Preformed compressible and non-compressible back-up materials:
 - .1 Polyethylene, urethane, neoprene or vinyl foam:
 - .1 Extruded closed or open cell foam backer rod.
 - .2 Size: oversize to between 30 to 50 %.
 - .2 Neoprene or butyl rubber:
 - .1 Round solid rod, Shore A hardness 70.
 - .3 High density foam:
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
 - .4 Bond breaker tape:

- .1 Polyethylene bond breaker tape which will not bond to sealant.

2.4 JOINT CLEANER

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

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.

3.8 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 RELATED SECTIONS

- .1 Section 07 92 00 – Joint Sealants.
- .2 Section 08 71 00 - Door Hardware
- .3 Section 09 91 99 – Painting for Minor Works.

1.2 REFERENCES

- .1 ASTM A653/A653M-09 - Steel Sheet, Zinc-Coated (Galvanized).
- .2 ASTM C553-08 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .3 ASTM C578-09e1 - Rigid, Cellular Polystyrene Thermal Insulation.
- .4 ASTM C591-09 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
- .5 ASTM C665-06 - Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .6 ASTM C1289-08e1 - Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- .7 ASTM E90-09 - Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .8 ASTM E413-04 - Classification for Rating Sound Insulation
- .9 CAN/ULC S104-10 - Standard Method for Fire Tests of Door Assemblies.
- .10 CAN/ULC S105-09 - Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.
- .11 CAN/ULC-S704-03 - Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .12 CAN/CSA-G40.20-04/G40.21-04 (R2009) - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .13 CSA-W59-03 (R2008) - Welded Steel Construction (Metal Arc Welding).
- .14 CSDMA (Canadian Steel Door Manufacturers Association)

- .1 Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000.
- .2 Selection and Usage Guide for Commercial Steel Doors and Frames, 2009.
- .15 DHI (Door Hardware Institute) - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
- .16 NFPA 80 - Fire Doors and Fire Windows (2010 Edition).
- .17 NFPA 252-2008 - Methods of Fire Tests of Door Assemblies.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the work with frame opening construction, door, and hardware installation.
- .2 Sequencing: Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

1.4 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submittal Procedures.
- .2 Product Data: Indicate door and frame configurations and finishes, location of cut-outs for hardware reinforcement.
- .3 Shop Drawings:
 - .1 Indicate frame elevations, reinforcement, anchor types and spacing, location of cut-outs for hardware, and finish.
 - .2 Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing, finishes, and hardware.

1.5 CLOSEOUT SUBMITTALS

- .1 Section 01 78 00: Closeout Submittals.

1.6 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Conform to requirements of CSDMA. Maintain one (1) copy of document on Site.

- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section and have experience in this size and type of project.

1.7 REGULATORY REQUIREMENTS

- .1 Fire Rated Door and Frame Construction: Labelled and listed to CAN4-S104 and NFPA 252.
- .2 Installed Door and Frame Assembly: Conform to NFPA 80 for fire rated class as scheduled.

1.8 DELIVERY, STORAGE, AND PROTECTION

- .1 Refer to Section 01 61 00.
- .2 Remove doors and frames from wrappings or coverings upon receipt on Site and inspect for damage.
- .3 Store in vertical position, spaced with blocking to permit air circulation between components.
- .4 Store materials on planks or dunnage, out of water and covered to protect from damage.
- .5 Clean and touch up scratches or disfigurement caused by shipping or handling with zinc-rich primer.

Part 2 Products

2.1 MANUFACTURERS

- .1 Manufacturers offering functionally and aesthetically equivalent products.

2.2 MATERIALS

- .1 Sheet Steel: Galvanized steel to ASTM A653/A653M, commercial grade (CS), Type B.
 - .1 Exterior Doors and Frames: Coating designation Z275 (G90).
 - .2 Interior Doors and Frames: Coating designation ZF120 (A40).
- .2 Reinforcement Channel: To CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653/A653M, coating designation to match door.

2.3 DOOR CORE MATERIALS

- .1 Honeycomb Core: Structural small cell 25.4 mm (1 inch) maximum kraft paper honeycomb; weight 36.3 kg (80 lb) per ream minimum, density 16.5 kg/cu m (1.03 pcf) minimum, sanded to required thickness.
 - .1 Fire Rated Doors: Refer to Drawings and Schedules.
- .2 Polystyrene Core: ASTM C578, Type 1, rigid extruded fire retardant, closed cell board, density 16 to 32 kg/cu m (1 to 2 pcf), thermal values RSI-1.0 (R-6.0) minimum.

2.4 ADHESIVES

- .1 Cores and Steel Components: Heat resistant, structural reinforced epoxy, resin based adhesive.
- .2 Lock Seam: Reinforced epoxy resin, high viscosity, thicksotropic sealant.

2.5 PRIMERS

- .1 Rust inhibitive touch-up only.

2.6 ACCESSORIES

- .1 Door Silencers: Single stud rubber/neoprene.
- .2 Exterior Top Caps: Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.
- .3 Frame Thermal Breaks: Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.
- .4 Weatherstripping: Specified in Section 08 71 00.

2.7 FABRICATION - DOORS

- .1 Interior Doors: Laminated core construction.
- .2 Longitudinal Edges: Tack welded, filled and sanded with no visible edge seams.
- .3 Mortised, blanked, reinforced, drilled and tapped for templated hardware, in accordance with templates provided by hardware supplier.
- .4 Reinforce for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.
- .5 Top and Bottom Channels: Inverted, recessed, welded steel channels.

- .6 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .7 Sound Rated Door after Fabrication: STC of minimum 48, measured to ASTM E413.

2.8 LAMINATED CORE CONSTRUCTION

- .1 Exterior Doors: Both face sheets 1.2 mm (18 gauge) steel, with polystyrene core, laminated under pressure to face sheets.
- .2 Interior Doors: Both face sheets 1.2 mm (18 gauge) steel with honeycomb core (refer to Schedule), laminated under pressure to face sheets.

2.9 FABRICATION - FRAMES

- .1 Exterior Frames: 1.6 mm (14 gauge) thick base metal thickness.
 - .1 Frames: Welded type construction thermally broken.
- .2 Interior Frames: 1.6 mm (14 gauge) thick base metal thickness.
 - .1 Door Frames and Window Assemblies: Welded type construction.
 - .2 Fire rated Frames: Refer to Drawings and Schedules.
- .3 Mortised, blanked, reinforced, drilled and tapped for templated hardware, in accordance with templates provided by hardware supplier.
- .4 Prepare frames for silencers. Provide three (3) single silencers for single doors and mullions of double doors on strike side. Provide two (2) single silencers on frame head at double doors without mullions.
- .5 Configure exterior frames with special profile to receive recessed weatherstripping.
- .6 Attach fire rated label to each fire rated door unit.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that opening sizes and tolerances are acceptable; check floor area within path of door swing for flatness.
- .2 Verify doors and frames are correct size, swing, rating and opening number.
- .3 Remove temporary shipping spreaders.

3.2 INSTALLATION

- .1 Install doors and frames to CSDMA.
- .2 Install fire-rated doors and frames in accordance with NFPA 80, and local authority having jurisdiction.
- .3 Coordinate with masonry, gypsum board and concrete wall construction for anchor placement and throat depths.
- .4 Coordinate installation of doors and frames with installation of hardware and view holes specified in Section 08 71 00.
- .5 Set frames plumb, square, level and at correct elevation.
- .6 Secure anchorages and connections to adjacent construction.
- .7 Brace frames rigidly in position while building-in. Install wood spreaders at third points of frame rebate height to maintain frame width. Provide vertical support at centre of head for openings exceeding 1 200 mm (48 inches) in width.
- .8 Remove wood spreaders after frames have been built-in.
- .9 Make allowance for deflection to ensure structural loads are not transmitted to frame product.
- .10 Install doors, and hardware in accordance with hardware templates and manufacturer's instructions.
- .11 Adjust operable parts for correct clearances and function.
- .12 Install door silencers.
- .13 Finish paint as specified in Section 09 91 99.
- .14 Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.3 ERECTION TOLERANCES

- .1 Section 01 73 00: Execution Requirements.
- .2 Maximum Diagonal Distortion: 1.5 mm (1/16 inch) measured with straight edges, crossed corner to corner.

3.4 SCHEDULE

- .1 Refer to Door Schedule Section 08 71 00.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
 - .1 Quality Standards for Architectural Woodwork (latest edition).
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-71.19-[M88], Adhesive, Contact, Sprayable.
 - .2 CAN/CGSB-71.20-[M88], Adhesive, Contact, Brushable.
- .3 Canadian Standards Association (CSA International).
 - .1 CSA A440.2-[98], Energy Performance of Windows and Other Fenestration Systems.
 - .2 CSA O115-[M1982(R2001)], Hardwood and Decorative Plywood.
 - .3 CAN/CSA O132.2 Series-[90(R1998)], Wood Flush Doors.
 - .4 CAN/CSA-O132.5-[M1992(R1998)], Stile and Rail Wood Doors.
 - .5 CAN/CSA-Z808-[96], A Sustainable Forest Management System: Guidance Document.
 - .6 CSA Certification Program for Windows and Doors [00].
- .4 National Fire Protection Association (NFPA).
 - .1 NFPA 80-[1999], Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252-[1999], Standard Method of Fire Tests of Door Assemblies.
- .5 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN-4S104M-[80(R1985)], Fire Tests of Door Assemblies.
 - .2 CAN4-S105M-[85 (R1992)], Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
 - .1 For caulking materials during application and curing.
 - .2 For door materials and adhesives.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate door types, sizes, core construction, and cutouts.

1.3 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit two (2) 300 x 300 mm corner sample of each type wood door illustrating veneer and colour.
- .3 Show door construction, core, and faces.
- .4 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Wood fire rated doors: labelled and listed by an organization accredited by Standards Council of Canada.
- .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Storage and Protection:
 - .1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
 - .2 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.
 - .3 Protect doors from scratches, handling marks and other damage. Wrap doors.
 - .4 Store doors away from direct sunlight.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Dispose of corrugated cardboard and plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.
- .3 Unused or damaged glazing materials are not recyclable and must not be diverted to municipal recycling programs.
- .4 Divert unused adhesive material from landfill to official hazardous material collections site approved by Departmental Representative.

Part 2 Products

2.1 NON-RATED WOOD FLUSH DOORS

- .1 Solid core: to CAN/CSA-O132.2.1.
 - .1 Construction:
 - .1 Solid particleboard core with density of 28-32 lbs per cubic foot.
 - .2 Stiles: 3mm thick veneer, longitudinally laminated by hot pressing with type 1 structural glue, as per ASTM-D5456-93 (LVL FSC), including 22mm piece of hardwood, matched with faces, for a total width of 107mm.
 - .3 Top and Bottom Rails: 3mm thick veneer, longitudinally laminated by hot pressing with type 1 structural glue, as per ASTM-D5456-93 (LVL FSC), or laminated strand lumber (LSL) for a total width of 85mm.
 - .4 Faces: Oak Veneer, Rift Cut (choice of face veneers, 2 ply plywood), hardboard panel or plastic laminate glued to composite cross-band.
 - .5 Door to be prepared for hardware noted in Section 08 71 02.
 - .6 Edges: Square
 - .2 Adhesive: Type 1 PVA (waterproof).
 - .3 Warranty: lifetime
 - .4 STC Rating: As specified and scheduled.

2.2 FABRICATION

- .1 Fabricate non-rated doors in accordance with AWMAC Premium Grade Quality Standards requirements
- .2 Provide lock blocks for hardware reinforcement.
- .3 Vertical Exposed Edge of Stiles/Vertical edge strips: Hardwood to match face veneer in texture.
- .4 Fit door edge trim to edge of stiles after applying veneer facing.
- .5 Bond edge banding to cores.
- .6 Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.
- .7 Factory fit doors for frame opening dimensions identified on shop drawings.
- .8 Provide edge clearances in accordance with AWMAC Premium Quality Standard.
- .9 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.

2.3 FRAMES

- .1 Fabricate frames in accordance with CSDMA specifications.

- .2 Manufacture frames to STC rating as specified in schedule, measured in accordance with ASTM E90.
- .3 Fabricate frames to profiles and maximum face sizes as indicated.
- .4 Interior Frames: 1.6 mm (16 gauge) thick base metal thickness.
 - .1 Welded type construction.
 - .2 Fire rated Frames: Refer to Drawings and Schedules.
- .5 Mortised, blanked, reinforced, drilled and tapped for templated hardware, in accordance with templates provided by hardware supplier.
- .6 Prepare frames for silencers. Provide three (3) single silencers for single doors and mullions of double doors on strike side. Provide two (2) single silencers on frame head at double doors without mullions.
- .7 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

2.4 FRAME ANCHORAGE

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

2.5 ACCESSORIES

- .1 Door Hardware: Specified in Section 08 71 02
- .2 Threshold: Smooth and flush to provide seal for door in closed position.
- .3 Perimeter and bottom acoustic seals: As provided or recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

- .1 Verify that opening sizes and tolerances are acceptable.

- .2 Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.3 INSTALLATION

- .1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.
- .2 Install labelled fire rated doors to NFPA 80.
- .3 Install doors and hardware in accordance with manufacturer's printed instructions and CAN/CSA-O132.2 Series, Appendix A.
- .4 Adjust hardware for correct function.
- .5 Install non-rated doors in accordance with AWMAC Premium Grade Quality Standards requirements.
- .6 Trim non-rated door width by cutting equally on both jamb edges.
- .7 Trim door height by cutting bottom edges to a maximum of 19 mm.
- .8 Machine cut for hardware.
- .9 Coordinate installation of doors with installation of frames specified with hardware specified in Section 08 71 00.
- .10 Set frames plumb, square, level and at correct elevation.
- .11 Secure anchorages and connections to adjacent construction.
- .12 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .13 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .14 Caulk perimeter of frames between frame and adjacent material.

3.4 ADJUSTMENT

- .1 Adjust door for smooth and balanced door movement.
- .2 Adjust closer for full closure.
- .3 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

3.5 CLEANING

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.

- .2 Remove traces of primer, caulking; clean doors and frames.
- .3 Clean glass and glazing materials with approved non-abrasive cleaner.
- .4 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CAN4-S104-M80(R1985) - Method for Fire Tests of Door Assemblies.
- .2 CAN/ULC-S132-2007 - Emergency Exit and Emergency Fire Exit Hardware.
- .3 CSDMA (Canadian Steel Door Manufacturers Association).
- .4 DHI (Door and Hardware Institute Canada) - AHC and EHC certification programs.
- .5 DHI (Door Hardware Institute) - A115 series.
- .6 DHI (Door Hardware Institute) - WDHS.3 - Hardware Locations for Wood Flush Doors.
- .7 BHMA (Builders Hardware Manufacturers Association) - A156 series.
- .8 NFPA 80 - Fire Doors, Fire Windows.
- .9 NFPA 252 - Fire Tests of Door Assemblies (2008 Edition).
- .10 UL 10B - Fire Tests of Door Assemblies.
- .11 UL 305 - Panic Hardware.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Coordination: Coordinate with other work having a direct bearing on work of this section.
 - .1 Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
 - .2 Coordinate keying requirements during the course of the Work. Refer to item 2.3.
- .2 Sequencing: Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- .3 Submit in accordance with Section 01 33 00: Submittal Procedures.
- .4 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .5 Hardware List:
 - .1 Submit contract hardware list.

- .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .6 Shop Drawings:
 - .1 Indicate locations and mounting heights of each type of hardware, schedules, catalogue cuts, electrical characteristics and connection requirements, including make, model, material, function, finish, and all other pertinent information for each door or pair of doors. Use standard typed hardware list. "Horizontal" list not permitted.
- .7 Samples:
 - .1 Submit one (1) sample of each type hardware specified, when requested by Contract Administrator illustrating style, colour, and finish.
 - .2 Identify each sample by label indicating applicable specification paragraph number, finish, and hardware package number.

1.3 CLOSEOUT SUBMITTALS

- .1 Section 01 78 00: Closeout Procedures.
- .2 Operation and Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- .3 Provide maintenance data, parts list, and manufacturer's instructions for each type door closers, locksets, door holders, and panic hardware for incorporation into maintenance manual.
- .4 Brief maintenance staff regarding proper care of hardware such as lubrication of locksets, adjustments of door closers, cleaning, and general maintenance.
- .5 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- .6 Record Documentation:
 - .1 Record actual locations of installed cylinders and their master key code.
 - .2 Keys: Deliver with identifying tags directly to Departmental Representative.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Tools:
 - .1 Provide special wrenches and tools applicable to each different or special hardware component.
 - .2 Provide maintenance tools and accessories supplied by hardware component manufacturer.

1.5 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.

- .2 Perform Work to the following requirements:
 - .1 BHMA A156 series.
 - .2 DHI - A115 series.
 - .3 DHI - WDHS.3.
 - .4 CSDMA.
 - .5 NFPA 252.
 - .6 UL 10B.
 - .7 UL 305.
 - .8 ULC S132.
 - .9 CAN4-S104.
- .3 Use ULC listed and labeled hardware for doors in fire separations and exit doors.
- .4 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.
- .5 Installer Qualifications: Company specializing in performing the work of this section and have experience in this size and type of project.
- .6 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for Products requiring electrical connection. Listed and classified by ULC as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND PROTECTION

- .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 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect door hardware from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.8 COORDINATION MEETING

- .1 Prior to the installation of door hardware or wiring of electric locksets, Contractor to arrange for a meeting with the Departmental Representative,

Building Security Officer, Electrical Contractor, Hardware Consultant and Door Hardware Supplier to review functions of electrically controlled door hardware.

Part 2 Products

2.1 SUPPLIERS

- .1 Acceptable Suppliers: As indicated in Hardware Schedule.

2.2 MANUFACTURERS

- .1 Acceptable Manufacturers: As indicated in Hardware Schedule.

2.3 KEYING

- .1 Supplier and Contractor to coordinate keying with Departmental Representative's existing keying system. Hierarchy of sub-keys can be coordinated with Departmental Representative to suit tenants needs, provided that they are keyed to master system.

2.4 FINISHES

- .1 Finishes: As indicated in Hardware Schedule.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that doors and frames are ready to receive work and dimensions are as indicated on Shop Drawings.
- .2 Verify that electric power is available to power operated devices and is of the correct characteristics.

3.2 INSTALLATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).

- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .6 Install key control cabinet.
- .7 Use only manufacturer's supplied fasteners.
 - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .8 Mounting heights for hardware from finished floor to centre line of hardware item.

3.3 ADJUSTING

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

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 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
 - .3 Remove protective material from hardware items where present.
 - .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.5 PROTECTION OF FINISHED WORK

- .1 Do not permit adjacent work to damage hardware or finish.
- .2 Repair damage to adjacent materials caused by door hardware installation.

3.6 SCHEDULES

- .1 Refer to Door Hardware Schedule.

END OF SECTION

DOOR						FRAME		FIRE RATING	HARDWARE GROUP	REMARKS
NO.	NOM.SIZE	TYPE	MAT.	FIN.	GLS.	MAT.	FIN.			
D300	915 x 2133 x 45	5	SWC	OV	6mm	PS	PT	45	1	1, 2, 3, 5, 6, 8, 10
D301	915 x 2133 x 45	1A	PS/TL	PT	6mm	PS	PT	N/A	2	1, 7
D302	915 x 2133 x 45	1B	PS/TL	PT	6mm	PS	PT	N/A	2	1, 7
D303	(2) x 760 x 2133 x 45	4	HWC	OV	-	PS	PT	N/A	3	5, 9
D304	915 x 2133 x 45	3A	PS/TL	PT	8mm	PS	PT	N/A	4	1, 3, 4, 7, 10
D310	915 x 2133 x 45	3B	PS/TL	PT	6mm	PS	PT	N/A	2	1, 7
D312	915 x 2133 x 45	2	SWC	OV	-	PS	PT	N/A	5	1, 3, 4, 5, 10
D313	915 x 2133 x 45	2	SWC	OV	-	PS	PT	N/A	6	1, 5
D332	915 x 2133 x 45	1C	PS/TL	PT	6mm	PS	PT	N/A	7	1, 7
D336	915 x 2133 x 45	2	SWC	OV	-	PS	PT	N/A	8	1, 2, 3, 5, 10
D337	915 x 2133 x 45	5	SWC	OV	6mm	PS	PT	45	9	1, 2, 3, 5, 6, 8, 10

REMARKS:

- 1 Sound Seal
- 2 Automatic Door Operator
- 3 Card Reader, Electric Strike & Door Contact
- 4 GAC to provide signage to be installed on outside face of door
- 5 Oak Veneer door with clear polyurethane finish
- 6 Glass Transom Window
- 7 Window Film to be provided on inside face of glass
- 8 Window Film to be provided on both sides of glass
- 9 Wood By-Pass Door with Perforated Metal Insert
- 10 Request to Exit Motion Sensor

ABBREVIATIONS:

- CL Clear Polyurethane Finish
- EXST Existing
- HM Hollow Metal
- TL Tempered Glass
- PT Paint
- SWC Solid Wood Core
- HWC Hollow Wood Core
- PS Pressed Steel
- OV Oak Veneer

Hardware Sets

Set: 1.0

3 Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4"	US26D	MK
1 Hotel Lock	ML2029 NSA LC	626	RU
1 Mortise Cylinder	Medeco to Suit (Supplied by Owner)	626	MC
1 Electric Strike	1006-LBM	630	HS
1 Electric Strike Faceplate	HM	630	HS
1 Strike Latch Guard	150		HS
1 Automatic Opener	6331	689	NO
1 Kick Plate	K1050 8"	US32D	RO
1 Wall Stop	406	US32D	RO
1 Gasketing	S88BL		PE
1 Door Bottom	4131CRL		PE
1 Door Contact	By Security/Electrical Division		OT
1 Full Height Actuator	639		NO
1 Video Intercom	By Security/Electrical Division		OT
1 Card Reader	By Security/Electrical Division		00
1 Request to Exit Sensor	By Security/ Electrical Division		OT
1 Power Supply	By Security/Electrical Division		OT

Notes: Actuator for use on push side of door only. Outside lever always rigid/locked. Swiping valid card or signal from entry system will release the electric strike and power open the door. Swiping the inside actuator will also release the electric strike and power open the door. Door will not open when deadbolt is thrown. Free egress at all times by turning inside lever.

