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PROJECT MANUAL
Issued for Tender

RCMP Manitou Detachment
RENOVATIONS
Manitou, Manitoba

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Part 1 General

1.1 TAXES

- .1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).

1.2 FEES, PERMITS and CERTIFICATES

- .1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.

1.3 CONSTRUCTION PROGRESS SCHEDULE

- .1 Schedule and execute work with least possible interference or disturbance to the normal use of premises.
- .2 On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion. When the Departmental Representative has reviewed schedule, take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.
- .3 Carry out work during "regular hours", Monday to Friday from 07:00 to 18:00 hours.
- .4 Give the Departmental Representative 48 hours notice for work to be carried out during "off hours".

1.4 PROJECT MEETINGS

- .1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording minutes.
- .2 Contractor Project Manager, Superintendent, major subcontractor required to attend.
- .3 Schedule: bi-weekly meeting for the duration of the Work.

1.5 SUBMITTAL PROCEDURES

- .1 Submit promptly to Departmental Representative submittals listed for review, in orderly sequence to not cause delay in work.
- .2 Do not proceed with work affected by submittals until review is complete.
- .3 Shop Drawings:
 - .1 Submit electronic (PDF) copies of shop drawings.
 - .2 The review is for the sole purpose of ascertaining conformance with the general design concept, and does not mean approval of the design details inherent in the shop drawings, responsibility for which shall remain with the Contractor. Such review shall not relieve the Contractor of responsibility for errors or omissions in

the shop drawings or of his responsibility for meeting all requirements of the Contract Documents.

- .4 Product Data:
 - .1 Submit electronic (PDF) copies of product data: manufacturers catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.
 - .2 Cross reference product data information to applicable portions on Contract Documents.
- .5 Samples:
 - .1 Submit samples: examples of materials, equipment, quality, finishes and workmanship.
 - .2 Where colour, pattern or texture is criterion, submit full range of samples.
 - .3 Reviewed and accepted samples will become standard of material and workmanship, against which installed work will be verified.
- .6 Submit photographs of interiors, surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

1.6 REGULATORY REQUIREMENTS

- .1 References and Codes:
 - .1 Materials shall be new and work shall conform to the minimum applicable standards of the “References” indicated in the specification sections, the National Building Code of Canada (NBC), including all amendments up to tender closing date, and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply.
- .2 Building Smoking Environment:
 - .1 Smoking is not permitted in the Building. Obey smoking restrictions on building property.

1.7 SAFETY

- .1 The Contractor agrees that it is Prime Contractor as designated under The Workplace Safety and Health Act of Manitoba and agrees to make itself knowledgeable, abide by and assume all relevant obligations attached to this designation.
- .2 Observe The Workplace Safety and Health Act W210 and relevant work regulations under the Act.
- .3 Contractor and its employees shall be covered by Workers Compensation for all Work.
 - .1 Contractor shall provide written evidence of coverage, satisfactory to Departmental Representative prior to commencing Work.

1.8 FIRE SAFETY REQUIREMENTS

- .1 Comply with both the National Building Code of Canada and the National Fire Code of Canada for safety of persons in buildings in the event of a fire and the protection of buildings from the effects of fire, as follows;
 - .1 The National Building Code (NBC): for fire safety and fire protection features that are required to be incorporated in a building during construction.
 - .2 The National Fire Code (NFC):
 - .1 The on-going maintenance and use of the fire safety and fire protection features incorporated in buildings.
 - .2 The conduct of activities that might cause fire hazards in and around buildings.
 - .3 Limitations on hazardous contents in and around buildings.
 - .4 The establishment of fire safety plans.
 - .5 Fire safety at construction and demolition sites.
- .2 Where work requires interruption or cause activation of fire alarms or fire suppression, extinguishing or protection systems:
 - .1 Provide “Watchman Service”. In general, watchman service is defined as an individual conversant with “Fire Emergency Procedures”, performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.
 - .2 Immediately upon completion of work, restore fire protection systems to normal operation and verify that all devices are fully operational.
 - .3 Inform fire alarm system monitoring agency and local Fire Department immediately prior to isolation and immediately upon restoration of normal operation.

1.9 QUALITY CONTROL

- .1 Review and Inspection of the Work:
 - .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. Coordinate date and time with regularly scheduled site visits performed by the Departmental Representative.
 - .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.

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

1.10 HAZARDOUS MATERIALS

- .1 Hazardous Materials: product, substance, or organism that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .2 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS) acceptable to Human Resources and Skills Development Canada (HRSDC), Labour Program.
- .3 For work in occupied buildings, give the Department Representative 48 hours notice for work involving hazardous substances (Canada Labour Code Part II Section 10), and before painting, caulking or using adhesives and other materials, that cause off gassing.

1.11 TEMPORARY UTILITIES

- .1 Existing services required for work, excluding power required for space temporary heating, may be used by the Contractor without charge. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.
- .2 Connect to existing power supply in accordance with Canadian Electrical Code.
- .3 Notify the Departmental Representative and utility companies of intended interruption of services and obtain requisite permission.
- .4 Give the Departmental Representative 48 hours notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Keep duration of these interruptions to a minimum. Carry out all interruptions after normal hours of the occupants.

1.12 CONSTRUCTION FACILITIES

- .1 Installation and Removal
 - .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
 - .2 Identify areas which have to be gravelled to prevent tracking of mud.
 - .3 Indicate use of supplemental or other staging area.
 - .4 Provide construction facilities in order to execute work expeditiously.
 - .5 Remove from site all such work after use.
- .2 Access Scaffold:
 - .1 Scaffolding: in accordance with CSA Z797 – Code of Practice for Access Scaffold.
 - .2 Provide and maintain scaffolding, ladders and platforms.
- .3 Site Storage:
 - .1 The Departmental Representative will assign storage space that shall be equipped and maintained by the Contractor.
 - .2 Do not unreasonably encumber site with materials or equipment.
 - .3 Move stored products or equipment that interferes with operations of Departmental Representative or other contractors.
 - .4 Obtain and pay for use of additional storage or work areas needed for operations.
 - .5 Do not load or permit to load any part of work with weight or force that will endanger work.
- .4 Where security is reduced by work provide temporary means to maintain security.
- .5 Sanitary facilities:
 - .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
 - .2 Others shall not be used.
 - .3 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .6 Signage:
 - .1 Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices, etcetera, in both official languages or by the use of commonly understood graphic symbols and to approval of the Departmental Representative.
 - .2 No advertising will be permitted on this project.
- .7 Construction Parking
 - .1 Parking will be permitted on site provided it does not disrupt performance of Work or access to private parking.
 - .2 Provide and maintain adequate access to project site.

- .8 Protection and Maintenance of Traffic
 - .1 