Set: 2.0

3 Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4"	US26D	MK
1 Dormitory Lock	ML2065 NSA LC	626	RU
1 Mortise Cylinder	Medeco to Suit (Supplied by Owner)	626	MC
1 Floor Stop	441H	US26D	RO
1 Gasketing	S88BL		PE
1 Door Bottom	4131CRL		PE

Set: 3.0

1 Sliding Door Hardware	HBP200A		PE
1 Fascia	F134C		PE
2 Flush Pull	95B	US26D	RO

Set: 4.0

3 Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4"	US26D	MK
1 Storeroom Lock	ML2057 NSA LC	626	RU
1 Mortise Cylinder	Medeco to Suit (Supplied by Owner)	626	MC
1 Strike Latch Guard	150		HS
1 Electric Strike	1500C-LM	630	HS
1 Surface Closer	1431 P9	EN	SA
1 Wall Stop	406	US32D	RO
1 Gasketing	S88BL		PE
1 Door Bottom	4131CRL		PE
1 Door Contact	By Security/Electrical Division		OT
1 Card Reader	By Security/Electrical Division		00
1 Request to Exit Sensor	By Security/ Electrical Division		OT
1 Power Supply	By Security/Electrical Division		OT

Notes: Outside lever always rigid/locked. Swiping valid card will release the electric strike. Free egress at all times by turning inside lever. Install strike as fail safe. Electric strike to release on fire alarm signal.

Set: 5.0

3 Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4"	US26D	MK
1 Hotel Lock	ML2029 NSA LC	626	RU
1 Mortise Cylinder	Medeco to Suit (Supplied by Owner)	626	MC
1 Electric Strike	1006-LBM	630	HS
1 Electric Strike Faceplate	HM	630	HS
1 Surface Closer	1431 O	EN	SA
1 Kick Plate	K1050 8"	US32D	RO
1 Wall Stop	406	US32D	RO
1 Gasketing	S88BL		PE
1 Door Bottom	4131CRL		PE
1 Door Contact	By Security/Electrical Division		OT

1 Card Reader	By Security/Electrical Division	00
1 Request to Exit Sensor	By Security/ Electrical Division	OT
1 Power Supply	By Security/Electrical Division	OT

Notes: Outside lever always rigid/locked. Swiping valid card will release the electric strike. Door will not open when deadbolt is thrown. Free egress at all times by turning inside lever.

Set: 6.0

3 Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4"	US26D	MK
1 Hotel Lock	ML2029 NSA LC	626	RU
1 Mortise Cylinder	Medeco to Suit (Supplied by Owner)	626	MC
1 Surface Closer	1431 O	EN	SA
1 Kick Plate	K1050 8"	US32D	RO
1 Wall Stop	406	US32D	RO
1 Gasketing	S88BL		PE
1 Door Bottom	4131CRL		PE

Notes: Outside lever always rigid/locked. Free egress at all times by turning inside lever.

Set: 7.0

3 Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4"	US26D	MK
1 Storeroom Lock	ML2057 NSA LC	626	RU
1 Mortise Cylinder	Medeco to Suit (Supplied by Owner)	626	MC
1 Wall Stop	406	US32D	RO
1 Gasketing	S88BL		PE
1 Door Bottom	4131CRL		PE

Set: 8.0

3 Hinge, Full Mortise	TA2714 NRP 4-1/2" x 4"	US26D	MK
1 Hotel Lock	ML2029 NSA LC	626	RU
1 Mortise Cylinder	Medeco to Suit (Supplied by Owner)	626	MC
1 Electric Strike	1006-LBM	630	HS
1 Electric Strike Faceplate	HM	630	HS
1 Strike Latch Guard	150		HS
1 Automatic Opener	6331	689	NO
1 Kick Plate	K1050 8"	US32D	RO

1 Wall Stop	406	US32D	RO
1 Gasketing	S88BL		PE
1 Door Bottom	4131CRL		PE
1 Door Contact	By Security/Electrical Division		OT
2 Full Height Actuator	639		NO
1 Card Reader	By Security/Electrical Division		00
1 Request to Exit Sensor	By Security/ Electrical Division		OT
1 Power Supply	By Security/Electrical Division		OT

Notes: Outside lever always rigid/locked. Swiping valid card will release the electric strike and enable the pull side actuator, which will power open the door when pressed. Swiping the inside actuator will always release the electric strike and power open the door. Door will not open when deadbolt is thrown. Free egress at all times by turning inside lever.

Set: 9.0

3 Hinges, Full Mortise	TA2714 NRP 4-1/2" x 4"	US26D	MK
1 Hotel Lock	ML2029 NSA LC	626	RU
1 Mortise Cylinder	Medeco to Suit (Supplied by Owner)	626	MC
1 Electric Strike	1006-LBM	630	HS
1 Electric Strike Faceplate	HM	630	HS
1 Automatic Opener	6311	689	NO
1 Kick Plate	K1050 8"	US32D	RO
1 Wall Stop	406	US32D	RO
1 Gasketing	S88BL		PE
1 Door Bottom	4131CRL		PE
1 Door Contact	By Security/Electrical Division		OT
2 Full Height Actuator	639		NO
1 Card Reader	By Security/ Electrical Division		00
1 Request to Exit Sensor	By Security/ Electrical Division		OT
1 Power Supply	By Security/ Electrical Division		OT

Notes: Outside lever always rigid/locked. Swiping valid card will release the electric strike and enable the push side actuator, which will power open the door when pressed. Swiping the inside actuator will always release the electric strike and power open the door. Door will not open when deadbolt is thrown. Free egress at all times by turning inside lever.

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C542-05, Standard Specification for Lock-Strip Gaskets.
 - .2 ASTM D790-10, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - .3 ASTM D1003-13, Standard Test Method for Haze and Luminous Transmittance of Plastics.
 - .4 ASTM D1929-13a, Standard Test Method for Determining Ignition Temperature of Plastics.
 - .5 ASTM D2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
 - .6 ASTM E84-10, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .7 ASTM F1233-08, Standard Test Method for Security Glazing Materials and Systems.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
 - .2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.
 - .3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
 - .4 CAN/CGSB-12.4-M91, Heat Absorbing Glass.
 - .5 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.
 - .6 CAN/CGSB-12.8-97, Insulating Glass Units.
 - .7 CAN/CGSB-12.8-97 (Amendment), Insulating Glass Units.
 - .8 CAN/CGSB-12.9-M91, Spandrel Glass.
 - .9 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.
 - .10 CAN/CGSB-12.11-M90, Wired Safety Glass.
 - .11 CAN/CGSB-12.12-M90, Plastic Safety Glazing Sheets.
 - .12 CAN/CGSB-12.13-M91, Patterned Glass.
- .3 Environmental Choice Program (ECP)
 - .1 CCD-045-95, Sealants and Caulking Compounds.
- .4 Glass Association of North American (GANA)
 - .1 GANA Glazing Manual.
 - .2 GANA Laminated Glazing Reference Manual - 2009.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting prior to beginning work of this Section with Departmental Representative.
 - .1 Verify project requirements.

- .2 Review installation and substrate conditions.
- .3 Co-ordination with other building subtrades.
- .4 Review manufacturer's written installation instructions and warranty requirements.
- .2 Arrange for site visit with Departmental Representative prior to start of Work to examine existing site conditions adjacent to demolition Work.
- .3 Ensure key personnel attend.

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 glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
- .4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

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 glazing for incorporation into manual.

1.5 QUALITY ASSURANCE

- .1 Certificates: 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 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect glazing from nicks, scratches, and blemishes.
- .3 Protect prefinished aluminum surfaces with wrapping.
- .4 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Flat Glass:
 - .1 Float glass: to CAN/CGSB-12.3, glazing quality, 6 mm thick.
 - .2 Sheet glass: to CAN/CGSB-12.2, AA-special selected, 6 mm thick or as required.
- .2 Door Sidelites
 - .1 6mm tempered glass
- .3 Safety Glass (Door Type 3A & 5)
 - .1 8mm tempered glass
 - .2 Fastened on Operational Zone side of door
- .4 Sealant: in accordance with Section 07 92 00 - Joint Sealants
 - .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
 - .1 Ensure sealant does not contain chemical restrictions to CCD-045.

2.2 ACCESSORIES

- .1 Setting blocks: neoprene 80-90 Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.
- .2 Spacer shims: neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.
- .3 Glazing tape:
 - .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; to required size; black colour.
 - .2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25 %, to effect an air and vapour seal; to suitable size.
- .4 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot, colour from manufactures as selected.
- .5 Glazing clips: manufacturer's standard type.
- .6 Lock-strip gaskets: to ASTM C542.
- .7 Plastic Decorative/Privacy Glazing Film:

- .1 Flexible polyester, low gloss, non-reflective adhesive film. Etched effect, 90% opacity.
 - .1 Refer to Elevations on ID02 for glazing film design.
 - .2 Installation: Installed on the Meeting Room/ Office side of the glass.
- .2 Flexible polyester, etched effect, with pressure sensitive adhesive. Confirm pattern: Falling Leaf Pattern with Departmental Representative
 - .1 Refer to Elevations on ID02 for glazing film design.
 - .2 Installation: Installed on the Operational Zone side of the door.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
 - .1 Verify that openings for glazing are correctly sized and within tolerance.
 - .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
 - .3 Visually inspect substrate in presence of Departmental Representative.
 - .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION: INTERIOR - DRY METHOD (TAPE AND TAPE)

- .1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.
- .2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.
- .3 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.
- .4 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.

- .5 Place glazing tape on free perimeter of glazing in same manner described.
- .6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- .7 Knife trim protruding tape.

3.4 INSTALLATION: INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

- .1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.
- .2 Cut glazing tape to length and install against permanent stops, projecting 1.6 mm above sight line.
- .3 Place setting blocks at 1/4points, with edge block maximum 150 mm from corners.
- .4 Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of light or unit.
- .5 Install removable stops, with spacer shims inserted between glazing and applied stops at 600 mm intervals, 6 mm below sight line.
- .6 Fill gaps between light and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.
- .7 Trim protruding tape edge.

3.5 INSTALLATION: INTERIOR - WET METHOD COMPOUND AND COMPOUND

- .1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.
- .2 Install glazing resting on setting blocks. Install applied stop and centre light by use of spacer shims at 600 mm centres, 6 mm below sight line.
- .3 Locate and secure glazing light using spring wire clips or glazers' clips.
- .4 Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.6 INSTALLATION: PLASTIC FILM

- .1 Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.
- .2 Place without air bubbles, creases or visible distortion.
- .3 Fit tight to glass perimeter with razor cut edge.

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.
 - .1 Remove traces of primer, caulking.
 - .2 Remove glazing materials from finish surfaces.
 - .3 Remove labels.
 - .4 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.8 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 After installation, mark each light with an "X" by using removable plastic tape or paste.
 - .1 Do not mark heat absorbing or reflective glass units.
- .3 Repair damage to adjacent materials caused by glazing installation.

3.9 SCHEDULE

- .1 Interior doors, sidelights and transoms: 6mm tempered glass.
- .2 Interior doors and sidelights penetrating fire-rated walls: 6mm wired glass.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C1396/C1396M-09a, Standard Specification for Gypsum Wallboard.
 - .2 ASTM C475/C475M-02(2007), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .3 ASTM C514-04 (2009)e1, Standard Specification for Nails for the Application of Gypsum Board.
 - .4 ASTM C645-09a, Standard Specification for Nonstructural Steel Framing Members.
 - .5 ASTM C754-09a, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - .6 ASTM C840-08, Standard Specification for Application and Finishing of Gypsum Board.
 - .7 ASTM C954-10, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.84 mm to 2.84 mm in Thickness.
 - .8 ASTM C1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .9 ASTM C1047-10, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .10 ASTM C1178/C1178M-08, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
 - .11 ASTM A627-03: *Standard Test Methods for Tool-Resisting Steel Bars, Flats, and Shapes for Detention and Correctional facilities*
 - .12 ASTM F1267-07: *Standard Specification for Metal Expanded Steel*
 - .13 CAN/CGSB-1.60: *Interior Alkyd Gloss Enamel Paint*
 - .14 EMMA 557-99: *Standard for Expanded Metal, Introduction, Product Selection Considerations, Terminology, Manufacturing Process, Manufacturing Tolerances and Applications.*
 - .15
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .3 Gypsum Association Trade Organizations
 - .1 GA-214, Recommended Levels of Gypsum Board Finish

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 gypsum, framing, sealants 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 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 indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store materials inside, level, under cover. Protect from weather, damage from construction operations and other causes, in accordance with manufacturer's printed instructions.
 - .3 Handle materials to prevent damage to edges or surfaces. Protect metal accessories and trim from being bent or damaged.
 - .4 Store and protect [partition materials] from [nicks, scratches, and blemishes].
 - .5 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Performance / Design Criteria:
 - .1 Partition assembly to be non-combustible construction & fire resistance rated (where noted on Drawings).
 - .2 Minimum sound transmission class rating (STC) of installed panel partitions to be as indicated on Drawings, tested to ASTM E90.
- .2 Non-structural Metal Framing:
 - .1 Non-load bearing channel stud framing: to ASTM C645, stud size as noted on Drawings, roll formed from 0.53 mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centres.
 - .2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32 mm flange height.
 - .3 Metal channel stiffener: 19 x 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.
- .3 Gypsum Board:
 - .1 Standard board: to ASTM C1396/C1396M, 16mm, Type X as shown on Drawings. 1200 mm wide x maximum practical length, ends square cut, edges tapered.
 - .2 Glass mat water-resistant gypsum backing board: to ASTM C1178/C1178M, thickness as noted on Drawings, 1200 mm wide x maximum practical length.
 - .3 Metal furring runners, hangers, tie wires, inserts, and anchors.
 - .4 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.

- .5 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, PVC, Zinc, or zinc-coated by hot-dip process / zinc-coated by electrolytic process, 0.5 mm base thickness, perforated flanges, one piece length per location.
- .6 Flattened Metal Mesh, to EMMA 557-99, Style 19mm-9F: nominal strand thickness of (3mm), diamond opening of (12.7mm – 42.6mm). Mesh to be fastened on attack side of steel studs (unless otherwise noted); with 3/16" steel rivets and "fender" washer at 200mm on centre.
 - .1 Pictures of each layer of the wall as construction progresses will have to be provided to Global Affairs Canada, Domestic Security Unit for approval prior to the drywall being installed. The drywall must not be installed over the steel security mesh until written approval is received from the Domestic Security Unit.
- .7 Metal Strapping, #20 gauge to be fastened with self-tapping sheet metal screws at each stud horizontally and at least every 600mm o/c vertically; all sections of steel mesh are to overlap at least 100mm at each joint.
 - .2 Pictures of each layer of the wall as construction progresses will have to be provided to Global Affairs Canada, Domestic Security Unit for approval prior to the drywall being installed. The drywall must not be installed over the steel security mesh until written approval is received from the Domestic Security Unit.

2.2 ACCESSORIES

- .1 Acoustical insulation: Refer to Section 07 21 16.
- .2 Sealants: in accordance with Section 07 92 00 - Joint Sealants to ASTM C475.
- .3 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.

Part 3 Execution

3.1 EXAMINATION

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

3.2 ERECTION OF FRAMING

- .1 Install steel framing members to receive screw-attached gypsum board in accordance with ASTM C754 except where specified otherwise.

- .2 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.
- .3 Place studs vertically at 400 mm on centre and maximum of 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .4 Erect metal studding to tolerance of 1:1000.
- .5 Place two (2) beads of acoustic sealant between runners and substrate to achieve an acoustic seal.
- .6 Place one (1) beads of acoustic sealant between studs and adjacent vertical surfaces to achieve an acoustic seal.
- .7 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .8 Include two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .9 Install heavy gauge single jamb studs at openings.
- .10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .11 Include 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .12 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .13 Extend partitions to ceiling height except where indicated.
- .14 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use double track slip joint.
- .15 Blocking: Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, opening frames, and all other wall mounted installations.
 - .1 Secure wood blocking to studs.
- .16 Blocking: To support installation of metal security mesh
 - .1 Secure wood blocking to studs.
- .17 Refer to Drawings for indication of partitions extending to finished ceiling only and for partitions extending through the ceiling to the structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
- .18 Coordinate placement of insulation in stud spaces after stud frame erection.

3.3 ERECTION OF SECURE DEMISING WALL (SDW) FRAMING – WALL TYPES W3a & W3b – G13-02

- .1 Install steel mesh on walls where indicated on Drawings. Section 05 50 00 to supply mesh for installation by this Section.

- .2 Install steel framing members to receive screw-attached gypsum board in accordance with ASTM C754 except where specified otherwise.
- .3 Align partition tracks at floor and ceiling and secure at 300 mm on centre maximum. Install using expanding or double expanding mechanical fasteners. Non-expanding fasteners (i.e. "Tapcon") is not acceptable. Ensure no embedded conduits are in slab prior to any fastener installation.
- .4 Space studs at 300mm on centre and secure to the top and bottom tracks with welds or rivets (not screws).
- .5 Install double studs at door jambs. Install door frame as per HMMA 840-07, Parts 3A, B, C, D and E, except that screws shall be replaced with steel rivets.
- .6 Install anti-spread bracing approximately 1200mm from bottom of wall between the door frame double stud and the adjacent stud on both sides of frame.
- .7 Construct wall corners with double studs.
- .8 Erect metal studding to tolerance of 1:1000.
- .9 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .10 Include two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .11 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with Departmental Representative's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .12 Include 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .13 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .14 Extend partitions to underside of structure unless noted otherwise.
- .15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use double track slip joint.
- .16 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .17 Install insulating strip under studs and tracks around perimeter of sound control partitions.

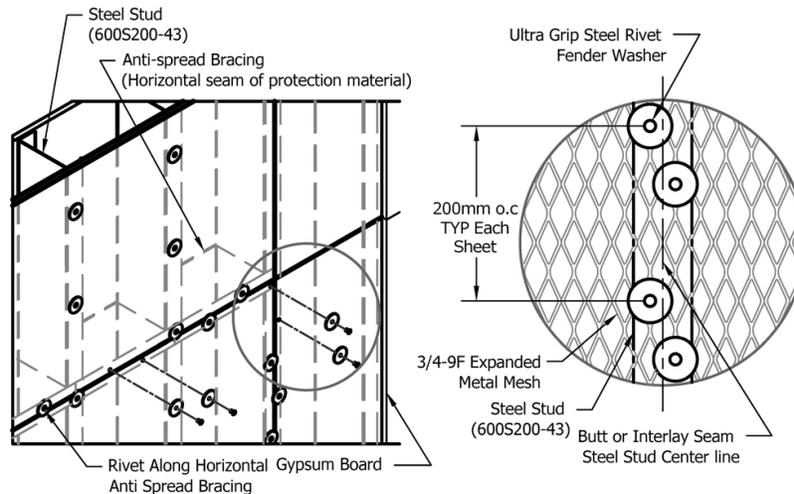
3.4 WALL FLATTENED METAL MESH INSTALLATION - G13-02

- .1 Install on metal mesh to steel studs to entire outside face of walls where indicated on Drawings. See below for fastening diagram.
- .2 Acceptable securement: 3/16" steel rivets and fender washers (1 1/2" O.D., 3/16" I.D.) at 200mm O.C.
 - .1 Standard of Acceptance:
 - .1 Rivets: Speaneur Part No. 301-440.

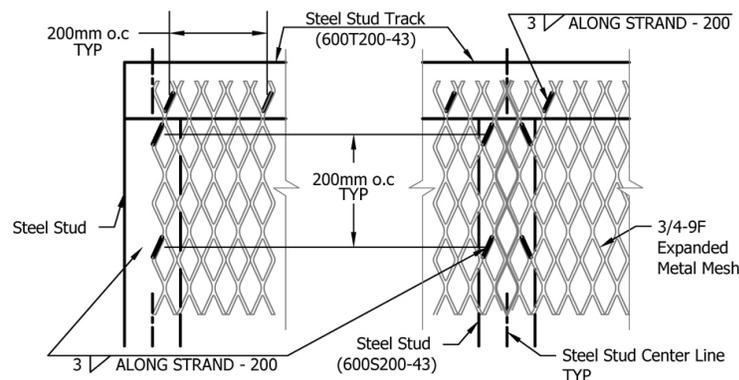
- .2 Washers: Fastenal Part No. 1133204
- .3 Include vertical wood blocking at 600mm O.C.
- .4 Note: Welding of metal mesh to steel studs is an acceptable alternative method of attachment.

3.4 WALL STEEL MESH ATTACHMENT DIAGRAMS - G13-02

- .1 Riveting attachment diagram:



- .2 Alternate welding attachment diagram:



3.5 ERECTION OF GYPSUM BOARD AND ACCESSORIES

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.
- .3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

- .4 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .5 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .6 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .7 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .8 Install acoustical insulation and sealant in sound rated partitions to correspond with tested assembly.
- .9 Install gypsum boards in direction that will minimize number of end-butt joints. Stagger end joints 250 mm minimum.

3.6 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
- .3 Apply water-resistant gypsum board where wall tiles or coating to be applied adjacent to slop sinks or in Janitors closets. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

3.7 EXISTING PLASTER REPAIR

- .1 Where existing plaster holes are being patched, fill any holes with gypsum board compound and towel to smooth surface. Refer to Asbestos Abatement Sections for precautions working with existing plaster finish.

3.8 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .6 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .7 Finish of Gypsum Board walls to be Level 4 or better in accordance with GA-214:

- .1 Finish corner beads, control joints and trim as required with three coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .2 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .3 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

3.9 CLEANING

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

3.10 PROTECTION

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

3.11 SCHEDULES

- .1 Refer to Wall Types on Drawings.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 Section 01 61 00 - Common Product Requirements
- .4 Section 01 78 00 - Closeout Submittals.
- .5 Section 02 41 99 - Demolition for Minor Works.
- .6 Section 05 50 00 - Metal Fabrications
- .7 Section 06 20 00 - Finish Carpentry.
- .8 Section 07 21 16 - Blanket Insulation.
- .9 Section 07 92 00 - Joint Sealing.
- .10 Section 08 11 00 - Metal Doors and Frames.
- .11 Section 09 21 16 - Gypsum Board Assemblies.
- .12 Section 09 51 99 - Acoustic Ceilings for Minor Works.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM C645-14, Specification for Nonstructural Steel Framing Members.
 - .2 ASTM C754-11, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.40-97, Primer, Structural Steel, Oil Alkyd Type.
- .3 Environmental Choice Program (ECP).
 - .1 CCD-047, Paints - Surface Coatings.
 - .2 CCD-048, Surface Coatings - Recycled Water-borne.

1.3 QUALITY ASSURANCE

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

- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

Part 2 Products

2.1 MATERIALS

- .1 Non-load bearing channel stud framing: to ASTM C645, 92 mm stud size or as required, roll formed from 0.53mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460mm centres.
- .2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32mm flange height.
- .3 Rigid structural support for gypsum wallboard assemblies to ASTM C 754:
 - .1 Furring Channel:
 - .1 Gauge: 18
 - .2 Size: 22mm or 38mm as required.
 - .2 Channel:
 - .3 Gauge: 16.
 - .4 Size: 19mm or 38mm as required.
- .1 Metal channel stiffener: 38mm x 13mm mm size, 1.4mm thick cold rolled steel, coated with rust inhibitive coating.
- .2 Wall Protection Material:
- .3 Acoustical sealant: to CAN/CGSB-19.21.
- .4 Insulating strip: rubberized, moisture resistant 3 mm thick cork or foam strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

Part 3 Execution

3.1 ERECTION

- .1 Align partition tracks at floor and ceiling and secure at 400mm on centre maximum.
- .2 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .3 Place studs vertically at 406mm on centre and not more than 50mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .4 Erect metal studding to tolerance of 1:1000.
- .5 Attach studs to bottom and ceiling track using screws.

- .6 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .7 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .9 Install heavy gauge single jamb studs at openings.
- .10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .12 Provide 40mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .13 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .14 Extend partitions to ceiling height except where noted otherwise on drawings.
- .15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 50mm leg ceiling tracks.
- .16 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .17 Install two continuous beads of acoustical sealant or insulating strip under studs and tracks around perimeter of sound control partitions.

3.2 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
 - .1 ANSI A108.1[99], Specification for the Installation of Ceramic Tile (Includes ANSI A108.1AC, 108.4.13, A118.1.10, ANSI A136.1).
 - .2 CTI A118.3[92], Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1).
 - .3 CTI A118.4[92], Specification for Latex Cement Mortar (included in ANSI A108.1).
 - .4 CTI A118.5[92], Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
 - .5 CTI A118.6[92], Specification for Ceramic Tile Grouts (included in ANSI A108.1).
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C144[04], Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C207[06], Specification for Hydrated Lime for Masonry Purposes.
 - .3 ASTM C847[06], Specification for Metal Lath.
 - .4 ASTM C979[05], Specification for Pigments for Integrally Coloured Concrete.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB51.34[M86(R1988)], Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CGSB 71GP22M[78(AMEND.)], Adhesive, Organic, for Installation of Ceramic Wall Tile.
 - .3 CAN/CGSB75.1[M88], Tile, Ceramic.
 - .4 CAN/CGSB25.20[95], Surface Sealer for Floors.
 - .5 CAN/CSAA3000[03(R2006)], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .4 Terrazzo Tile and Marble Association of Canada (TTMAC)
 - .1 Tile Specification Guide 09 30 00, Tile Installation Manual, latest edition.
 - .2 Tile Maintenance Guide, latest edition.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Provide product data in accordance with Section 01 33 00 Submittal Procedures.
 - .1 Include manufacturer's information on:

- .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Chemical resistant mortar and grout (Epoxy and Furan).
 - .3 Cementitious backer unit.
 - .4 Dryset cement mortar and grout.
 - .5 Divider strip.
 - .6 Elastomeric membrane and bond coat.
 - .7 Reinforcing tape.
 - .8 Levelling compound.
 - .9 Latex cement mortar and grout.
 - .10 Commercial cement grout.
 - .11 Organic adhesive.
 - .12 Waterproofing isolation membrane.
 - .13 Fasteners.
- .3 Provide samples in accordance with Section 01 33 00 Submittal Procedures.
- .1 Wall tile: submit 75mm x 150mm sample panel of each colour, texture, size, and pattern of tile.
 - .2 Adhere tile samples to 13 mm thick plywood and grout joints to represent project installation.

1.3 QUALITY ASSURANCE

- .1 Quality Assurance Submittals:
 - .1 Manufacturer's Instructions: manufacturer's installation instructions.
 - .2 Manufacturer's Field Reports: manufacturer's field reports specified.

1.4 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.

1.5 AMBIENT CONDITIONS

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C. for 48 hours before, during, and 48 hours after, installation.
- .2 Do not install tiles at temperatures less than 12 degrees C. or above 38 degrees C.
- .3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C. or above 25 degrees C.

1.6 MAINTENANCE

- .1 Extra Materials:

- .1 Provide maintenance materials in accordance with Section 01 78 00 Closeout Submittals.
- .2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.
- .3 Maintenance material same production run as installed material.

Part 2 Products

2.1 WALL TILE – KITCHEN BACK SPLASH

- .1 To CAN/CGSB75.1, Type 5, Class MR 4:
 - .1 Colour: Glossy White
 - .2 Pattern: Brick pattern as per elevation
 - .3 Size: 75mm x 150mm

2.2 THINSET MORTAR

- .1 Single component, high performance, polymer modified thin-set mortar, suitable for application.

2.3 GROUT

- .1 Grout: Epoxy
- .2 Colouring Pigments:
 - .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.
 - .2 Colouring pigments to be added to grout by manufacturer.
 - .3 Job coloured grout are not acceptable.
 - .4 Use in Commercial Cement Grout, DrySet Grout, and Latex Cement Grout.
 - .1 White, to be selected from manufacturer's standard range.

2.4 ACCESSORIES

- .1 Metal Trims:
 - .1 Standard of Acceptance:
 - .1 Top, bottom and sides of backsplash: Schluter Schiene, Satin anodized aluminium.
- .2 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.

2.5 CLEANING COMPOUNDS

- .1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and levelling compounds and elastomeric waterproofing membrane and coat.
- .2 Materials containing acid or caustic material are not acceptable.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual (latest edition), "Ceramic Tile", except where specified otherwise.
- .2 Install mortar build up over existing concrete to slopes indicated on Drawing.
- .3 Site verify condition of the existing concrete slab substrate prior to the commencement of work. Commencement of work will be understood to be acceptance of the existing concrete substrate condition.
- .4 Apply tile or backing coats to clean and sound surfaces.
- .5 Fit tile around corners and other built in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .6 Maximum surface tolerance 1:800.
- .7 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .8 Sound tiles after setting and replace hollow sounding units to obtain full bond.
- .9 Use metal trims at termination of wall tile panels.
- .10 Allow minimum 24 hours after installation of tiles, before grouting.
- .11 Clean installed tile surfaces after installation and grouting cured.

3.3 WALL TILE

- .1 Install in accordance with TTMAC details.

3.4 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCES

1. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation
2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
3. ASTM E1111/E1111M - Standard Test Method for Measuring the Interzone Attenuation of Open Office Components
4. ASTM E1414/E1414M - Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 DELIVERY, STORAGE AND HANDLING

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

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove and recycle waste materials to appropriate facilities.

Part 2 Products

2.1 MATERIAL

1. Plenum Barrier Board Insulation: Stone wool insulation, Plenum Barrier Board (W2 Wall Type):
 1. Size: 610mm x 1220mm.
 2. Thickness: 38mm
 3. Facing: Aluminum foil with fiber reinforcement.
 4. Warning Label: Printed in black ink on the facing shall be warning labels 101mm high by 101mm wide spaced 305mm in both directions with the words "Noise Barrier. Do not remove barrier or damage foil facing." Warning labels shall be oriented in all four directions in ninety-degree increments so legible from any edge of the board.
 5. Density: 8.0 lbs/cu ft (actual density).
 6. Fire Class: Class A.
 7. Fire Performance:
 - a. UL 723 (ASTM E84) Flame Spread / Smoke Developed: no greater than 25/50.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Refer to installation detail provided on drawing A01.

3.2 INSULATION INSTALLATION.

1. Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
2. Do not enclose insulation until it has been inspected and approved by Departmental Representative.
3. Site Tests and Inspections: Inspect around and between installed plenum barrier boards and around penetrating elements and fill openings with non-hardening acoustic sealant.

3.3 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C635/C635M-07, Standard Specifications for the 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.
 - .3 ASTM E1477-98a(2008), Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-2007, Standard Method of Test for Surface Burning Characteristics of Building Materials and 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 ceiling panels and ceiling suspension system and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS to Departmental Representative.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Submit reflected ceiling plans for special grid patterns as indicated.
 - .3 Indicate lay-out, hanger spacing and fastening details, splicing method for main and cross runners, change in level details, and acoustical unit support at ceiling fixture including lateral bracing and accessories.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate samples of each type acoustical units.

1.3 MAINTENANCE MATERIALS

- .1 Provide extra acoustical units in accordance with Section 01 78 00- Closeout Submittals.

- .2 Provide acoustical units amounting to 2 % of gross ceiling area for each pattern and type of acoustical tile, suspension system and trim required for project, minimum 1 complete factory-sealed package of each.
- .3 Ensure extra materials are from same production run as installed materials.
- .4 Deliver extra materials for each type of acoustical unit in original unopened packages clearly identified, including colour and texture.
- .5 Deliver to Departmental Representative upon completion of the work of this section.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: 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 materials inside, level, under cover. Protect from weather, damage from construction operations and other causes, in accordance with manufacturer's printed instructions.
 - .3 Handle materials to prevent damage to edges or surfaces. Protect metal accessories and trim from being bent or damaged.
 - .4 Store and protect acoustic ceiling materials from nicks, scratches, and blemishes.
 - .5 Replace defective or damaged materials with new.
- .1 Packaging Waste Management: remove and recycle waste materials to appropriate facilities.

Part 2 Products

2.1 MATERIALS

- .1 Acoustic Ceiling Tile Suspension System:
 - .1 Manufacturer: USG
 - .3 Grid: Donn Brand DX/DL
 - .4 Edge Profile: Square Lay-In
 - .5 Size: 15/16"
 - .5 Grid Finish: Flat White 050
- .2 Acoustic units for suspended ceiling system (ACT-1):
 - .1 Manufacturer: USG
 - .2 Style: Mars 88785
 - .3 Fire Rating: Class A
 - .4 Noise Reduction Coefficient (NRC) to ASTM C423: Minimum 0.75
 - .5 Ceiling Attenuation Class (CAC) rating to ASTM E1414/E1414M: Minimum 35.
 - .6 Light Reflectance (LR): 0.90
 - .7 Edge type: Shadowline Taper
 - .8 Colour: White.

- .9 Size: 610 x 1219 x 19 mm.
- .10 Surface coverings: Factory applied latex paint.
- .3 Acoustic units for suspended ceiling system (ACT-2):
 - .1 Manufacturer: USG
 - .2 Style: Mars High-NRC/High-CAC 89135
 - .3 Fire Rating: Class A
 - .4 Noise Reduction Coefficient (NRC) to ASTM C423: Minimum 0.85
 - .5 Ceiling Attenuation Class (CAC) rating to ASTM E1414/E1414M: Minimum 35.
 - .6 Light Reflectance (LR): 0.90
 - .7 Edge type: Shadowline Taper
 - .8 Colour: White.
 - .9 Size: 610 x 1219 x 19 mm.
 - .10 Surface coverings: Factory applied latex paint.
- .3 Adhesive: Low VOC type recommended by acoustic unit manufacturer.
- .4 Staples, nails and screws: To CSA B111 non-corrosive finish as recommended by acoustic unit manufacturer.
- .5 Hold down clips: Purpose made clips to secure tile to suspension system, approved for use in fire-rated systems.
- .6 Adhesives and mounting accessories as recommended by manufacturer.
- .7 Attachment devices: Size for five times design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.
- .8 Wire for hangers and ties: To ASTM A641/A641M, Class 1 zinc coating, soft annealed, with yield stress load at least 3 times design load, but not less than 12 gauge.
- .9 Touch-Up Paint: Type and colour to match acoustic and grid units.
- .10 Face Plate: Armstrong, Axiom unslotted face plate (AXTBC), 152mm wide, White

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions prior to acoustical ceiling installation.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Contract Administrator 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 Installation: in accordance with ASTM C636 except where specified otherwise.
- .2 Suspension System:
 - .1 Erect ceiling suspension system after work above ceiling has been inspected by Contract Administrator.
 - .2 Secure hangers to overhead structure using attachment methods acceptable to Contract Administrator.

- .3 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.
 - .4 Lay out centreline of ceiling both ways, to provide balanced borders at room perimeter as indicated on reflected ceiling plan.
 - .5 Install wall moulding to provide correct ceiling height.
 - .6 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, grilles and speakers.
 - .7 Support at light fixtures and diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
 - .8 Interlock cross member to main runner to provide rigid assembly.
 - .9 Ensure finished ceiling system is square with adjoining walls and level within 1:1000.
 - .10 Control relative humidity and temperature levels in accordance to manufacturer's recommendations prior to ceiling installation.
- .3 Acoustic Panels:
- .1 Install acoustical panels and tiles in ceiling suspension system.
 - .2 Co-ordinate ceiling work with work of other sections such as interior lighting, fire protection communication, and intrusion and detection systems.

3.3 CLEANING

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

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM F1303-[04], Standard Specification for Sheet Vinyl Floor Covering with Backing.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-[04], Architectural Coatings.
 - .2 SCAQMD Rule 1168-[05], Adhesives and Sealants Applications.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit duplicate 300 x 300 mm sample pieces of sheet material, 300 mm long base.
- .4 Closeout Submittals:
 - .1 Provide maintenance data for resilient flooring for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 DELIVERY, STORAGE AND HANDLING

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

1.4 AMBIENT CONDITIONS

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

1.5 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide extra materials of resilient sheet flooring and adhesives in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Provide minimum 10% extra of each colour, pattern and type flooring material required for project for maintenance use.
 - .3 Extra materials one piece and from same production run as installed materials.

- .4 Identify each roll of sheet flooring and each container of adhesive.
- .5 Deliver to Departmental Representative, upon completion of the work of this section.
- .6 Store where directed by Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Vinyl Plank (VP-1): 100% solid vinyl plank flooring
 - .1 Pattern: wood grain with embossed texture
 - .2 Edge: Bevelled
 - .3 Thickness: 5.0mm.
 - .4 Wear Layer: .50mm
 - .5 Colour: Grey tone
 - .6 Class (ASTM F1700): Class III, Type B
 - .7 Installation: Glue down
 - .8 Slip Resistance: R9
 - .9 Warranty: 15 year commercial
 - .10 Sound Transmission Class (ASTM E413): 67 STC
- .2 Static Dissipative Tile (SDT-1): static dissipative homogeneous floor covering in tile format.
 - .1 Pattern: abstract pattern with overall mottling
 - .2 Colour: Grey
 - .3 Thickness: 2mm
 - .4 Light Reflectance Value: 53%
 - .5 Size: 615mm x 615mm
 - .6 Electrostatic General Requirements (IEC 61340-4-1): Compliant
 - .7 Electrical Resistance (IEC 61340-4-1): $1 \times 10^6 \leq R \leq 10^8 \Omega$
 - .8 Body Voltage Generation, in combination with ESD control footwear
Typical value: $< 100 \text{ V} \sim 40 \text{ V}$
 - .9 Slip Resistance: R9
 - .10 Installation: Glue down
- .3 Resilient base (RB-1): continuous, top set, complete with premoulded end stops and external corners:
 - .11 Type: rubber.
 - .12 Height: to match existing
 - .13 Thickness: to match existing
 - .14 Length: Installers choice.
 - .15 Colour: to match existing
- .2 Base Accessories: Premoulded end stops and internal / external corners, of same material, size, and colour as base.

- .3 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.
 - .1 Rubber floor adhesives:
 - .1 Adhesive: maximum VOC limit 60 g/L.
 - .2 Cove base adhesives:
 - .1 Adhesive: maximum VOC limit 50 g/L
- .5 Subfloor filler and leveller: as recommended by flooring manufacturer for use with their product.
- .6 Wheeled Transition Strip (TR-1): Wheeled, rubber transition strip, smooth with lip to extend over floor finish, shoulder flush with top of adjacent floor finish. Ensure compliance with CSA B651-12 "Accessibility Design for the Built Environment".
 - .1 To be provided where Carpet Tile (CPT-1) transitions to Static Dissipative Tile (SDT-1).
 - .2 Profile: as selected from manufacturer's full range
 - .3 Colour: as selected from manufacturer's full range
- .7 Sealer: type recommended by flooring manufacturer.
 - .1 Sealant:
 - .1 Sealant: maximum VOC limit 50 g/L.
- .8 Wax: type recommended by flooring manufacturer.

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 SITE VERIFICATION OF CONDITIONS

- .1 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

3.3 PREPARATION

- .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 Prime existing concrete floor surface to resilient flooring manufacturer's printed instructions.

3.4 APPLICATION: FLOORING

- .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 occupation.
- .2 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring with seams parallel to building lines to produce a minimum number of seams. Border widths minimum 1/3 width of full material.
- .4 Heat weld seams of linoleum sheet flooring in accordance with manufacturer's printed instructions.
- .5 As installation progresses, roll flooring with 45 kg minimum roller to ensure full adhesion.
- .6 Cut flooring around fixed objects.
- .7 Install feature strips and floor markings where indicated. Fit joints tightly.
- .8 Install flooring in pan type floor access covers. Maintain floor pattern.
- .9 Continue flooring over areas which will be under built-in furniture.
- .10 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.
- .11 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.
- .12 Install metal edge strips at unprotected or exposed edges where flooring terminates.

3.5 APPLICATION: BASE

- .1 Lay out base to keep number of joints at minimum.
- .2 Clean substrate and prime with one coat of adhesive.
- .3 Apply adhesive to back of base.
- .4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.
- .5 Install straight and level to variation of 1:1000.
- .6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.

- .7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.
- .8 Use toeless type base where floor finish will be carpet, coved type elsewhere.
- .9 Install toeless type base before installation of carpet on floors.
- .10 Heat weld base in accordance with manufacturer's printed instructions.

3.6 FIELD QUALITY CONTROL

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

3.7 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Remove excess adhesive from floor, base and wall surfaces without damage.
- .3 Clean, seal and wax floor and base surface to flooring manufacturer's printed instructions.

3.8 PROTECTION

- .1 Protect new floors from time of final set of adhesive until final inspection.
- .2 Prohibit traffic on floor for 48hours after installation.
- .3 Use only water-based coating for linoleum.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Association of Textile Chemists and Colorists (AATCC)
 - .1 AATCC Test Method 16, Colorfastness to Light.
 - .2 AATCC Test Method 23, Colorfastness to Burn Gas Fumes.
 - .3 AATCC Test Method 129, Colourfastness to Ozone in the Atmosphere Under High Humidities.
 - .4 AATCC Test Method 134, Electrostatic Propensity of Carpets.
 - .5 AATCC Test Method 171, Carpets: Cleaning of; Hot Water Extraction Method.
 - .6 AATCC Test Method 175-, Stain Resistance: Pile Floor Coverings.
 - .7 AATCC Test Method 189, Fluorine Content of Carpet Fibers.
- .2 ASTM International
 - .1 ASTM D297-13, Standard Test Methods for Rubber Products-Chemical Analysis.
 - .2 ASTM D1335-12, Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings.
 - .3 ASTM D2661-11, Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
 - .4 ASTM D1667-05 (2011), Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
 - .5 ASTM D3574-11, Standard Test Methods for Flexible Cellular Materials -Slab, Bonded, and Molded Urethane Foams.
 - .6 ASTM D3936-12, Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 22-2004, Textile Test Methods -Colourfastness to Rubbing (Crocking).
 - .2 CAN/CGSB-4.2 No.27.6M-2004, Textile Test Methods -Flame Resistance -Methemine Tablet Test for Textile Floor Coverings.
 - .3 CAN/CGSB-4.2 No. 76-94 /ISO 2551: 1981, Textile Test Methods - Machine-Made Textile Floor Coverings - Determination of Dimensional Changes Due to the Effects of Varied Water and Heat Conditions.
 - .4 CAN/CGSB-4.2 No.77.1-94 /ISO 4919: 2000, Textile Test Methods - Carpets - Determination of Tuft Withdrawal Force.
 - .5 CAN/CGSB-4.129-93(R1997), Carpets for Commercial Use.
- .4 Carpet and Rug Institute (CRI)
 - .1 CRI Carpet Installation Standard 2011 .
 - .2 CRI Green Label Indoor Air Quality Testing Program.
 - .3 CRI Green Label Plus Indoor Air Quality Testing Program.
- .5 Environmental Choice Program (ECP)

- .1 CCD-152-2009, Flooring Products, Commercial Non-modular Textile Flooring.
- .6 Health Canada
 - .1 C.R.C., c.923-10, Hazardous Products Act - Carpet Regulations, Part II of Schedule 1.
- .7 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .8 National Floor Covering Association (NFCA)
 - .1 National Floor Covering Specification Manual 2007 .
- .9 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S102.2-07, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning on-site installation, with Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other construction subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.
- .2 Comply with manufacturer's written recommendations for sequencing and scheduling construction operations.

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 each carpet tile, adhesive, carpet protection, subfloor patching compound and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29 - 06 Health and Safety Requirements.
- .3 Shop Drawings:
 - .1 Information on shop drawings to indicate:
 - .1 Nap: direction, open edges, special patterns.
 - .2 Cutouts: show locations where cutouts are required.
 - .3 Edgings: show location of edge moldings and edge bindings.
- .4 Samples:

- .1 Submit for review and acceptance of each unit.
- .2 Samples will be returned for inclusion into work.
- .3 Submit duplicate samples of each type of carpet tile specified and duplicate tiles for each colour selected, and floor base.
- .5 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .6 Test and Evaluation Reports:
 - .1 Certified test reports showing compliance with specified performance characteristics and physical properties.
- .7 Manufacturer's Instructions: submit manufacturer's installation and storage instructions.
- .8 Manufacturers Reports:
 - .1 Manufacturer's Field Reports: submit manufacturer's written reports within [3] days of review, verifying compliance with specifications.
- .9 Qualification Statements:
 - .1 Compliance: to CAN/ULC-S102 and CAN/ULC-S102.2.
 - .2 Testing: passes testing requirements of:
 - .1 Green Label Plus Indoor Air Quality Testing Program.
 - .3 Tuft bind: meets requirements of CAN/CGSB-4.129 when tested to CAN/CGSB-4.2 No.77.1.

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 [installed products] for incorporation into manual.
- .3 Warranty Documentation: submit warranty documents specified.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra stock materials: deliver to Departmental Representative extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.
 - .1 Quantity: provide minimum 10% of:
 - .1 Carpet tile.
 - .2 Adhesives.
 - .2 Delivery, storage and protection: comply with Departmental Representative 's requirements for delivery and storage of extra materials.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Prequalification: compliance with Health Canada regulations under "Hazardous Products Act", Part II of Schedule 1, to CAN/CGSB-4.2 No. 27.6.

- .2 Qualifications:
 - .1 Manufacturer: capable of providing field service representation during construction and approving application method.
 - .2 Flooring Installer/Applicator/Contractor:
 - .1 Experienced in performing work of this Section who has specialized in installation of work similar to that required for this project.
 - .2 Certified by carpet manufacturer prior to bid submission.
 - .3 Must not sub-contract labour without written approval of Departmental Representative.
 - .4 Responsible for proper product installation, including floor testing and preparation as specified and in accordance with carpet manufacturer's written instructions.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - .3 Store and protect carpet tile and adhesive in original containers or wrapping with manufacturer's seals and labels intact.
 - .4 Store and protect carpet tile and accessories in location as directed by Departmental Representative.
 - .5 Store carpet and adhesive at minimum temperature of 18 degrees C and relative humidity of maximum 65% for minimum of 48 hours before installation.
 - .6 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness.
 - .7 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
 - .8 Replace defective or damaged materials with new.

1.8 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Moisture: ensure substrate is within moisture limits and alkalinity limits recommended by manufacturer.
 - .2 Temperature: maintain ambient temperature of not less than 18 degrees C from 48 hours before installation to at least 48 hours after completion of work.
 - .3 Relative humidity: maintain between 10% and 65% for 48 hours before, during and 48 hours after installation.

- .4 Ventilation:
 - .1 Departmental Representative will co-ordinate operation of ventilation system during installation of carpet. Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.
 - .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities. Provide fans equipped with HEPA filters.
 - .3 Provide continuous ventilation during and after carpet application. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of carpet installation.
- .5 Install carpet after space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete.

1.9 WARRANTY

- .1 Manufacturer's warranty: submit, for Departmental Representative's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and does not limit other rights Owner may have under Contract Documents.
- .2 Warranty period: 1 year, commencing on date of substantial performance of work.
 - .1 Warranty covers labour and repair or replacement of defective components for 1 year after date of substantial performance.

Part 2 Products

2.1 MATERIALS

- .1 Manufacturers:
 - .1 Ensure manufacturer has minimum 5 years experience in manufacturing components similar to or exceeding requirements of project.
- .2 Description:
 - .1 Adhesives: VOC limit 50 g/L maximum to SCAQMD Rule 1168 GS-36.
 - .2 Primer/Sealer: in accordance with manufacturer's recommendations for surface conditions:
 - .1 VOC limit: 100 g/L maximum to SCAQMD Rule 1113.

2.2 CARPET TILE

- .1 Carpet Tile: Multi-level pattern loop manufactured in one colour dye lot, conforming to the following criteria:
 - .1 Manufacturer: Shaw Contract
 - .2 Style: Bias Tile, Open Work 5T043
 - .3 Colour: Tinsmith 093555
 - .4 Fiber Type: Eco Solution Q Nylon
 - .5 Dye Method: 53% Solution Dyed / 47% Yard Dyed

- .6 Gauge: 1/10 inch. (39.4 per 10cm)
- .7 Finished Pile Thickness: 3.33 mm (0.131 inch)
- .8 Total Thickness: 6.63mm (0.26 inch)
- .9 Tufted Weight: (22 oz/sq yd).
- .10 Stitch Count: 10 per inch.
- .11 Primary Backing Material: Synthetic.
- .12 Secondary Backing Material: Ecoworx Tile.
- .13 Size: 610 x 610 mm (24" x 24" inches).
- .14 Installation Method: to match existing installation pattern

2.3 PERFORMANCE

- .1 Flammability: certified for flammability to Health Canada regulations under "Hazardous Products - Carpet Regulations", Part II of Schedule 1.
- .2 Flame Spread: maximum flame spread rating 300, maximum smoke developed classification 500, when tested to CAN/ULC-S102.2.
- .3 Smoke Development: 450 or less per ASTM E662.
- .4 Dry Breaking Strength: to ASTM D2661, minimum acceptable tear strength in both length and width:
 - .1 11.3 kg for carpets installed by glue down installation.
- .5 Wear: maximum 10% of pile face fibre by weight for 10 years.
- .6 Edge Ravel: none for 10 years.
- .7 Static Resistance: permanent static control to AATCC 134, 3000 V maximum at 20% RH and 22 degrees C.
- .8 Static Generation: less than 3.0kV per AATCC 134 for 10 years.
- .9 Tuft Bind: Tuft Lock: to ASTM D1335/CAN/CGSB-4.129, minimum acceptable 1.6 kilograms for cut pile product, 3.6 for loop pile product.
- .10 De-lamination of Secondary Backing: Lamination Strength of Secondary Backing: to ASTM D3936, minimum acceptable peel strength of 1.6kg/25 mm.
- .11 Stain resistance: to AATCC 175, 8.
- .12 Soil Resistance: 350 ppm fluorine minimum. Fluorine Durability Level to AATCC 189.
- .13 Colourfastness to light: to CAN/CGSB-4.2 No.18.3, AATCC 16.
- .14 Colourfastness to atmosphere: to AATCC 129 and AATCC 23.
- .15 Colourfastness to crocking: to CAN/CGSB-4.2 No. 22.
- .16 Indoor Air Quality Certification: certified to CRI Green Label Plus IAQ requirements.

2.4 ACCESSORIES

- .1 Base: Refer to Section 09 65 00 Resilient Flooring

Part 3 Execution

3.1 INSTALLERS

- .1 Use experienced and qualified technicians to carry out assembly and installation of tile carpet.

3.2 EXAMINATION

- .1 Examine conditions, substrates and work to receive work of this Section
- .2 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for carpet tile installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied.

3.3 PREPARATION

- .1 Subfloor Preparation:
 - .1 Inspect concrete and determine special care required to make it a suitable for carpet.
 - .2 Fill and level cracks 3 mm wide or protrusions over 0.8 mm with appropriate and compatible polymer fortified patching compound.
 - .3 Comply with manufacturer's written recommendations for maximum patch thickness.
 - .4 Prime large patch areas with compatible primer.
 - .5 Ensure concrete substrates are cured, clean and dry.
 - .6 Ensure concrete substrates are free of paint, dirt, grease, oil, curing or parting agents, and other contaminants, including sealers, that interfere with the bonding of adhesive.
 - .7 Where powdery or porous concrete surface is encountered, apply primer compatible with adhesive to provide a suitable surface for glue-down installation.
- .2 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations and co-ordinate.
 - .1 Prepare floor surfaces in accordance with CRI Carpet Installation Standard.
- .3 Tile Carpeting Preparation:
 - .1 Pre-condition carpeting following manufacturer's written instructions.
- .4 Demolition / Removal:
 - .1 Remove existing carpet tiles and turn over to Departmental Representative.
 - .2 Vacuum used carpet before removal.
 - .3 Remove used tiles and pack in container. Use effective packing techniques to maximize amount of material in container.

- .4 Sort only clean, dry carpet tiles for reclamation. Clean is defined as carpet free from demolition debris, asbestos contamination, garbage, knife blades and tack strips.

3.4 INSTALLATION

- .1 Install carpet tiles in accordance with manufacturer's written instructions, and CRI Carpet Installation Standard and co-ordinate with Section 01 73 00 - Execution.
- .2 Co-ordinate tile carpeting work with work of other trades, for proper time and sequence to avoid construction delays.
- .3 Snugly join carpet tiles in completed installation.
 - .1 Measure distance covered by 11 carpet tiles (10 joints) and ensure distance is in compliance with manufacturer specifications.
 - .2 Do not trap yarn between carpet tiles.
- .4 Apply thin film of pressure-sensitive adhesive according to manufacturer's recommendations.
- .5 Ensure finished installation presents smooth wearing surface free from conspicuous seams, burring and other faults.
- .6 Use material from same dye lot.
 - .1 Ensure colour, pattern and texture match within visual areas.
 - .2 Maintain constant pile direction.
- .7 Fit around architectural, mechanical, electrical and telephone outlets, and furniture fitments, around perimeter of rooms into recesses, and around projections.
- .8 Install carpet tiles smooth and free from bubbles, puckers, and other defects.
- .9 Protect exposed carpet tile edges at transition to other flooring materials with suitable transition strips.
- .10 Base Installation: Refer to Section 06 20 00 – Finish Carpentry

3.5 SITE QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Co-ordinate manufacturer's services with Section 01 45 00 - Quality Control. Have manufacturer review work involved in handling, installation / application, protection and cleaning of its product[s], and submit written reports, in acceptable format, to verify compliance of work with Contract.
 - .2 Manufacturer's field services: provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
 - .3 Schedule site visits:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.

- .4 Obtain reports within 3 days of review and submit immediately to Departmental Representative.

3.6 CLEANING

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

3.7 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Prohibit traffic on carpet for period of 24 hours minimum after installation and until adhesive is cured.
- .3 Install carpet protection to satisfaction of Departmental Representative.
- .4 Repair damage to adjacent materials caused by tile carpeting installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, latest edition.
 - .2 MPI - Maintenance Repainting Manual, latest edition.

1.2 SUBMITTALS

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

1.3 STORAGE AND HANDLING

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

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from Site and dispose of packaging materials at appropriate recycling facilities.

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

1.5 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
 - .1 Ensure adequate ventilation in enclosed spaces.
 - .2 Provide minimum lighting level of 500 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.
 - .2 Test concrete, masonry and plaster surfaces for alkalinity as required.
 - .3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.
- .3 Additional application requirements:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of the building Lessee such that painted surfaces will have dried and cured sufficiently before occupants are affected.

Part 2 Products

2.1 MATERIALS

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Conform to latest MPI requirements for all painting work including preparation and priming.
- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual "Approved Product" listing.
- .5 Provide paint products meeting MPI "Environmentally Friendly" GPS-1 ratings based on VOC EPA Method 24 content levels.
- .6 Use MPI listed materials having minimum GPS-1 rating where indoor air quality (odour) requirements exist.

2.2 COLOURS

- .1 Allow for up to five (5) different colours, which will be determined at later date.
- .2 Perform colour tinting operations prior to delivery of paint to Site, in accordance with manufacturer's written instructions. Obtain written approval from Departmental Representative for tinting of painting materials.
- .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 Remix paint in containers prior to and during application to ensure breakup of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.3 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 - VelvetLike Finish	Max.10	10 to 35
Gloss Level 3 - Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 - SatinLike Finish	20 to 35	min. 35
Gloss Level 5 - Traditional SemiGloss 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 to be egg shell, unless noted otherwise.

2.4 INTERIOR PAINTING

- .1 Exposed Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.
 - .1 INT 5.1E Alkyd - Gloss Level 5 finish.
- .2 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).
 - .1 INT 5.3C - Alkyd Gloss Level 5 finish (over cementitious primer).
- .3 Dressed Lumber: wood doors, casings, mouldings, exposed interior wood boards & panels, etc.:
 - .1 INT 6.3K - Clear polyurethane varnish Gloss Level 4 finish
- .5 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock" type material, etc.
 - .1 INT 9.2A - Latex Gloss Level 4 finish (over latex sealer).
 - .2 INT 9.2C - Alkyd Gloss Level 4 finish (over latex sealer).
 - .3 INT 9.2M - Institutional low odour/low VOC Gloss Level 4 finish.
- .6 Metal Radiator Covers:

- .1 Primer: DTM Acrylic primer / finish.
- .2 Top Coat: DTM Acrylic coating. Semi-gloss finish.

2.5 DRY ERASE COATING (PT-5)

- .1 Colour: Clear
- .2 Fire Rating (ASTM E84): Class A, flame spread index 15, smoke developed index 5
- .3 VOC (EPA Method 24): 21 g/L Part A and B mixed, 13g/L Part A only, 97 g/L Part B only
- .4 Density: 9.5lbs/gal Part A, 7.88 lbs/gal Part B
- .5 Opacity (ASTM D2805): Clear N/A
- .6 Sag Resistance (ASTM D4400 Method 6.5.6): 4.4
- .7 Flow and Levelling (ASTM D2801): 9
- .8 Crack Resistance (ASTM D522): 4%
- .9 Finish / Gloss (ASTM D523) on Dry Wall Board:
 - .1 20 degrees: 63.4
 - .2 60 degrees: 82.3
 - .3 85 degrees: 96.1
- .10 Scrub Resistance (ASTM D2486): Greater than 5,000 cycles
- .11 Stain Removal/Washability: 98.3%
- .12 Chemistry Type: Non-Isocyanate based coating
- .13 Installation:
 - .1 Remove hardware, accessories, plates and similar items to allow dry erase coatings to be installed.
 - .2 Inspect to make certain surface is acceptable and then wipe all dust. Paint product is a high gloss coating; imperfections and visible seams will telegraph.
 - .3 Paint (if applicable): The latex top coat paint should have an eggshell, satin, semi-gloss or gloss finish. If the paint is flat or matte, apply 1 coat of preferred primer for best performance. Clear Dry Erase Coating should be applied over a 100% acrylic primer and topcoat. Primers and topcoats containing vinyl, oil or alkyd should not be used. Allow latex top coat to dry for at least 24 hours prior to applying Clear Dry Erase Coating.
 - .4 Clean: Wipe surface with a clean, damp cloth to remove dust and environmental debris. Allow surface to completely dry.
 - .5 Ventilate area thoroughly to aid in curing process and to dissipate mild odor. Allow a high percentage of outside air into current ventilation.
- .14 Application:
 - .1 Comply with manufacturers printed installation instructions. Mix components in strict accordance with manufacturer's instructions. Pot life is 1 hour maximum.
 - .2 Apply dry erase coating with specified roller only. Comply with the following:

- .1 Apply heavy single coat only, using 2 layer method as described. Do not recoat or touch up applied coating once 10 minute return time has passed.
- .2 Divide your entire planned surface into areas up to 50 square feet
- .3 Use a 4 inch foam roller to cut in all edges and light switches within the current area.
- .4 Using the included 9 inch roller, from one end of the current area to the other, apply in sections up to 4 feet wide by the full height of the surface.
- .5 Be sure to overlap the edges of each section and use a backrolling technique as you go to even out the application.
- .6 Watch for roller marks, drip marks, debris and missed spots, re-roll as needed.
- .7 Every 50 square feet or 3-5 minutes, return to the first section of the area you have just finished and apply the second layer using the same method detailed above. This helps to build up a thick and effective Clear Dry Erase Coating surface.
- .8 Do not wait more than 10 minutes to perform the second layer over the first.
- .9 Remove masking tape within 1 hour of painting.
- .3 Dry erase coating may be applied directly onto clean, dry, smooth surfaces which are:
 1. A finished drywall surface
 2. A latex-based topcoat
- .4 Coating shall cure for a minimum of 7 days after application before use.
- .5 Application Rate: 4 mils wet film thickness as measured with a wet film gauge; maximum 50 square feet per quart or 200 square feet per gallon.
- .15 **Cleaning and Maintenance:** Regular erasing and cleaning should be done with a standard dry erase eraser or a dry microfiber towel. For more thorough cleaning, a damp microfiber towel may be used or Manufacturer's suggested cleaner. If damaged, the original surface shall be deglossed by sanding surface and priming before recoating.

Part 3 Execution

3.1 GENERAL

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

3.2 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Contract Administrator damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .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.

3.3 PREPARATION

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint splatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Department Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
- .2 Surface Preparation:
 - .1 Remove 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 and MPI - Maintenance Repainting Manual specific requirements and coating manufacturer's recommendations.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements.

- .8 Touch up of shop primers with primer as specified.
- .9 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.4 APPLICATION

- .1 Method of application to conform to manufacturer's application instructions unless specified otherwise.
- .2 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .3 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .4 Sand and dust between coats to remove visible defects.
- .5 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.
- .6 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .7 Finish closets and alcoves as specified for adjoining rooms.
- .8 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.5 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Do not paint over nameplates.
- .2 Keep sprinkler heads free of paint.
- .3 Paint fire protection piping red.
- .4 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .5 Paint natural gas piping yellow.
- .6 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

1. ASTM International
 1. ASTM E557 Standard Practice for Architectural Application and Installation of Retractable Partitions.
 2. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 3. ASTM C1036 - Standard Specification for Flat Glass.
 4. ASTM C1048 - Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass.
 5. ASTM E84 - Surface Burning Characteristics of Building Materials.
 6. ASTM E413 - Classification for Rating Sound Insulation
2. Health Product Declaration Collaborative
 1. Health Product Declaration Open Standard v2.1
3. International Standards Organization
 1. ISO 14021 - Environmental Labels and Declarations - Self-Declared Environmental Claims (Type II Environmental Labeling).
 2. ISO 14025:2011-10, Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.
 3. ISO 14040:2009-11, Environmental Management - Life Cycle Assessment - Principles and Framework.
 4. ISO 14044:2006-10, Environmental Management - Life Cycle Assessment - Requirements and Guidelines.
 5. ISO 21930 - Sustainability in Buildings and Civil Engineering Works — Core Rules for Environmental Product Declarations of Construction Products and Services.
4. Other Standards
 1. ADA – Americans with Disabilities Act.
 2. ANSI Z97.1 - Safety Glazing Materials Used in Buildings.
 3. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
 4. NEMA LD3 - High Pressure Decorative Laminates.

1. QUALITY ASSURANCE

1. Installer Qualifications: An experienced installer who is certified by the retractable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
2. Acoustical Performance: Test retractable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure and classified in accordance with ASTM E413 to attain no less than the STC rating specified. Provide a complete and unedited written test report upon request.
3. Preparation of the opening shall conform to the criteria set forth per ASTM E557 "Standard Practice for Architectural Application and Installation of Retractable Partitions."
4. The retractable wall must be manufactured by a certified ISO-9001-2015 company or an equivalent quality control system.

1.5 SUBMITTALS

1. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of retractable partition, component, and accessory specified.
2. Shop Drawings: Show location and extent of retractable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.
3. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.
4. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.
5. Reports: Provide a complete and unedited written sound test report indicating glass thickness and spacing in test specimen matches product as submitted.
6. Create spaces that are healthy for occupants.
 1. Furnish products and materials with Health Product Declaration (HPD), Manufacturer Inventory, or other material health disclosure documentation. Products without an HPD or other disclosure documentation are not acceptable.
7. Furnish materials that generate the least amount of pollution.
 1. Furnish products and materials that have third party verified environmental product declarations (EPD's). Consider products and materials that have optimized environmental performance (reduced life cycle impacts). Products without an EPD or other disclosure documentation are not acceptable.

1.6 DELIVERY, STORAGE, AND HANDLING

1. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.
2. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.7 WARRANTY

1. Provide written warranty by manufacturer of retractable partitions agreeing to repair or replace any components with manufacturing defects.
2. Partition Warranty period: Two (2) years from date of shipment.
3. Suspension System Warranty: Five (5) years from date of shipment.

Part 2 Products

2.1 MANUFACTURERS, PRODUCTS, AND OPERATIONS

1. Manufacturers: Subject to compliance with requirements.
2. Products: Subject to compliance with the requirements, provide the following product:
 1. Manually operated paired panel retractable partition.

2.2 OPERATION

1. Series of paired flat panels hinged together in pairs, manually operated, top supported with retractable floor seals.
2. Final Closure:

1. Horizontally expanding panel edge with removable crank

2.3 PANEL CONSTRUCTION

1. 13mm, tackable 100% recycled gypsum board, class "A" rated single material or composite layers continuously bonded to panel frame. Acoustical ratings of panels with this construction minimum:
 1. 47 STC
2. Hinges for Panels, Closure Panels, Pass Doors, and Pocket Doors shall be:
 1. Full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.
3. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.
4. Panel Weights:
 1. 47 STC - 7 lbs./square foot

2.4 PANEL FINISH

1. Panel finish shall be:
 1. Reinforced vinyl with woven backing weighing not less than 21 ounces (595 grams) per lineal yard.
2. Panel Trim: Exposed panel trim of one consistent color:
 1. To be selected from manufacturer's standard range of finishes.

2.5 SOUND SEALS

1. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic or aluminum astragals or astragals in only one panel edge are not acceptable.
2. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
3. Horizontal bottom floor seals shall be:
 1. Automatic retractable seals providing nominal 2-inch (51mm) operating clearance with an operating range of +0.50-inch (13mm) to -1.50-inch (38mm) which automatically drop as panels are positioned, without the need for tools or cranks. Seal shall be retractable from either panel edge to permit multiple panel position and reversible operation.

2.6 SUSPENSION SYSTEM

1. Suspension System
 1. Suspension Tracks: Minimum 11-gauge, 0.12-inch (3.04mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 0.38-inch (10mm) diameter threaded rods. Aluminum track is not acceptable.
 1. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
 2. Carriers: One all-steel trolley with steel-tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.

Part 3: Execution

3.1 INSTALLATION

1. General: Comply with ASTM E557, retractable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
2. Install retractable partitions and accessories after other finishing operations, including painting have been completed.
3. Match retractable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
4. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.2 CLEANING AND PROTECTION

1. Clean partition surfaces upon completing installation of retractable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
2. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer that ensure retractable partitions are without damage or deterioration at time of Substantial Completion.

3.3 ADJUSTING

1. Adjust retractable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.4 EXAMINATION

1. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of retractable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 DEMONSTRATION

1. Demonstrate proper operation and maintenance procedures to Owner's representative.
2. Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION

**Part
1**

General

1.1

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 corner and end wall guards. Include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29 - Health and Safety Requirements.
- .3 Installation Drawings:
 - .1 Indicate details, materials, finishes, dimensions.
- .4 Samples:
 - .1 Submit duplicate 300 mm long samples of profiles and colours for corner guards.

1.2

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 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store material indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect corner guards from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2

Products

2.1

MATERIALS

- .1 Vinyl corner and end wall guards: Extruded high impact vinyl, minimum 2 mm thick.
 - .1 Wings: 38 x 38 mm wing size, mounted to aluminum retainers; complete with closure caps.
 - .2 Filler strip for end wall guards: Stainless Steel
 - .3 Retainer: Stainless Steel, 1.6 mm thick.
 - .4 Impact resistance: Minimum 36 N-m/25 m (27 ft-lbs/inch) of thickness.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that conditions of substrates are acceptable for corner and end wall guard installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Departmental Representative of unacceptable conditions.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Install units to manufacturer's instructions, on solid backing and erect with materials and components straight, tight and in alignment.

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 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Clean surfaces after installation using manufacturer's written recommended cleaning procedures.
- .4 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .5 Waste Management: Remove waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 10-2018, Standard for Portable Fire Extinguishers.

1.2 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 and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies WHMIS SDS - Safety Data Sheets.
- .3 Provide shop drawings.
- .4 Quality control submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
- .5 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

- .1 Stored pressure rechargeable type with hose and shut-off nozzle, ULC labelled for A, B and C class protection.
 - .1 Minimum size 5A:10BC.

2.2 CARBON DIOXIDE

- .1 Extinguishers Insulated handle, hose and horn discharge assembly, self-closing lever or squeeze-grip operation, fully charged, ULC labelled for B and C class protection.
 - .1 Size 4.5 kg 2B:C.

2.3 EXTINGUISHER BRACKETS

- .1 Type recommended by departmental representative.

2.4 IDENTIFICATION

- .1 Identify extinguishers in accordance with recommendations of ANSI/NFPA 10, CAN/ULC-S508.
- .2 Attach bilingual tag to extinguishers, indicating month and year of installation. Provide space for service dates.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install or mount extinguishers in cabinets or on brackets as indicated and in accordance with NFPA 10.

3.3 FIELD QUALITY CONTROL

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

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 fans and grilles, registers, and diffuser, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
 - .1 Submit sprinkler drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 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.
 - .4 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 incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Operation data, where applicable, 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 white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information 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 documents, as follows:
 - .1 Drawings: Scan the full-sized field-verified as-built drawing set and save to PDF format. Scans shall be in colour and with good resolution to ensure drawings and markups are legible.
 - .2 Specifications: Adobe Acrobat (PDF).
 - .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.

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 an indoor location and in accordance with manufacturer's recommendations and in clean, dry, well-ventilated area.
 - .2 Store and protect grilles from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.5 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 has performed a hazardous substances assessment and identified materials requiring abatement as detailed in project Appendices:
 - .1 Hazardous substances are as defined in the Hazardous Products Act.
 - .2 Coordinate all removal of Hazardous substances with general contractor.

Part 2 Execution

2.1 EXAMINATION

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

2.2 PAINTING REPAIRS AND RESTORATION

- .1 Do painting in accordance with Section 09 91 99 - Painting for Minor Works.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

2.3 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of new ductwork.

2.4 DEMONSTRATION

- .1 Departmental Representative use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:

- .1 Exhaust Fan
- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Departmental Representative, if required, will record these demonstrations on video tape for future reference.

2.5 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.

2.6 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 13-19, Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 25-19, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S543-09(R2016), Standard for Internal Lug Quick Connect Couplings for Fire Hose.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and 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 Manitoba, Canada.
 - .2 Indicate:
 - .1 Materials.
 - .2 Finishes.
 - .3 Method of anchorage
 - .4 Number of anchors.
 - .5 Supports.
 - .6 Reinforcement.
 - .7 Assembly details.
 - .8 Accessories.
- .4 Samples:
 - .1 Submit samples of following:
 - .1 Signs.
- .5 Test reports:
 - .1 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.
- .8 Field Quality Control Submittals:

- .1 Manufacturer's Field Reports: manufacturer's field reports specified.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00 Closeout Submittals in accordance with ANSI/NFPA 20.
- .2 Manufacturer's catalogue Data, including specific model, type, and size for:
 - .1 Pipe and fittings.
 - .2 Valves, including gate, check, and globe.
 - .3 Sprinkler heads.
 - .4 Pipe hangers and supports.
 - .5 Mechanical couplings.
- .3 Drawings:
 - .1 Sprinkler heads and piping system layout.
 - .1 Prepare 760 mm by 1050 mm detail working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)".
 - .2 Show data essential for proper installation of each system.
 - .3 Show details, plan view, elevations, and sections of systems supply and piping.
 - .4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.
 - .2 Electrical wiring diagrams.
- .4 Design Data:
 - .1 Calculations of sprinkler system design.
 - .1 Subject to the approval of the fire protection contractor's engineer of record, hydraulic calculations may be waived for renovation projects, that are limited to relocation and/or conversion of sprinkler heads from upright to pendant (or vice versa), in which hazard classification(s) has not changed.
 - .2 Should the fire protection contractor's engineer of record be satisfied that design conditions have not changed enough to warrant updated hydraulic calculations, submit a letter under seal stating as such along with the rationale for the assessment. Alternatively, include a note on the sealed working drawings indicating same as above.
 - .2 Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.
- .5 Field Test Reports:
 - .1 Preliminary tests on piping system.
- .6 Records:
 - .1 As-built drawings of each system.
 - .1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.
 - .2 Submit 760 mm by 1050 mm drawings on reproducible Mylar film with title block similar to full size contract drawings.
- .7 Operation and Maintenance Manuals:
 - .1 Provide detailed hydraulic calculations including summary sheet, and Material and Test Certificate for aboveground piping and other documentation for incorporation into manual in accordance with NFPA 13.

1.4 QUALITY ASSURANCE

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 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:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Storage and Protection:
 - .1 Store materials indoors, in dry location.
 - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

Part 2 Products

2.1 DESIGN REQUIREMENTS

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

- .1 Make distribution uniform throughout the area in which sprinkler heads will open.
- .2 Discharge from individual heads in hydraulically most remote area to be 100 % of specified density.
- .8 Water Supply:
 - .1 Base hydraulic calculations on existing building sprinkler distribution piping system.

2.2 ABOVE GROUND PIPING SYSTEMS

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

2.3 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
 - .2 Provide fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .3 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
 - .4 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
 - .5 Fittings: ULC approved for use in wet pipe sprinkler systems.
 - .6 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
 - .7 Side outlet tees using rubber gasketed fittings are not permitted.
 - .8 Sprinkler pipe and fittings: metal.
- .3 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 C: pendant chrome glass bulb type.
- .3 Provide nominal 1.2 cm orifice sprinkler heads.
 - .1 Release element of each head to be of temperature rating of hazard level or higher as suitable for specific application.

- .2 Provide polished chromium-plated pendent sprinklers below suspended ceilings.
- .3 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.

2.5 PIPE SLEEVES

- .1 Provide pipe sleeves where piping passes through walls.
- .2 Secure sleeves in position and location during construction.
- .3 Provide sleeves of sufficient length to pass through entire thickness of walls.
- .4 Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs:
 - .1 Provide 0.61 mm thick galvanized steel sheet.

2.6 ESCUTCHEON PLATES

- .1 Provide one piece type metal plates for piping passing through walls or ceilings in exposed spaces.
- .2 Provide polished chromium-plated finish on copper alloy plates in finished spaces.
- .3 Provide paint finish on metal plates in unfinished spaces.

2.7 SPARE PARTS CABINET

- .1 Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve. Number and types of extra sprinkler heads as specified in NFPA 13.

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 FIELD QUALITY CONTROL

- .1 Site Test, Inspection:
 - .1 Perform test to determine compliance with specified requirements in presence of Departmental Representative.

- .2 Test, inspect, and approve piping before covering or concealing.
- .3 Preliminary Tests:
 - .1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.
 - .2 Flush piping with potable water in accordance with NFPA 13.
 - .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.
 - .4 Test alarms and other devices.
 - .5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.
- .4 Formal Tests and Inspections:
 - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
 - .2 Submit written request for formal inspection at least 15 days prior to inspection date.
 - .3 Repeat required tests as directed.
 - .4 Correct defects and make additional tests until systems comply with contract requirements.
 - .5 Furnish instruments, connecting devices, equipment, personnel for tests.
- .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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A126-04 (2014), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62-17, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2 American Water Works Association (AWWA)
 - .1 ANSI/AWWA C700-15, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 ANSI/AWWA C701-15, Standard for Cold Water Meters-Turbine Type for Customer Service.
 - .3 ANSI/AWWA C702-15, Standard for Cold Water Meters-Compound Type.
- .3 CSA Group (CSA)
 - .1 CAN/CSA-B64 Series-11 (R2016), Backflow Preventers and Vacuum Breakers.
 - .2 CSA B79-08 (R2018), Commercial and Residential Drains and Cleanouts.
- .4 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada 2015 (NPC).
- .5 Plumbing and Drainage Institute (PDI)
 - .1 PDI-WH201-R2017, Water Hammer Arresters Standard.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this section, with Departmental Representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building construction subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings to indicate materials, finishes, dimensions, construction and assembly details.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: manufacturers' field reports specified.

1.4 CLOSEOUT SUBMITTALS

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

1.5 DELIVERY, STORAGE AND HANDLING

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

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:
 - .1 Wall Access: face or wall type, round, stainless steel cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
 - .2 Floor Access: cast iron body and frame with adjustable secured nickel bronze top, round and:
 - .1 Plugs: bolted bronze with neoprene gasket.
 - .2 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
 - .3 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

2.2 WATER HAMMER ARRESTORS

- .1 Stainless steel construction, bellows type: to PDI-WH201.

Part 3 Execution

3.1 EXAMINATION

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

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Install in accordance with local authority having jurisdiction, National Plumbing Code of Canada (NPC), and provincial codes.
- .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 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 WATER HAMMER ARRESTORS

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

3.6 TESTING AND ADJUSTING

- .1 General:
 - .1 Test and adjust plumbing specialties and accessories in accordance with Section 01 91 13 - General Commissioning Requirements: General Requirements, supplemented as specified.
- .2 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Adjustments:
 - .1 Verify that flow rate and pressure meet design criteria.
 - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
- .4 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .5 Cleanouts:

- .1 Verify covers are gas-tight, secure, yet readily removable.
- .6 Water hammer arrestors:
 - .1 Verify proper installation of correct type of water hammer arrester.

3.7 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.

3.8 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.

3.9 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 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
- .3 Shop Drawings.
 - .1 Submit shop drawings to indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.
 - .2 Wiring and schematic diagrams.
 - .3 Dimensions and recommended installation.
 - .4 Pump performance and efficiency curves.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: manufacturers' field reports specified.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, include:
 - .1 Manufacturers name, type, model year, capacity and serial number.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list with names and addresses.

1.3 QUALITY ASSURANCE

- .1 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section, to:
 - .1 Verify project requirements.
 - .2 Review installation conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

Part 2 Products

2.1 BILGE AND SEWAGE PUMP

- .1 Capacity: 1.67 L/s against 50 kPa total head.
- .2 Construction: simplex CSA approved, housing epoxy coated cast iron, stainless steel shaft, non-clog bronze impeller, carbon and ceramic shaft seal, designed to handle 13 mm solids and for sump depth of 0.11m.
- .3 Motor: 250 W (1/3 hp), hermetically sealed, with automatic overload protection.
- .4 Control: buoyant case and manual override switch.
- .5 Sump: Polypropylene, one piece, to manufacturers standard, with 38mm inlet, outlet and vent holes.

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 Route discharge and vent piping concealed within wall cavity up to ceiling plenum.
- .3 Ensure pump and motor assembly do not support piping.
- .4 Align vertical pit mounted pump assembly after mounting and securing cover plate.
- .5 Install assembly with manually drainable check valve on discharge, union connections for unit removal.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
 - .1 Check power supply.
 - .2 Check starter protective devices.
- .2 Start-up, check for proper and safe operation.
- .3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.

3.4 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 Start pump, check impeller rotation.
 - .3 Check for safe and proper operation.

- .4 Check settings, operation of operating, other protective devices.
- .5 Test operation of hands-on-auto switch.
- .6 Check base for free-floating, no obstructions under base.
- .7 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
- .8 Adjust alignment of piping and conduit to ensure full flexibility.
- .9 Eliminate causes of cavitation, flashing, air entrainment.

3.5 FPT – SANITARY PUMPS

- .1 Application tolerances:
 - .1 Flow: plus 10%; minus 0%.
 - .2 Pressure: plus 10%; Minus 5%.
- .2 FPT Procedures:
 - .1 Verify pump cycles at a rate of less than 30 seconds.
 - .2 Verify there are no leaks in system.
 - .3 Verify pump operates on automatic and manual overrides.
- .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.

3.6 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.

3.7 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 American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15-18, Cast Copper Alloy Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-18, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-16, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
 - .5 ASME B16.26-18 Cast Copper Alloy Fittings for Flared Copper Tubes.
- .2 ASTM International (ASTM)
 - .1 ASTM A182/A 182M-19, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
 - .2 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM B42-15a, Seamless Copper Tube, Standard Sizes.
 - .4 ASTM B88M-18, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S101-14, Fire Endurance Tests of Buildings Construction and Materials.
 - .2 CAN/ULC S115-18, Standard Method of Fire Tests of Firestop.
- .4 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .6 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-80-13, Bronze Gate, Globe, Angle and Check Valves.
- .7 National Research Council (NRC)
 - .1 National Plumbing Code of Canada (NPC) 2015.
- .8 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

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

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.

Part 2 Products

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems, within building.
 - .1 Above ground:
 - .1 Copper tube, hard drawn, type L: to ASTM B88.

2.2 FITTINGS

- .1 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.
- .2 Cast copper, solder type: to ANSI/ASME B16.18.
- .3 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .4 NPS 1 ½ and smaller:
 - .1 Wrought copper to ANSI/ASME B16.22; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

2.3 JOINTS

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

2.4 BALL VALVES

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

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Install in accordance with local authority having jurisdiction, NPC, Provincial Plumbing Code.
- .2 Assemble piping using fittings manufactured to ANSI and Standard Council of Canada (SCC) standards.
- .3 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .5 Valves
 - .1 Isolate equipment, fixtures and branches with ball valves.

3.3 PRESSURE TESTS

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

3.4 FLUSHING AND CLEANING

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

3.5 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.

3.6 START-UP

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

- .4 Rectify start-up deficiencies.

3.7 PERFORMANCE VERIFICATION

- .1 Scheduling:
 - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify performance of temperature controls.
 - .2 Verify compliance with safety and health requirements.
 - .3 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
 - .4 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.
- .3 Reports:
 - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Reports, using report forms as specified in Section 01 91 13 - General Commissioning (Cx) Requirements: Report Forms and Schematics.
 - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.8 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM D2564- 12 (R2018), Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 CSA Group (CSA)
 - .1 CAN/CSA-Series B1800- 18, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.
- .3 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36- 13, Commercial Adhesives.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .5 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada 2015 (NPC).
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168- 2019, Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 DELIVERY, STORAGE AND HANDLING

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

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.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Install in accordance with Manitoba Plumbing Code and local authority having jurisdiction.

3.3 TESTING

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

3.4 PERFORMANCE VERIFICATION

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

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA-B125.3-18, Plumbing Fittings.
 - .2 CAN/CSA-B651-18, Accessible Design for the Built Environment.
- .2 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .3 List of recommended spare parts.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 SUSTAINABLE MATERIAL

- .1 Materials and products in accordance with Section 01 47 15 Sustainable Requirements: Construction.

2.2 MANUFACTURED UNITS

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.
- .5 Fixtures to be product of one manufacturer.
- .6 Trim to be product of one manufacturer.

- .7 Stainless steel counter top sinks.
 - .1 SK-1: single compartment, non-ledge back.
 - .1 From 1.2 mm thick type 304 stainless steel, self-rimming, undercoated, clamps. Inside sizes: 520 x 410 x 200 mm.
 - .2 Trim: ASME A112.18.1, NFS 61 lead free compliant, 3-hole 208mm spacing, chrome plated cast brass body, with 220mm long swing spout, aerator, single lever handle, washerless controls with ceramic cartridge, accessories to limit maximum flow rate to 5.7 litres/minute at 413 kPa.
 - .3 Waste fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass P-trap with cleanout.
- .8 Fixture piping:
 - .1 Hot and cold water supplies to each fixture:
 - .1 Chrome plated rigid supply pipes each with screwdriver stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with clean out on each fixture not having integral trap.
 - .2 Chrome plated in all exposed places.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Mounting:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified. Coordinate installation with millwork.

3.3 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Checks:
 - .1 Aerators: operation, cleanliness.

3.4 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A125-96 (R2018), Standard Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A563-15, Standard Specification for Carbon and Alloy Steel Nuts.
- .2 Factory Mutual (FM)
- .3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58-18, 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.
- .4 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada 2015 (NPC).
- .5 Underwriter's Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 SYSTEM DESCRIPTION

- .1 Design Requirements:

- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
- .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

2.2 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP58. ANSI B31.1 and
- .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 copper plated.
- .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 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 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, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 Ensure "U" has hole in bottom for rivetting to insulation shields.
- .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.
 - .1 Finishes for steel pipework: galvanized.
 - .2 Finishes for copper, glass, brass or aluminum pipework: epoxy coated.

- .8 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.

2.4 INSULATION PROTECTION SHIELDS

- .1 Insulated cold piping:
 - .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
- .2 Insulated hot piping:
 - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

2.5 VARIABLE SUPPORT SPRING HANGERS

- .1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
- .2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.
- .3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.
- .4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/- 5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.6 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
- .2 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .3 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .4 Use approved constant support type hangers where:
 - .1 Vertical movement of pipework is 13 mm or more,
 - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .5 Use variable support spring hangers where:
 - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
 - .2 Variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

- .1 Plumbing piping: to National Plumbing Code 2015 and authority having jurisdiction.
- .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.

3.6 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.
- .2 Adjustable clevis:
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:

- .1 Hammer jaw firmly against underside of beam.

3.7 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-24.3-92, Identification of Piping Systems.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 13-19, Standard for the Installation of Sprinkler Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
- .2 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Product data to include paint colour chips, other products specified in this section.
- .4 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.3 QUALITY ASSURANCE

- .1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

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

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.

- .1 Identification for PWGSC Preventive Maintenance Support System (PMSS):

- .1 Use arrangement of Main identifier, Source identifier, Destination identifier.
 - .2 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.
- .3 Before starting work, obtain written approval of identification system from Departmental Representative.

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
Domestic hot water supply	Green	DOM. HW SUPPLY
Domestic cold water supply	Green	DOM. CWS
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
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.

2.8 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.

2.9 LANGUAGE

- .1 Identification in English.

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 TIMING

- .1 Provide identification only after painting specified Section 09 91 23 - Interior Painting has been completed.

3.3 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Identify systems, equipment to conform to PWGSC PMSS.

3.4 NAMEPLATES

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

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

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

3.6 VALVES, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively.

3.7 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 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-1-2002.
 - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.
 - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.
- .4 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
 - .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
 - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.2 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 Provisions for TAB installed and operational.
- .5 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air systems:
 - .1 Duct systems clean.
 - .2 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .3 Fire, volume control dampers installed and open.
 - .4 Access doors, installed, closed.
 - .5 Outlets installed, volume control dampers open.

1.9 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 5 %, minus 5 %.

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.

1.12 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.13 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.

1.14 TAB REPORT

- .1 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .2 Submit 1 copy of TAB Report to Departmental Representative for verification and approval, in both official languages in PDF format.

1.15 VERIFICATION

- .1 Reported results subject to verification by Departmental Representative.
- .2 Provide personnel and instrumentation to verify up to 30 % of reported results.
- .3 Number and location of verified results as directed by Departmental Representative.
- .4 Pay costs to repeat TAB as required to satisfaction of Departmental Representative.

1.16 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.

1.17 COMPLETION OF TAB

- .1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

1.18 AIR SYSTEMS

- .1 Standard: TAB to most stringent of TAB standards of AABC.

- .2 Do TAB of following systems, equipment, components, controls:
 - .1 All new and revised VAV boxes and their associated diffusers.
 - .2 New transfer fans and grilles.
 - .3 Fire dampers, verification of new and existing.
- .3 Qualifications: personnel performing TAB current member in good standing of AABC.
- .4 Quality assurance: perform TAB under direction of supervisor qualified AABC.
- .5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .6 Locations of equipment measurements: to include as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
- .7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.19 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

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .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 90.1-16, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 ASTM International (ASTM)
 - .1 ASTM B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .2 ASTM C335-17, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C411-19, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M-07 (R2019), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C547-17, Standard Specification for Mineral Fiber Pipe Insulation.
 - .6 ASTM C553-13, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .7 ASTM C612-14, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .8 ASTM C921-10 (R2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36-13, Commercial Adhesives.
- .4 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-19, Adhesive and Sealant Applications.
- .5 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
- .6 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-18, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-17, 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.

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: specialist in performing work of this section, and have experience in this size and type of project, member of TIAC.

1.4 DELIVERY, STORAGE AND HANDLING

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

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 Lagging adhesive: compatible with insulation.

2.4 DUCT LINER

- .1 General:
 - .1 Mineral Fibre duct liner: air surface coated mat facing.
 - .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with NFPA 90A, CAN/ULC-S102 and NFPA 90B.
 - .3 Recycled Content: EcoLogo certified with minimum by weight 35% recycled content.
 - .4 Fungi resistance: to ASTM C1338 and ASTM G21.
- .2 Rigid:
 - .1 Use on flat surfaces where indicated.
 - .2 25 mm thick, to ASTM C1071 Type 2, fibrous glass rigid board duct liner.

- .3 Density: 48 kg/m³ minimum.
 - .4 Thermal resistance to be minimum 0.76 (m². degrees C)/W for 25 mm thickness, 1.53 (m².degrees C)/W for 50 mm thickness when tested in accordance with ASTM C177, at 24 degrees C mean temperature.
 - .5 Maximum velocity on faced air side: 20.3 m/s.
 - .6 Minimum NRC of 0.70 at 25 mm thickness based on Type A mounting to ASTM C423.
 - .7 Recycled Content: EcoLogo certified containing minimum by weight 45% recycled content.
- .3 Flexible:
- .1 Use on round or oval surfaces as indicated.
 - .2 25 mm thick, to ASTM C1071 Type 1, fibrous glass blanket duct liner.
 - .3 Density: 24 kg/m³ minimum.
 - .4 Thermal resistance to be minimum 0.37 (m².degrees C)/W for 12 mm thickness, 1.41 (m².degrees C)/W to 50 mm thickness, 0.74 (m².degrees C)/W for 25 mm thickness, 1.11 (m².degrees C)/W for 38 mm thickness when tested in accordance with ASTM C177, at 24 degrees C mean temperature.
 - .5 Maximum velocity on coated air side: 25.4 m/s.
 - .6 Minimum NRC of 0.65 at 25 mm thickness based on Type A mounting to ASTM C423.

2.5 ADHESIVE

- .1 Adhesive: to NFPA 90A and NFPA 90B, ASTM C916.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29 degrees C to plus 93 degrees C.
- .3 Water-based fire retardant type.

2.6 JOINT TAPE

- .1 Poly-Vinyl treated open weave fiberglass membrane 50 mm wide.

2.7 SEALER

- .1 Meet requirements of NFPA 90B and NFPA 90A.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68 degrees C to plus 93 degrees C.

2.8 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
- .2 Tie wire: 1.5 mm stainless steel.
- .3 Banding: 19 mm wide, 0.5 mm thick stainless steel.
- .4 Fasteners: 2 mm diameter pins with 35 mm square clips, length to suit thickness of insulation.

Part 3 Execution

3.1 APPLICATION

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

3.2 PRE-INSTALLATION REQUIREMENTS

- .1 Pressure test ductwork systems complete, witness and certify.
- .2 Ensure surfaces are clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and as indicated.
- .3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 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 air supply and return air ductwork where indicated on drawings by acoustic hatching symbol.	None	None	32
Rectangular cold and dual temperature supply air ducts	C-1	yes	50
Round cold and dual temperature supply air ducts.	C-2	yes	50
Supply, return and exhaust ducts exposed in space being served.	none		

3.5 DUCT LINER

- .1 Install in accordance with manufacturer's recommendations, and as follows:
 - .1 Fasten to interior sheet metal surface with 90 % coverage of adhesive to ASTM C916.
 - .1 Exposed leading edges and transverse joints to be factory coated or coated with adhesive during fabrication.
 - .2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425 mm on centres to compress duct liner sufficiently to hold it firmly in place.
 - .1 Spacing of mechanical fasteners in accordance with SMAC HVAC Duct Construction Standard and NAIMA AH116.

- .2 In systems, where air velocities exceeds 20.3 m/s, install galvanized sheet metal nosing to leading edges of duct liner.

3.6 JOINTS

- .1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:
 - .1 Bed tape in sealer.
 - .2 Apply 2 coats of sealer over tape.
- .2 Replace damaged areas of liner at discretion of Departmental Representative.
- .3 Protect leading and trailing edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

3.7 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM C335-17, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .2 ASTM C411-19, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .3 ASTM C449/C449M-07 (R2019), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .4 ASTM C547-17, Mineral Fiber Pipe Insulation.
 - .5 ASTM C921-10 (R2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .5 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-18, Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-17, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702-14, Thermal Insulation, Mineral Fibre, for Buildings
 - .4 CAN/ULC-S702.2-15, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.2 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix label beneath sample indicating service.
- .5 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
- .2 Installer: specialist in performing work of this Section, and have successful experience in this size and type of project, member of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions required by manufacturer.
- .3 Waste Management and Disposal:
 - .1 Waste Management and Disposal: in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code A-1: rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC-S702.
 - .2 Maximum "k" factor: to CAN/ULC-S702.
- .4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC-S702.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to CAN/ULC-S702.

2.3 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.
- .2 Contact adhesive: quick setting.

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.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and this specification.

- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-1.
 - .1 Securements: Tape at 300 mm on centre.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code 1501-H.
- .3 TIAC Code: A-3.
 - .1 Securements: Tape at 300 mm on centre.
 - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.
- .4 Thickness of insulation as listed in following table.
 - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
 - .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Applica-tion	Temp degrees C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
			to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over	
Domestic HWS	all	A-1	25	25	25	38	38	38
Domestic CWS	All	A-3	25	25	25	25	25	25

- .5 Finishes:
 - .1 Concealed, indoors: canvas on valves, fittings. No further finish.
 - .2 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
 - .3 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.5 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 41 00 Regulatory Requirements, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Low-emitting materials.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASME

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

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

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.

Part 2 Products

2.1 IDENTIFICATION

- .1 Provide in accordance with Section 23 05 53.01 - Mechanical Identification.

2.2 CONTROL AIR TUBING

- .1 Plastic: flame retardant PVC tubing with minimum burst gauge pressure of 1.4 MPa at 80 degrees C.
- .2 Copper: type M complete with flared fittings.

Part 3 Execution

3.1 EXAMINATION

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

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Identify and code pneumatic tubing at every branch and at each piece of equipment and components.
- .2 Use copper tubing with flared fittings in following locations:
 - .1 Inaccessible areas.
 - .2 Where single lines travel from tube tray to instruments.

- .3 Areas of heat above 80 degrees C.
 - .4 Mechanical rooms.
 - .5 Rooms where piping subject to damage.
 - .6 Adjacent to heating pipes passing through common sleeve.
 - .7 Where air pressures above 200 kPa.
 - .8 Where codes will not permit use of PVC.
 - .9 In fire rated walls and ceilings.
- .3 Run PVC tubing in cable trays or metal conduit. Use barb type fittings.
 - .4 Follow building lines. Do not cover with insulation. Install drip legs and drains at low points.

3.4 FIELD QUALITY CONTROL

- .1 Start-Up and Adjustment:
 - .1 Upon completion of installation, test, adjust and regulate controls or safety equipment provided under this Section.
 - .2 Adjust and place in operating condition.

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.

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 A635/A635M-15, 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.
 - .2 ASTM A653/A653M-19a, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-36-13, Standard for Adhesives for Commercial Use.
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-18, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-18, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.
 - .3 IAQ Guideline for Occupied Buildings Under Construction 2007.
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-19, Adhesives and Sealants Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for metal ducts and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Test and Evaluation Reports:
 - .1 Certification of Ratings:
 - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:

- .1 Store materials indoors, off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect metal ducts from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C
250	C
125	C

- .2 Seal classification:
 - .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
 - .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.
 - .3 Class C: transverse joints and connections made air tight with sealant. Longitudinal seams unsealed.

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 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.4 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
 - .1 Rectangular: standard radius, or short radius with single thickness turning vanes. centreline radius: 1.5 times width of duct.
 - .2 Round: smooth radius, centreline radius: 1.5 times diameter.
- .3 Mitred elbows, rectangular:
 - .1 To 407 mm: with single thickness turning vanes.
 - .2 Over 407 mm: with double thickness turning vanes.
- .4 Branches:
 - .1 Rectangular main and branch: with 45 degrees entry on branch.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.

- .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
 - .1 Refer to details.

2.5 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.

2.6 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA.
- .3 Joints: to SMACNA. Proprietary manufactured flanged duct joint to be considered to be a class A seal.
- .4 Hangers and Supports:
 - .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 SMACNA.
 - .3 Hangers: galvanized steel angle with galvanized steel rods to following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .2 For steel joist: manufactured joist clamp.
 - .3 For steel beams: manufactured beam clamps:

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

3.2 GENERAL

- .1 Do work in accordance with NFPA, ASHRAE and SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
 - .1 Insulate strap hangers 100 mm beyond insulated duct
 - .2 Ensure diffuser is fully seated.
- .3 Support risers in accordance with SMACNA.
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.3 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.
- .2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.5 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 REFERENCE STANDARDS

- .1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2005.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedure.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate:
 - .1 Flexible connections.
 - .2 Duct access doors.
 - .3 Turning vanes.
 - .4 Instrument test ports.

1.3 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 GENERAL

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m².

2.3 ACCESS DOORS IN DUCTS

- .1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

- .2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.
- .3 Gaskets: neoprene.
- .4 Hardware:
 - .1 Up to 300 x 300 mm: two sash locks complete with safety chain.
 - .2 301 to 450 mm: four sash locks complete with safety chain.
 - .3 451 to 1000 mm: piano hinge and minimum two sash locks.
 - .4 Doors over 1000 mm: piano hinge and two handles operable from both sides.
 - .5 Hold open devices.

2.4 TURNING VANES

- .1 Factory or shop fabricated single thickness or double thickness with trailing edge, to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST

- .1 1.6 mm thick steel zinc plated after manufacture.
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28 mm minimum inside diameter. Length to suit insulation thickness.
- .4 Neoprene mounting gasket.

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.
 - .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 Flexible Connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets to supply air units and fans.
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 As indicated.
 - .2 Length of connection: 100 mm.
 - .3 Minimum distance between metal parts when system in operation: 75 mm.
 - .4 Install in accordance with recommendations of SMACNA.
 - .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.

- .2 Access Doors and Viewing Panels:
 - .1 Size:
 - .1 As required for servicing equipment.
 - .2 Locations:
 - .1 Fire and smoke dampers.
 - .2 Control dampers.
 - .3 Devices requiring maintenance.
 - .4 Required by code.
 - .5 Elsewhere as indicated.
- .3 Instrument Test Ports:
 - .1 General:
 - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
 - .2 Locate to permit easy manipulation of instruments.
 - .3 Install insulation port extensions as required.
 - .4 Locations:
 - .1 For traverse readings:
 - .1 Ducted inlets to roof and wall exhausters.
 - .2 Inlets and outlets of other fan systems.
 - .3 Main and sub-main ducts.
 - .4 And as indicated.
 - .2 For temperature readings:
 - .1 In mixed air applications in locations as approved by Departmental Representative.
 - .2 Downstream of junctions of two converging air streams of different temperatures.
 - .3 And as indicated.
- .4 Turning Vanes:
 - .1 Install in accordance with recommendations of SMACNA and 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2013.

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

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Operation and Maintenance Data: submit operation and maintenance data for dampers for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 GENERAL

- .1 Manufacture to SMACNA standards.

2.2 SINGLE BLADE DAMPERS

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside nylon end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for damper installation in accordance with manufacturer's written instructions.
 - .1 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 where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 Dampers: vibration free.
- .6 Ensure damper operators are observable and accessible.
- .7 Corrections and adjustments conducted by Departmental Representative.

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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-18, Standard for the Installation of Air Conditioning and Ventilating Systems.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S112-10 (R2016), Standard Test Method of Fire Test of Fire Damper Assemblies.
 - .2 CAN/ULC-S112.2-07 (R2016), Standard Method of Fire Test of Ceiling Fire Stop Flap Assemblies.
 - .3 ULC-S505-1974, Standard for Fusible Links for Fire Protection Service.

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 fire and smoke dampers and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate the following:
 - .1 Fire dampers.
 - .2 Fusible links.
 - .3 Design details of break-away joints.
- .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Operation and Maintenance Data: submit operation and maintenance data for fire and smoke dampers for incorporation into manual.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Submit maintenance materials in accordance with Section 01 78 00 Closeout Submittals.
 - .2 Provide:
 - .1 6 fusible links of each type.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 01 61 00 Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:

- .1 Store materials in dry location, indoors, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect fire and smoke dampers from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 FIRE DAMPERS

- .1 Fire dampers: arrangement Type B, listed ULC, meet requirements of authorities having jurisdiction and NFPA 90A. Fire damper assemblies fire tested in accordance with CAN/ULC-S112.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
 - .1 Fire dampers: 1-1/2 hour fire rated unless otherwise indicated.
 - .2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.
- .3 Top hinged: offset single damper, round or square; multi-blade hinged interlocking type; sized to maintain full duct cross section as indicated.
- .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 to prevent disruption of 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 Provide factory Installed security bars in common sleeve with damper where Indicated on drawings.
 - .1 Vertical Bars – 1/2" (13) diameter zinc plated bar. 6" (152) on center. Hardness Rockwell 80/90 B.
 - .2 Horizontal Bars – 2" x 1/4" (51 x 6) flat bar – 12" (305) on center. Grille frame – 10 gage x 2" (51) galvanized steel.
 - .3 Vertical bars pass through the horizontal bar(s). Bars are welded to the frame and at each intersection of the horizontal bar.
- .9 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.
- .10 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition of floor slab depth or thickness.
- .11 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.
 - .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 in accordance with NFPA 90A and in accordance with conditions of ULC listing.
- .2 Maintain integrity of fire separation.
- .3 Install security bars integrated into secure walls as per manufactures guidelines and GAS Physical Security Construction Design Brief document.
- .4 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .5 Install access door adjacent to each damper. See Section 23 33 00 - Air Duct Accessories.
- .6 Coordinate installation of fire stopping with Section 07 84 00 - Fire Stopping.
- .7 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.
- .8 Install break-away joints of approved design on each side of fire separation.

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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B, Standard for Installation of Warm Air Heating and Air-Conditioning Systems.
- .3 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
 - .2 SMACNA IAQ Guideline for Occupied Buildings under Construction, 2005.
- .4 Underwriters' Laboratories (UL)
 - .1 UL 181, Standard for Factory-Made Air Ducts and Air Connectors.
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S110, Standard Methods of Tests for Air Ducts.

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 flexible ducts and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate:
 - .1 Thermal properties.
 - .2 Friction loss.
 - .3 Acoustical loss.
 - .4 Leakage.
 - .5 Fire rating.
- .3 Test and Evaluation Reports:
 - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.3 DELIVERY, STORAGE AND HANDLING

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

- .2 Store and protect flexible ducts from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 GENERAL

- .1 Factory fabricated to CAN/ULC-S110.
- .2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.
- .3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

2.2 NON-METALLIC - UNINSULATED

- .1 Non-collapsible, coated mineral base fabric type, mechanically bonded to, and helically supported by, external steel wire.
- .2 Performance:
 - .1 Factory tested to 2.5 kPa without leakage.
 - .2 Maximum relative pressure drop coefficient: 3.

Part 3 Execution

3.1 EXAMINATION

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

- .1 Install in accordance with: SMACNA
- .2 Maximum installed length: One continuous length at 1500 mm (5'-0"). Use standard sheetmetal elbows at drop points to outlets.

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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)
 - .1 ANSI/AMCA Standard 99-16, Standards Handbook.
 - .2 ANSI/ASHRAE 51-07 (ANSI/AMCA 210-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
 - .3 ANSI/AMCA Standard 300-14, Reverberant Room Method for Sound Testing of Fans.
 - .4 ANSI/AMCA Standard 301-14, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .2 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
 - .1 MPI #18, Primer, Zinc Rich, Organic.

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 HVAC fans and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide:
 - .1 Fan performance curves showing point of operation, bhp and efficiency.
 - .2 Sound rating data at point of operation.
 - .2 Indicate:
 - .1 Motors, sheaves, bearings, shaft details.
 - .2 Minimum performance achievable with variable speed controllers.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
 - .1 Provide:
 - .1 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
 - .1 Bearings and seals.
 - .2 Addresses of suppliers.
 - .3 List of specialized tools necessary for adjusting, repairing or replacing.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 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, in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect HVAC fans from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

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 in force.
 - .2 Capacity: flow rate, total pressure, W, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
 - .3 Fans: statically and dynamically balanced, constructed in conformity with ANSI/AMCA Standard 99.
 - .4 Sound ratings: comply with ANSI/AMCA Standard 301, tested to ANSI/AMCA Standard 300. Supply unit with ANSI/AMCA certified sound rating seal.

2.2 FANS GENERAL

- .1 Motors:
 - .1 Sizes as per schedule.
- .2 Factory primed before assembly in colour standard to manufacturer.
- .3 Flexible connections: to Section 23 33 00 - Air Duct Accessories.

2.3 CIRCULAR DUCT FANS

- .1 cUL and CSA tested and approved, AMCA 211 and 311 tested.
- .2 Galvanized steel fan housing with venturi inlet.
- .3 Motor: external rotor with permanent split capacitor (PSC) motor, permanently sealed self lubricating ball bearings, automatic reset thermal overload protection, rated for continuous duty.
- .4 Wheel: backward inclined wheel, statically and dynamically balanced.
- .5 Electrical: externally mounted electrical terminal box with pre-wired terminal strip connections and capacitor.

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 HVAC fans 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 FAN INSTALLATION

- .1 Install fans as indicated, complete with resilient mountings, flexible electrical leads and flexible connections in accordance with Section 23 33 00 - Air Duct Accessories.

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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)
 - .1 ANSI/ASHRAE 51-16 (ANSI/AMCA 210-16), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .2 International Organization of Standardization (ISO)
 - .1 ISO 3741-2010, Acoustics-Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Precision Methods for Reverberation Rooms.
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-18, Standard for the Installation of Air Conditioning and Ventilating Systems.
- .4 Underwriter's Laboratories (UL)
 - .1 UL 181-17, Factory-Made Air Ducts and Air Connectors.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedure.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for air terminal units and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate the following:
 - .1 Capacity.
 - .2 Pressure drop.
 - .3 Noise rating.
 - .4 Leakage.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Test and Evaluation Reports:
 - .1 Test data: to ANSI/AMCA Standard 210.
 - .1 Submit published test data on DIN (Direct Internal Noise), in accordance with ISO 3741 made by independent testing agency for 0, 2.5 and 6 m/s branch velocity or inlet velocity.
 - .2 Sound power level with minimum inlet pressure of 0.5 kPa in accordance with ISO 3741 for 2nd through 7th octave band, also made by independent testing agency.
 - .3 Pressure loss through silencer shall not exceed 60% of inlet velocity pressure maximum.

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 air terminal units for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

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 certified ADC (Air Diffusion Council) testing agency signifying adherence to codes and standards.

2.2 VARIABLE AIR VOLUME UNITS

- .1 Terminal units of the same type to be product of one manufacturer.
- .2 Pressure independent reset to air flow between minimum and maximum air volume.
- .3 Controls Contractor shall verify site conditions prior to providing any equipment or controls shop drawings.
- .4 Sizes, capacities, differential pressures and sound ratings: as indicated.
- .5 Differential pressure not to exceed 25 Pa at inlet air velocity of 10 m/s.
- .6 Complete with:
 - .1 Operator and controller: existing pneumatic controls system, contractor to field verify requirements prior to ordering.
 - .2 Sound attenuator: 900mm in length.
 - .3 Multiport outlet adapter: as indicated.
 - .4 Pneumatic controller to operate damper operator between maximum or minimum air volume settings.
- .7 Minimum 35 kPa reset span.
- .8 Adjustable reset start point.
- .9 Adjustable reset span to maximum 70 kPa when supplied with minimum 140 kPa main control air.
- .10 No control air bleed off through inlet sensor.
- .11 Casing: constructed of galvanized steel, internally lined with 25 mm, 0.7 kg density fibrous glass, to UL181 and NFPA 90A. Mount control components inside protective metal shroud.

- .12 Damper: galvanized steel with peripheral gasket and self lubricating bearings. Air leakage past closed damper not to exceed 2% of nominal rating at 750 Pa inlet static pressure, in accordance with Air Diffusion Council test procedure.

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 terminal units 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 in accordance with manufacturers recommendations.
- .2 Support independently of ductwork.
- .3 Install with at least 1000 mm of flexible inlet ducting and minimum of four duct diameters of straight inlet duct, same size as inlet.
- .4 Locate controls, dampers and access panels for easy access.

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 and 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 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedure.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for diffusers, registers and grilles and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate following:
 - .1 Capacity.
 - .2 Throw and terminal velocity.
 - .3 Noise criteria.
 - .4 Pressure drop.
 - .5 Neck velocity.

1.2 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 33 00 Submittal Procedure.
 - .2 Include:
 - .1 Keys for volume control adjustment.
 - .2 Keys for air flow pattern adjustment.

1.3 DELIVERY, STORAGE AND HANDLING

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

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, as scheduled.

- .2 Frames:
 - .1 Coordinate selection with architectural ceiling plan.
 - .2 Full perimeter gaskets.
 - .3 Countersunk screwholes where applicable. No screwholes In T-bar ceiling applications.
- .3 Colour: Pre-finished white.

2.3 MANUFACTURED UNITS

- .1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

2.4 DIFFUSERS

- .1 General: volume control dampers with flow straightening devices and blank-off quadrants and gaskets.
- .2 Ceiling Diffusers: steel, square type, having adjustable pattern, lay-in mounted. Finish: white.
- .3 Refer to the schedule for frame, materials of fabrication, finishes, and accessories.

2.5 RETURN AND EXHAUST GRILLES AND REGISTERS

- .1 Ceiling Grilles: Aluminum, 19 mm border, 25 x 25 mm egg crate type face bars. Finish: baked enamel, white.
- .2 Wall Grilles: Streamlined blades, Aluminum ,19 mm (3/4 inch) minimum depth, 19 mm (3/4 inch) maximum spacing, horizontal face bars.
- .3 Refer to the schedule for, finishes, and accessories.

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.
 - .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 in accordance with manufacturers instructions.
- .2 Install with oval head screws in countersunk holes where fastenings are visible.

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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI).
 - .1 ANSI C12.7-1993 (R1999), Requirements for Watthour Meter Sockets.
 - .2 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.
- .2 ASTM International (ASTM)
 - .1 ASTM B148-97 (03), Standard Specification for Aluminum-Bronze Sand Castings.
- .3 National Electrical Manufacturer's Association (NEMA).
 - .1 NEMA 250-03, Enclosures for Electrical Equipment (1000 Volts Maximum).
- .4 Air Movement and Control Association, Inc. (AMCA).
 - .1 AMCA Standard 500-D-98, Laboratory Method of Testing Dampers For Rating.
- .5 CSA Group CSA Group
 - .1 CSA-C22.1-02, 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings and manufacturer's installation instructions in accordance with Section 25 05 02 - EMCS: Submittals and Review Process.
- .2 Pre-Installation Tests.
 - .1 Submit samples at random from equipment shipped, as requested by Departmental Representative, for testing before installation. Replace devices not meeting specified performance and accuracy.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions for specified equipment and devices.

1.4 EXISTING CONDITIONS

- .1 Cutting and Patching: in accordance with Section 02 41 19 Selective Interior Demolition supplemented as specified herein.
- .2 Repair surfaces damaged during execution of Work.
- .3 Turn over to Departmental Representative existing materials removed from Work not identified for re-use.

Part 2 Products

2.1 GENERAL

- .1 Control devices of each category to be of same type and manufacturer.

- .2 Provide manufacturer thermostats for all pieces of equipment, interlock dampers, and auxiliary devices as required.
- .3 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight assembly.
- .4 Operating conditions: 0 - 32 degrees C with 10 - 90 % RH (non-condensing) unless otherwise specified.
- .5 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.
- .6 Devices installed in user occupied space not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

2.2 THERMOSTAT (ELECTRIC STANDALONE)

- .1 Requirements:
 - .1 LCD Display with backlight.
 - .2 24 volts, with setback/setup temperature control.
 - .3 7 Day Programmable
 - .4 Single heating and single cooling.
 - .5 Auto changeover control.

2.3 THERMOSTAT (PNEUMATIC)

- .1 Manufacturer - Johnson Controls
- .2 Requirements:
 - .1 Direct acting, heating and cooling.
 - .2 13 to 25 psig control air pressure.
 - .3 1 to 5 psi throttling range.

2.4 7-DAY PROGRAMMABLE TIME CLOCKS

- .1 Requirements:
 - .1 Seven day programming switch timer with synchronous timing motor and seven day dial, continuously charged Ni-cad battery driven power failure 8 hour carry over and multiple switch trippers to control systems for minimum of two and maximum of eight signals per day with two normally open and two normally closed output switches.
 - .2 Solid state programmable time control with multiple separate programs, 24 hour battery carry over duty cycling, individual on/off/auto switches for each program, 7 day programming, 365 day calendar with 20 programmable holidays choice of fail safe operation for each program, system fault alarm.

2.5 ELECTROMECHANICAL RELAYS

- .1 Requirements:
 - .1 Double voltage, DPDT, plug-in type with termination base.
 - .2 Coils: rated for 120V AC or 24V DC. Other voltage: provide transformer.
 - .3 Contacts: rated at 5 amps at 120 V AC.
 - .4 Relay to have visual status indication

2.6 PANELS

- .1 Wall mounted enamelled steel cabinets with hinged and key-locked front door.

- .2 Multiple panels as required to handle requirements with additional space to accommodate 25% additional capacity as required by Departmental Representative without adding additional cabinets.
- .3 Panels to be lockable with same key.

2.7 WIRING

- .1 In accordance with Section 26 27 10 - Modular Wiring System & 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.

Part 3 Execution

3.1 INSTALLATION

- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.
- .2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.
- .3 Fire stopping: provide space for fire stopping in accordance with Section 07 84 00 - Fire stopping. Maintain the fire-resistance rating integrity of the fire separation.
- .4 Electrical:
 - .1 Complete installation in accordance with Section 26 05 00 - Common Work Results for Electrical.
 - .2 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.
 - .3 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Departmental Representative to review before starting Work. Wiring in mechanical rooms, wiring in service rooms and exposed wiring must be in conduit.
- .5 VAV Terminal Units: supply, install and adjust as required.
 - .1 Air probe, actuator and associated pneumatic vav controls.
 - .2 Tubing from air probe to differential pressure sensor as well as installation and adjustment of air flow sensors and actuators.
 - .3 Co-ordinate air flow adjustments with balancing trade.

3.2 PANELS

- .1 Arrange for conduit and tubing entry from top, bottom or either side.
- .2 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.
- .3 Identify wiring and conduit clearly.

3.3 TESTING AND COMMISSIONING

- .1 Calibrate and test field devices for accuracy and performance.

END OF SECTION

Part 1 General

1.1 SEQUENCING

- .1 Sequencing of operations for systems as follows:
 - .1 Variable Air Volume Terminal Unit (Heating & Cooling)
 - .1 Direct acting dual temperature thermostat set at 19-24 degrees C (66-75 degrees F) maintains constant space temperature by modulating variable volume damper operator during the day and 8 degrees C (15 degrees F) during night setback.
 - .2 When there is a call for heat, variable air volume damper shall modulate to minimum position, and the perimeter induction units control valve shall open to maintain temperature setpoint. Induction units fan motors shall run based on existing control strategies.
 - .2 Variable Air Volume Terminal Unit (Cooling only – VAV304E & VAV-342E)
 - .1 Direct acting dual temperature thermostat set at 19-24 degrees C (66-75 degrees F) maintains constant space temperature by modulating variable volume damper operator during the day and 8 degrees C (15 degrees F) during night setback.
 - .3 Kitchenette and Photocopier Inline Transfer Air Fan (F-2 & F-3)
 - .1 Transfer air fan shall run continuously during occupied hours (adj.).
 - .4 Telecom Room Inline Transfer Air Fan (F-1)
 - .1 Thermostat shall be set to 30 Degrees C (86 Degrees F) (adj.)
 - .1 If space temperature rises above setpoint, transfer fan shall be energized. Fan shall be de-energized once space temperature setpoint is reached.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 References

- .1 Definitions:
 - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE 100 CD.
- .2 Reference Standards:
 - .1 CSA Group
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.
 - .2 CSA-C22.2 NO. 0-20 - General requirements - Canadian electrical code, part II
 - .3 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
 - .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE 100 CD, Standards Dictionary: Glossary of Terms and Definitions.

1.2 Action And Informational Submittals

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .5 Submit two (2) number of copies of 600 x 900 mm minimum size drawings to authority having jurisdiction.
 - .6 If changes are required, notify Departmental Representative of these changes before they are made.
- .3 Certificates:
 - .1 Provide CSA certified equipment.
 - .2 Where CSA certified equipment is not available, submit such equipment to inspection authorities 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.

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 lighting, lighting controls, fire alarm, access control, and intrusion alarm 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.
- .3 Record Documentation:
 - .1 Prior to Substantial Performance of the Work, electronically transfer the marked-up information from the as-built documents, as follows:
 - .1 Drawings: Scan the full-sized field-verified as-built drawing set and save to PDF format. Scans shall be in colour and with good resolution to ensure drawings and markups are legible.
 - .2 Mark revised documents as "RECORD DOCUMENTS". Include all revisions.
 - .3 Submit completed record documents to Consultant on a CD, DVD, or by electronic transfer.
 - .4 Project record documents shall comprise a complete and accurate record of the actual electrical installation. Record drawings that are inaccurate or incomplete shall be returned to the contractor for correction and completion.
 - .5 Record drawings shall contain a stamp bearing the words "Record Drawing" or "As-Built Drawing", the electrical contractor's company name, date, and the contractor's signature.
 - .6 Indicate on record drawings, location of all buried services. This information is to be certified correct by Consultant before backfilling commences.
 - .7 Record actual size and location of all cables including depth of cables where buried.

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 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, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates for control items in English.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities 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 Control wiring and conduit: in accordance with mechanical specifications and drawings.

2.4 Warning Signs

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction.
- .2 Decal 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 Labeling of devices: Plastic adhesive tape with 5 mm (3/16 inch) black letters on white background.
 - .1 Use only for identification of individual wall switches, receptacles, and control device stations.
 - .2 Indicate associated panel and circuit number.
- .2 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm black face, white core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .3 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .4 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .5 Allow for minimum of twenty-five (25) letters per nameplate.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .7 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. ____" as directed by Departmental Representative.
- .8 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .9 Terminal cabinets and pull boxes: indicate system and voltage.

2.7 Wiring Identification

- .1 Identify wiring with permanent indelible identifying markings, numbered, 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.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

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.

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 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: 1200 mm.
 - .2 Wall receptacles:
 - .1 General: 400 mm.
 - .2 Above top of counters or counter splash backs: 175 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 400 mm.
 - .5 Fire alarm stations: 1200 mm.
 - .6 Fire alarm bells: 2100 mm.
 - .7 Television/AV conference TV outlets: Coordinate behind television location.

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 Protection

- .1 Sprinkler Proof Equipment
 - .1 All surface mounted electrical equipment located in sprinklered areas shall be sprinkler proof and shall be provided with suitable hoods and shields.
 - .2 Entrance of conduits into the top of surface mount electrical panels/cabinets/distributions and motor control centers shall utilize O-rings and watertight connectors.
 - .3 All recessed mounted branch circuit panels and distribution panels shall be provided with a Type 2 enclosure.

3.9 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 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

3.10 SYSTEM STARTUP

- .1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.

3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures

1.2 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 Departmental Representative 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.

1.3 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 and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.4 Administrative Requirements

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.
- .2 Scheduling: Account for Departmental Representative's continued occupancy requirements during selective demolition and schedule staged occupancy and worksite activities as a defined.

1.5 Quality Assurance

- .1 Regulatory Requirements: Perform work of this Section in accordance with:

- .1 Workers Compensation Board of Manitoba.
- .2 SAFE Manitoba.

1.6 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: Consultant 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.
- .3 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.

1.7 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 Departmental Representative's property.
- .2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials.
 - .1 Leave main electrical distribution panel in place; panel can be used for temporary construction power for this and subsequent contracts in accordance with Section 01 51 00 – Temporary Utilities; coordinate temporary power connections with Departmental Representative.
 - .2 Leave main telephone terminal backboard in place; panel can be used for temporary construction telephone system for this and subsequent contracts in accordance with Section 01 51 00 – Temporary Utilities; coordinate temporary telephone connections with Departmental Representative.

Part 2 Products

2.1 Materials

- .1 General Patching and Repair Materials: Refer to Section 02 41 19.16 - Selective Interior Demolition for listing of patching and repair materials incidental 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 19.16 - Selective Interior Demolition 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 unless specifically noted otherwise.
 - .3 Disconnect and remove existing fire alarm system including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
 - .4 Disconnect and remove communication systems including associated conduits, boxes, cabling, and similar items unless specifically noted otherwise.

- .5 Disconnect and remove telephone outlets, associated conduit, cabling and sub terminal backboards and related accessories; maintain telephone service and main terminal backboard as is.
- .6 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.
- .7 Disconnect panel feeders back to main distribution panel and re label respective circuit breaker as "SPARE".
- .8 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.
- .9 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.
- .10 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.
- .11 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.

END OF SECTION

Part 1 General

1.1 References

- .1 CSA Group (CSA)
 - .1 CAN/CSA-C22.2 No.18.1- 13 (R2018), Metallic Outlet Boxes.
 - .2 CAN/CSA C22.2 No.65-18, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE), Includes Update No. 1 (2019).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.2 Action And Informational Submittals

- .1 Submit 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 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.

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 aluminum sheathed cable and flexible conduit as required to: CAN/CSA-C22.2 No.18.1.

Part 3 Execution

3.1 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.

3.2 Cleaning

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

END OF SECTION

Part 1 General

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 insulation type RW90XLPE rated at 600 V.

2.2 Armoured Cables

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel 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, and armour of closely wound aluminum wire.

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 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 Installation Of Building Wires

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

3.4 Wiring Methods

- .1 Concealed Dry Interior Locations: Use only building wire in raceway. Armoured cabling may be used for individual drops to equipment and devices only.
- .2 Exposed Dry Interior Locations: Use only building wire in raceway.
- .3 Above Accessible Ceilings: Use only building wire in raceway. Armoured cabling may be used for individual drops to equipment and devices only.

3.5 Installation Of Armoured Cables

- .1 Group cables wherever possible and where permissible on channels.

3.6 Installation Of Control Cables

- .1 Install control cables, systems cables and wires in conduit.
- .2 Ground control cable shield.

END OF SECTION

Part 1 General

1.1 Reference Standards

- .1 CSA Group
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No.41-13, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
 - .3 CAN/CSA C22.2 No.65-18, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE), Includes Update No. 1 (2019).

1.2 Delivery, Storage And Handling

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials in a clean, dry, well-ventilated area and to manufacturers recommendations.
 - .2 Store and protect connectors and terminations from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: remove for reuse in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 Connectors And Terminations

- .1 Compression connectors to CSA C22.2 No.65, suitable size and material 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 C22.2No.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 reuse or 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 References

- .1 CSA-C22.1-18 - Canadian Electrical Code, Part I (24th Edition), Safety Standard for Electrical Installations.

Part 2 Products

2.1 Equipment

- .1 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .2 Insulated grounding conductors: green, copper conductors, size as indicated.
- .3 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

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 grounding equipment installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative and Consultant of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative or Consultant.

3.2 Installation General

- .1 Protect exposed grounding conductors from mechanical injury.
- .2 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .3 Provide bonding to meet Regulatory Requirements.
- .4 Mechanical connections shall be used for bonding connections to equipment. Soldered joints shall not be permitted.
- .5 Provide bonding wire connected to both ends of flexible conduit. Neatly attach to exterior of flexible conduit.
- .6 Bonding connections shall be made using a star configuration. Loop connections shall be avoided.
- .7 Single conductor cables with metallic armour shall be bonded at the supply end only. Provide non-metallic entry plates for load end terminations. Provide a separate bonding conductor.
- .8 Provide separate bonding conductor in all non-metallic raceways.
- .9 Bond together metal siding not attached to grounded structure; bond to ground.
- .10 Install ground grid under access floors. Construct grid of #6 AWG bare copper wire bonded to every fourth pedestal.

- .11 Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Use #6 AWG bare copper conductor.
- .12 Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.3 Communication Systems

- .1 Install communications grounding system for bonding of all telephone, data, fire alarm, paging as follows:
 - .1 When placed in ferrous metallic conduit or EMT longer than 1 m, bond to each end of conduit or EMT using 6 AWG bare copper conductor.

3.4 Field Quality Control

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests before energizing electrical system.
- .3 Disconnect ground fault indicator during tests.

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.

END OF SECTION

Part 1 General

1.1 Waste Management And Disposal

- .1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .2 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 Support Channels

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted and suspended.

Part 3 Execution

3.1 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 900mm on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24th Edition.

1.2 Action And Informational Submittals

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

Part 2 Products

2.1 Junction And Pull Boxes

- .1 Construction:welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat turned edge covers.
- .4 All covers for junction and pull boxes with a dimension larger than 250mm shall have hinged covers.

Part 3 Execution

3.1 Junction, Pull Boxes And Cabinets Installation

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 Identification

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

END OF SECTION

Part 1 General

1.1 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24th 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.

Part 2 Products

2.1 Outlet And Conduit Boxes General

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 Galvanized Steel Outlet Boxes

- .1 One-piece electro-galvanized construction.
- .2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .5 Extension and plaster rings for flush mounting devices in finished walls.

2.3 Fittings - General

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 Installation

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

Part 1 General

1.1 References

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18-98(R2003). Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 83-M1985(R2007), Electrical Metallic Tubing.

1.2 Action And Informational Submittals

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

Part 2 Products

2.1 Conduits

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

2.2 Conduit Fastenings

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 900mm on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 Conduit Fittings

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws and cast devices are not acceptable.

2.4 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 mechanical and electrical service rooms.
- .3 Use electrical metallic tubing (EMT).
- .4 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without prewired outlet box, connection to surface or recessed fluorescent fixtures, and work in movable metal partitions.
- .5 Minimum conduit size for lighting and power circuits: 21 mm.
- .6 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .7 Mechanically bend steel conduit over 21 mm diameter.
- .8 Install fish cord in empty conduits.
- .9 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .10 Dry conduits out before installing wire.
- .11 Do not mount conduits horizontally within walls or partitions.

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.
- .7 Do not mount surface conduits horizontally on walls.

3.4 Low Profile Overfloor Raceway

- .1 Size:
 - .1 Four Channel Raceway: 175mm (6-7/8") W x 12.7mm (1/2") H
 - .1 Outer channel capacity:
 - .1 Up to 7 #12AWG RW90
 - .2 Up to 2 CAT6
 - .2 Inner channel capacity:
 - .1 Up to 14 #12AWG RW90
 - .2 Up to 3 CAT6
- .2 Base:
 - .1 Aluminum divided into four channels
- .3 Cover:
 - .1 Steel tamper resistant
- .4 Devices: Provide covers and accessories to accept devices specified in Section 26 27 26.

- .5 Channel Finish: Black powder coat.
- .6 Fittings: Provide manufacturer's standard fittings as required or as detailed.

3.5 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.

3.6 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.

END OF SECTION

Part 1 General

1.1 Reference Standards

- .1 CSA Group (CSA)
 - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.

1.2 Action And Informational Submittals

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for network lighting controls and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Complete assembly.
 - .2 Contact surfaces.
 - .3 Construction features.
 - .4 Wiring diagrams.

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 network lighting controls for incorporation into manual.

1.4 Delivery, Storage And Handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .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, in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect network lighting controls from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 Components

- .1 Components: to CSA C22.1.
- .2 Designed for lighting control up to and including 600 V 20 amp.
- .3 Integrally moulded thermoplastic, colour coded black for normal and red for emergency circuits.

- .4 Certified to make or break under full rated load.
- .5 Quick change frames with pre-assembled relays, transformer rectification, multi-recessed control ports, and one power-in plug and five power-out receptacles.
- .6 Cable sets consisting of starter cables, joiner cables, and control cables.
- .7 Low Voltage Switch Kit.
- .8 Occupancy Sensor Kit.
- .9 Ambient Light Sensor Kit.

2.2 Enclosures

- .1 Design enclosures for ceiling or wall mounting with stand-off uni-directional brackets.
 - .1 Hinged fail safe cover with interceptor openings.
 - .2 Constructed of metal with safety blue paint, ventilated back with side air inlets, and complete with sixteen receptacle knockouts.

2.3 Frames

- .1 Pre-install quick change frames into enclosure and complete with [10] maximum control ports, one power-in plug and five power-out receptacles.
 - .1 Power-out receptacles 4 of 5 are controlled by internal low voltage relays connected to the control ports.
 - .2 One power out receptacles is for circuit feeding unswitched.
 - .3 Each of 4 power-out receptacles is controlled using one low voltage switch kit and/or one occupancy sensor kit.
 - .4 Remaining 2 control ports are for connection to central computer.

2.4 Cable Sets

- .1 Two to nine conductor - No. 12 to 18 stranded Ultralx-105 armoured cable c/w integrally moulded male and/or female caps.
- .2 Factory assembled and integrally moulded.
- .3 Four metre minimum lengths. Allow 2 metre extra cable for relocation of fixtures and equipment where required.
- .4 Starter cables: complete with 1 end prepared for field installation and other end complete with integrally moulded female cap.
 - .1 Field prepared end: armour removed 150 mm and complete with locknutless connector and suitable for circuit connection to standard outlet box.
- .5 Joiner cables: integrally moulded male cap on one end and integrally moulded female cap on the other end.
- .6 Low voltage cables: one end prepared for field installation with locknutless box connector and six inch tails with mini-quick connector prepared for connection to low voltage switch kit or occupancy sensors kit. Other end complete with mini quick-connector for connection to the Smart-Light enclosure control ports.

2.5 Low Voltage Switch Kit

- .1 Complete with low voltage push button switch, three position backplate, and single cover plate.
 - .1 Low voltage switch is provided with six inch tails and mini quick-connector ready for connection to low voltage cable.

2.6 Sensor Kit

- .1 Complete with bar hanger and outlet box pre-assembled for insertion of low voltage cable locknutless box connector into outlet box.
 - .1 Ceiling mounting occupancy sensor with mini quick-connector for connection through 7/8 tile hole to low voltage control cable inserted in outlet box.

2.7 Central Control

- .1 Complete with one end connected with mini quick-connector for connection to Smart-Light enclosure control port. Other end complete with locknutless box connector and prepared with 36 inch tails for connection to central control panel.

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 network lighting controls installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 Installation

- .1 Install system and components in accordance with manufacturer's instructions.
- .2 Install starter cables to circuit outlet boxes and connect to power circuit and energize.
- .3 Install Smart-Light enclosures as shown on drawings and connect starter cable to power-in plug.
- .4 Connect joiner cables to each of power-out receptacles to first luminaire of controlled circuit as shown.
- .5 Install joiner cables between interceptors in fixtures or equipment. Allow extra cable to facilitate removal and relocation of fixtures or equipment.
- .6 Install blanking plugs in unconnected receptacles.
- .7 Integrally moulded thermoplastic components to match colour identification system (i.e. black for normal power, red for emergency power).
- .8 Install low voltage switch kits and low voltage cables as shown on drawings and connect to control ports of controlled circuits.
- .9 Install sensor kits and low voltage cables as shown on drawings and connect to control ports of controlled circuits.
- .10 Install central control kit from each or grouped Smart-Light enclosure to central control panel as shown on drawings.
 - .1 Connect to control port of Smart-Light as indicated.
 - .2 Connections within central control panel as instructed by control manufacturer.

3.3 Field Quality Control

- .1 On completion of installation, manufacturer representative shall be notified to carry out site inspection and report any inconsistencies to the Departmental Representative. Corrections are to be implemented to comply with manufacturer's report.

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 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse or 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 network lighting controls installation.

END OF SECTION

Part 1 General

1.1 Reference Standards

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No.29-15, Panelboards and Enclosed Panelboards.

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 and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings.
 - .2 Include on shop drawings:
 - .1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

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 panelboards for incorporation into manual.

1.4 Delivery, Storage And Handling

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
- .2 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 and in a safe, clean, dry, well-ventilated area.
 - .2 Store and protect equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 Panelboards

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250 V panelboards: bus and breakers rated for 10,000 A (symmetrical) interrupting capacity or as indicated.

- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Minimum of 2 flush locks for each panel board.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating of mains.
- .8 Mains: suitable for bolt-on breakers.
- .9 Trim with concealed front bolts and hinges.
- .10 Trim and door finish: baked enamel.
- .11 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.

2.2 Breakers

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Nameplate for each panelboard size 4 engraved.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

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 panelboards 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 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.

- .3 Connect loads to circuits.
- .4 Connect neutral conductors to common neutral bus with respective neutral identified.

3.3 Cleaning

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

3.4 Protection

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

END OF SECTION

Part 1 General

1.1 References

- .1 CSA International
 - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA C22.2 No.42.1-13(R2017), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D), Updates No. 1 (2016) and Update No. 2 (2020).
 - .3 CSA C22.2 No.55-15(R2020), Special Use Switches.
 - .4 CSA C22.2 No.111-18, General-Use Snap Switches (Trinational standard with UL 20 and NMX-J-005-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 wiring devices 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 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 Store and protect wiring devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 SWITCHES

- .1 15 A, 347 V, single pole, double pole, three-way, four-way switches to: CSA C22.2 No.55
- .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 White toggle.
- .3 Switches of one manufacturer throughout project.

2.2 Vacancy Sensors

- .1 15 A, 347 V, single pole
- .2 Mount: Ceiling or wall as noted on drawings.
- .3 Sensing technologies: Dual technology, equipped with both
 - .1 Passive infrared sensing
 - .2 Ultrasonic sensing
- .4 Sensitivity: adjustable
- .5 Automatic off: Adjustable from 5-30 minutes.
- .6 Vacancy Sensors of one manufacturer throughout project.

2.3 RECEPTACLES

- .1 Duplex receptacles with following features:
 - .1 Configuration: Type as specified and indicated.
 - .1 General: CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42
 - .2 20A: CSA type 5-20R, 125V, 20 A, U ground to CSA C22.2 No. 42.
 - .3 GFCI: Duplex receptacle with integral ground fault circuit interrupter to meet regulatory requirements complete with steady-on "Green-Power-On" and steady-on "Red-Power-Tripped Off" LED indicator lights.
 - .4 USB: CSA type 5-15R, 125V, 15 A, U ground with USB type A and type C chargers with smart chips optimized for USB power delivery. Type A port to be rated 2.4A@5V and type C to be rated 3A@5V.
 - .2 Specification grade.
 - .3 White urea moulded housing.
 - .4 Suitable for No. 10 AWG for back and side wiring.
 - .5 Break-off links for use as split receptacles.
 - .6 Eight back wired entrances, four side wiring screws.
 - .7 Triple wipe contacts and rivetted grounding contacts.
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.

2.4 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Stainless steel, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

2.5 Source Quality Control

- .1 Cover plates from one manufacturer throughout project.

Part 3 Execution

3.1 Installation

- .1 Switches:

- .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical or as indicated.
- .2 Receptacles:
- .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical.
 - .3 Install GFI type receptacles as indicated.
 - .4 Do not install devices back-to-back in wall.
- .3 Cover plates:
- .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.
- .4 Label:
- .1 Label all electrical devices with its circuit number.

3.2 Cleaning

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

3.3 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 Reference Standards

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No. 5, 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.

1.3 Delivery, Storage And Handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store circuit breakers indoors, in dry location, 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.

Part 2 Products

2.1 Breakers General

- .1 Moulded-case circuit breakers, 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 with temperature compensation for 40 degrees C ambient.
- .3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .4 Common-trip breakers: with single handle for multi-pole applications.
- .5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

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.

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

END OF SECTION

Approved: 2013-12-31

Part 1 General

1.1 Reference Standards

- .1 CSA Group
 - .1 CAN/CSA-C22.2 No.4-16 (R2020), Enclosed and Dead-Front Switches (Tri-National Standard, with NMX-J-162-ANCE-2016 and UL 98).

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 - 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 Section with manufacturer's written instructions and 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 a safe, 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.

Part 2 Products

2.1 Disconnect Switches

- .1 Horsepower rated, Non-fused disconnect switch in CSA enclosure, to CAN/CSA-C22.2 No.4 size as indicated.
- .2 Provision for padlocking in on-off switch position.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Quick-make, quick-break action.
- .5 ON-OFF switch position indication on switch enclosure cover.

2.2 Equipment Identification

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

Part 3 Execution

3.1 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.

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 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 and reuse.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 References

- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41.2-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F1137/F1137M-19, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International)
- .5 Underwriters' Laboratories of Canada (ULC)

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.

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 Divert unused metal materials from landfill to metal recycling facility.
- .4 Disposal and recycling of fluorescent lamps as per local regulations.
- .5 Disposal of old PCB filled ballasts as per PCB disposal procedures and regulations.

Part 2 Products

2.1 Led Luminaires And Drivers

- .1 All Luminaires
 - .1 Comply with IES LM-79-19 Approved Method for Optical and Electrical Measurements of Solid-State Lighting Products.
 - .2 Comply with IES LM-80-20 Approved Method for Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules.
 - .3 LED's shall be Restriction of Hazardous Substances Directive (RoHS) compliant.
 - .4 LED arrays shall be sealed, high performance, long life type; minimum 70% rated output at 50,000 hours.

- .5 LED luminaires shall deliver a minimum of 60 lumens per watt.
 - .1 LED's shall be "Bin No. 1" quality.
 - .6 Drivers shall be solid state and accept 347VAC at 60 Hz input.
 - .7 The LED light source shall be fully dimmable with use of compatible dimmers switch designated for low voltage loads.
 - .8 LED color temperatures: CRI 85, 4000K as noted +/- 275K unless otherwise noted.
 - .9 Luminaires shall have internal thermal protection.
 - .10 Luminaires shall not draw power in the off state. Luminaires with integral occupancy, motion, photo-controls, or individually addressable luminaires with external control and intelligence are exempt from this requirement. The power draw for such luminaires shall not exceed 0.5 watts when in the off state.
 - .11 Color spatial uniformity shall be within .004 of CIE 1976 diagram.
 - .12 Color maintenance over rated life shall be within .007 of CIE 1976.
 - .13 Indoor luminaires shall have a minimum CRI of 85.
 - .14 Luminaire manufacturers shall adhere to device manufacturer guidelines, certification programs, and test procedures for thermal management
 - .15 LED package(s)/module(s)/array(s) used in qualified luminaires shall deliver a minimum 70% of initial lumens, when installed in-situ, for a minimum of 50,000 hours.
 - .16 Luminaires shall be fully accessible from below ceiling plane for changing drivers, power supplies and arrays.
- .2 Power Supplies and Drivers
- .1 MB Hydro Powersmart approved.
 - .2 Power Factor: 0.90 or higher
 - .3 Maximum driver case temperature not to exceed driver manufacturer recommended in-situ operation.
 - .4 Output operating frequency: 60Hz.
 - .5 Interference: EMI and RFI compliant with FCC 47 CFR Part 15.
 - .6 Total Harmonic Distortion Rating: 20% Maximum.
 - .7 Meet electrical and thermal conditions as described in LM-80 Section 5.0.
 - .8 Primary Current: Confirm primary current with Drawings.
 - .9 Secondary Current: Confirm secondary current specified by individual luminaire manufacturers.
 - .10 Compatibility: Certified by manufacturer for use with individually specified luminaire and individually specified control components.
 - .11 Solid-state control components to be integral or external per each specified luminaire.
- .3 Controller and Control System
- .1 System electronics driver / controller to use coordinated communication protocols: 0-10V.
 - .2 The Contractor to ensure that external control equipment is compatible with LED control requirements
 - .3 Provide connector types and wiring as appropriate for un-interrupted communication between devices, considering distance maximums, field obstructions, and accessibility. Ensure that connection points are optically isolated for system noise reduction.
 - .4 Compatibility: Certified by manufacturer for use with individually specified luminaire and individually specified power supplies and/or drivers

2.2 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.3 Luminaires

- .1 As indicated in drawing schedules.

Part 3 Execution

3.1 Installation

- .1 Locate, relocate, and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Provide EMT conduit for luminaires. Flexible conduit for luminaires shall be limited, maximum length of 1500mm from junction box.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires from ceiling grid in accordance with local inspection requirements.

3.4 Luminaire Alignment

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 Cleaning

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

END OF SECTION

Part 1 General

1.1 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.141-15 (R2019), Emergency Lighting Equipment.
 - .2 CSA C860-11(R2016), Performance of Internally-Lighted Exit Signs.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 101-2018, Life Safety Code.

1.2 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.

Part 2 Products

2.1 Standard Units

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: extruded aluminum housing, enamel finish.
- .3 Face plates: extruded aluminum.
- .4 Lamps: LED <5.5W 50,000 hours.
- .5 Graphics: Green pictogram and graphical symbol and directional arrows to ISO 3864-1. Dimensions to ISO 7010.
- .6 Face plate to remain captive for relamping.
- .7 Supply voltage: Universal

Part 3 Execution

3.1 Manufacturer's Instructions

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

3.2 Installation

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits.
- .3 Ensure that exit light circuit breaker is locked in on position.

3.3 Cleaning

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

END OF SECTION

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.

Part 2 Products

2.1 System Description

- .1 Telecommunications raceways system consists of outlet boxes, cover plates, conduits, cable trays, pull boxes, sleeves and caps, fish wires, service poles, and service fittings.
- .2 Existing overhead cable tray distribution system to be extended.

2.2 Material

- .1 Conduits: EMT type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Cable trays: Basket-type, 305mm x 102mm.
- .3 Fish wire: polypropylene type.

Part 3 Execution

3.1 Installation

- .1 Modify and extend existing raceway system, including overhead distribution system, fish wire, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable tray, service poles, miscellaneous and positioning material to constitute complete system.

3.2 Cleaning

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

3.3 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 References

- .1 ICES-003 (Industry Canada): Interference-Causing Equipment Standard.
- .2 IEC 60065: Standard for Audio, Video and Similar Electronic Apparatus – Safety Requirements.
- .3 RoHS: Restriction of Hazardous Substances Directive 2002/95/EC.
- .4 UL 1310: Standard for Class 2 Power Units.
- .5 UL 2043: Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; 1996
- .6 UL 6500: Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use.
- .7 UL CL3P/CMP 75C: Communications cable intended for use in Class 2 or Class 3 circuits within buildings in ducts or plenums or other spaces used for environmental air.
- .8 ASTM E1573-18 The Measurement and Reporting of Masking Levels Using A-Weighted and One-Third-Octave-Band Sound Pressure Levels

1.2 Submittals

- .1 Product Data: Submit for each system component specified.
- .2 Manufacturer Instructions: Provide manufacturer's manuals for installation, startup and commissioning.
- .3 Shop Drawings: Provide the system design on an architectural floor plan showing the quantity, type and location of components, cabling and accessories.
- .4 Compliance Statement: Provide a signed document from an executive officer of the supplier stating that the system as proposed meets the Design and Performance Requirements.

1.3 Closeout Submittals

- .1 Warranty Documentation. Provide warranty documentation, with start date(s) and service contact(s).
- .2 Record Documentation: Provide the as-built system design on an architectural floor plan showing the quantity, type and location of components, cabling and accessories.
- .3 System Reports:
 - .1 Provide reports in electronic form.
 - .2 Report an inventory of electronic system components, including model number, serial number, and firmware version.
 - .3 Report the verified quantity of speakers installed per local control zone.
 - .4 Report all system settings.
 - .5 Report testing and commissioning data.
- .4 System Settings Backup: Provide an electronic backup file of all system settings.

1.4 Quality Assurance

- .1 Obtain required permits.
- .2 Follow applicable codes, including regulatory testing and certifications.
- .3 Source all sound masking equipment from a single supplier.
- .4 Source sound masking equipment from a manufacturer with a minimum of 10 years' experience manufacturing sound masking systems.
- .5 Have the system designed by an authorized manufacturer representative.
- .6 Ensure the installation contractor has received instruction on the specified products.
- .7 Have the system configured and commissioned by an authorized manufacturer representative or their approved contractor.
- .8 Ensure supplementary materials meet applicable standards.

1.5 Delivery, Storage And Handling

- .1 Protect equipment from moisture during shipping, storage and handling.
- .2 Deliver in manufacturer's original unopened and undamaged packages with manufacturer's labels legible and intact.
- .3 Inspect manufacturer's packages upon receipt.
- .4 Handle packages carefully.

1.6 Warranty

- .1 Provide a written product warranty covering sound masking components for defects in parts or assembly for a 5-year period from date of system startup.
- .2 Provide a written 1-year installation warranty.

Part 2 Products

2.1 Regulatory Testing And Certifications

- .1 Canada
 - .1 Safety and Electrical: IEC 60065
 - .2 Electromagnetic Interference (EMI): ICES-003
 - .3 Plenum Rated Cabling: CSA CMP 75C FT6
 - .4 Heavy Metals: RoHS
 - .5 Low Voltage Power Supplies: UL 1310

2.2 Design And Performance Requirements

- .1 System Architecture
 - .1 Provide a networked-decentralized system with addressable masking devices installed alongside the loudspeakers throughout the system area.
- .1 System Design

- .1 Design system in accordance with manufacturer's specifications.
- .2 Design system to cover all occupant spaces.
- .2 System Control
 - .1 Provide digital controls for all system settings.
 - .2 Provide a networked user interface for controlling and reviewing all system settings.
- .3 Masking Sound Generation
 - .1 Provide a sound masking generator for each local control zone.
 - .2 Provide a random masking sound generator. Alternatively, provide a pseudo-random generator with a cycle exceeding 24 hours and no noticeable repetitive pattern.
- .4 Sound Masking Control
 - .1 Provide each local control zone with independent control over the sound masking signal, including:
 - .1 An equalizer with at least 19 third-octave bands from 100 to 6,300 Hz.
 - .2 A volume control with 0.5 dBA increments over a range of 35 to 85 dBA, measured at a distance of one meter.
- .5 Sound Masking Commissioning and Tuning
 - .1 Provide automated field tuning of masking volume and frequency levels
 - .1 Adjust each local control zone in real time and based on site measurements to meet performance targets set out in Section 3.4.3.
- .6 Sound Masking Timer
 - .1 Provide a timer to adjust sound masking volume according to a programmed schedule.
 - .2 Provide 10 individually programmable timer zones.
 - .3 Allow each local control zone to be individually assigned to a timer zone.
 - .4 Allow unique schedules for each day of the week.
 - .5 Allow variable rates of volume adjustment for each scheduled change.
 - .6 Provide calendar-based programming.
 - .7 Provide programmable daylight saving time (DST) adjustments.
 - .8 Provide an acclimatization function to gradually increase the masking volume over a period of time, according to a programmed schedule and with independent schedules in each timer zone. Activate if system startup occurs post-occupancy.
- .8 System Diagnostics
 - .1 Include the capability of identifying masking devices that are not functioning.
- .9 System Reporting
 - .1 Provide a user interface for reading and displaying all current system settings.
 - .2 Include the ability to generate detailed reports of all system settings.
- .10 Physical and Electronic Security
 - .1 House below-ceiling electronic components in a locked metal enclosure.
 - .2 Password protect access to system control functions.
 - .3 Allow all settings to be backed up to an electronic storage medium.
- .11 Components

- .1 Network Control Panel
- .2 Primary Network Hub
- .3 Loudspeaker
- .4 Wall Mount Rack Swing Out 12U, 17" Depth, 10-32 threaded rack mounting rails 19" wide, fully enclosed with side and front doors.

Part 3 Execution

3.1 Examination

- .1 Ensure that the site is at a stage suitable for the system installation.
- .2 Ensure that the site is constructed according to plans including wall locations, ceiling types and plenum barriers.
- .3 Ensure planned power sources have been provided.
- .4 Ensure planned space is available for centrally located components.
- .5 Ensure third-party components interfacing with the system have been provided.

3.2 Installation

- .6 Follow manufacturer's installation manual.
- .7 Follow the system design for location of system components and wiring.
- .8 Record any necessary changes to the system design on the plan.

3.3 Site Quality Control

- .9 Ensure plenum height meets manufacturer's minimum specifications.
- .10 Ensure the distance between the top of the loudspeaker and the deck meets manufacturer's minimum specifications.
- .11 Suspend loudspeakers in a level manner.
- .12 Minimize obstructions to loudspeakers.
- .13 Support cables properly in the ceiling.
- .14 Securely terminate cables.

3.4 System Startup And Commissioning

- .1 Follow manufacturer's manuals for system startup.
 - .2 Follow manufacturer's manuals for configuration of system, according to Owner requirements, including timer, audio, occupant controls, diagnostic, and security functions.
 - .3 Sound Masking Commissioning
- .1 Set each control zone to the appropriate overall volume.

Area	Overall Volume (dBA)
Open Office	47.0
Private Office	43.0
Meeting Room	42.0
Corridor	47.0
Reception Area	47.0

- .2 Set each control zone to the sound masking curve.

Sound Masking Curve (45.0 dBA Overall Volume)

Band Center Frequency (Hz)	Target Band Level (dB)
100	46.9
125	45.9
160	44.7
200	43.9
250	42.7
315	41.4
400	40.4
500	38.9
630	37.4
800	35.4
1,000	33.7
1,250	31.4
1,600	29.4
2,000	27.4
2,500	24.9
3,150	22.4
4,000	19.4
5,000	16.4

Source: National Research Council of Canada sound masking curve from 100-5000 Hz. For curves at different overall volumes, adjust target band levels by 1 dB for each 1 dBA change in overall volume.

- .3 Commission the sound masking system with
 - .1 ceilings fully installed,
 - .2 all furnishings in place,
 - .3 mechanical systems operating at normal daytime levels, provided the existing sounds do not interfere with system commissioning
 - .1 in the event of interference, commission the sound masking system with the mechanical system off
 - .4 no occupant noise during measurements.
- .4 Select a commissioning location within each local control zone that reflects the seated position of an occupant in open plan areas or that of the primary occupant in a closed room.
 - .1 Mark the commissioning location precisely on the as-built system design.
 - .2 Assign the commissioning location an alphanumeric ID.
- .5 Conduct third-octave sound level measurements as per ASTM E1573-18:
 - .1 Use an ANSI Type 1 third-octave sound level analyzer.
 - .2 Set analyzer for A-weighted equivalent average level (Leq).
 - .3 Set analyzer for fast response.
 - .4 Hold the analyzer microphone oriented upwards at a height between 1.2 to 1.4 meters (4 to 4.7 feet) from the floor.
 - .5 Keep the analyzer at least 1 meter (3.3 feet) away from vertical or horizontal surfaces, to the extent possible.
 - .6 Move the analyzer through a slow horizontal arc of approximately 1 meter (3.3 feet), if possible while conforming to .3.4.5.5, but in any event no less than 60 centimeters (2 feet) during the measurement period.
 - .7 Measure for at least 15 seconds.
- .6 Conduct a third-octave sound level measurement with the sound masking deactivated to document existing conditions at each commissioning location.

- .1 Identify any third-octave band in existing conditions that exceeds the target band level for that location.
- .7 Using automated field tuning, adjust the sound masking at each commissioning location to conform to the sound masking curve and overall volume for that location, such that:
 - .1 The volume in each third-octave band from 100 Hz and 5000 Hz inclusive is within plus or minus two decibels (+/- 2 dB) of the target band level.
 - .1 Unless existing conditions exceed the maximum limit for the band.
 - .2 The overall volume is within plus or minus one half decibel (+/- 0.5 dBA) of the specified overall volume.
 - .1 Unless existing conditions cause overall volume to exceed tolerances.
- .8 If the sound masking curve and overall volume requirements are not met at a commissioning location, modify the system design, installation or commissioning, at the supplier's expense, until conformance is achieved.
 - .1 Unless deviation can be shown to be due to existing conditions.
- .4 Provide an electronic report of testing and commissioning data, including:
 - .1 As-built system design(s) showing all commissioning locations with ID references and local control zones.
 - .2 A table and graph of commissioned sound masking measurements for each commissioning location, including:
 - .1 Third-octave levels for bands within the sound masking curve.
 - .2 Overall volume level.
 - .3 The sound masking curve, overall volume and tolerances specified for that location.
 - .3 Explanation of any sound masking measurements which exceed tolerances for the sound masking curve or overall volume with a table and graph of existing conditions measurements for each such commissioning location, including:
 - .1 Third-octave levels for bands within the sound masking curve.
 - .2 Overall volume level.

3.5 Cleaning And Waste Management

- .1 Remove empty packaging and other material waste.
- .2 Clean system components where required.

3.6 Closeout Activities

- .3 Demonstrate operational system to Owner representative.
- .4 Review closeout submittals with Owner representative.
- .5 Train Owner representative to maintain system and use any occupant controls or interfaces, as required.
- .6 Review service and support contacts.

3.7 Attachments

- .1 System Design Schematic: Schematics of the system design on a floor plan showing the quantity and location of speakers and the size and location of local control zones.

END OF SECTION

Part 1 General

1.1 References

- .1 Government of Canada
 - .1 TB OSH Chapter 3-03, 1997-01-28, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire protection Electronic Data Processing Equipment.
 - .2 TB OSH Chapter 3-04, 1994-12-22, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-04, Standard for Fire Alarm Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-2014-AMD1, Amendment 1 to the 6th Edition Standard for Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525-2016, Audible Signal Device for Fire Alarm Systems.
 - .3 CAN/ULC-S526-2016, Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories.
 - .4 CAN/ULC-S527-2019, Standard for Control Units for Fire Alarms Systems.
 - .5 CAN/ULC-S528-2014, Standard for Manual Stations for Fire Alarm Systems, Including Accessories.
 - .6 CAN/ULC-529-2016, Standard for Smoke Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S530-M1991, Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .8 CAN/ULC-S531-2019, Standard for Smoke Alarms.
 - .9 CAN/ULC-S536-2019, Standard for Inspection and Testing of Fire Alarm Systems.
 - .10 CAN/ULC-S537-2019, Standard for Verification of Fire Alarm Systems.

1.2 Action And Informational Submittals

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Include:
 - .1 Layout of equipment.
 - .2 Zoning.
 - .3 Complete wiring diagram, including schematics of modules.
- .3 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 Verification and Inspection

- .1 On completion of the testing, submit to the Consultant, a Test Report for all new and modified devices certified by both the manufacturer and Electrical Contractor including
 - .1 A copy of the inspecting Technician's report showing location of each device and certifying the test results of each device.
 - .2 A Certificate of Verification confirming that the Inspection has been completed and showing the conditions upon which such Inspection and Certification have been rendered.
- .2 Include all costs for setting up and testing the fire alarm system.
- .3 As-builts
 - .1 Provide updated as-built drawing indicating all new and/or relocated fire alarm devices.

1.3 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.
- .3 System:
 - .1 To TB OSH Chapter 3-04.
 - .2 Subject to Fire Commissioner of Canada (FC) approval.
 - .3 Subject to FC inspection for final acceptance.

1.4 DELIVERY, STORAGE, AND HANDLING

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

Part 2 Products

2.1 Materials

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Visual signal devices: to CAN/ULC-S526.
- .3 Smoke detectors: to CAN/ULC-S529.

2.2 System Operation

- .1 Maintain and extend existing FA system to accommodate revised architectural layouts.
- .2 Existing fire alarm control panel Siemens Cerberus Pyrotronics.

2.3 Visual Alarm Signal Devices

- .1 Flush-mounted assembly of stroboscopic type suitable for use in electrically supervised circuit and powered from notification appliance circuits.

- .2 Appliances: minimum of 15 candela measured as approved by ULC, but not less than effective intensity required by National Building Code of Canada for appliance spacing and location as shown.
- .3 Protect lamps with thermoplastic lens and labelled "FIRE" in letters at least 12 mm high.
- .4 Provide visible appliances as indicated.
- .5 Visible appliances may be part of audio-visual assembly, where more than two appliances are located in same room or corridor.

2.4 Conduit

- .1 Electrical Metallic Tubing (EMT):

2.5 Wiring

- .1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.
- .2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor
- .3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.
- .4 Wire for connection to base telegraphic alarm loop: No. 12 AWG minimum solid copper conductor.
- .5 Insulation 90 degrees C minimum with nylon jacket.
- .6 Colour code wiring.

Part 3 Execution

3.1 Manufacturer's Instruction

- .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 and TB OSH Chapter 3-04.
- .2 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .3 Connect signalling circuits to main control panel.

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 and signalling circuits to ensure proper operation of system.

- .4 Class A circuits.
 - .1 Test each conductor on circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near midmost point of 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 near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
- .5 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 CLEANING

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

END OF SECTION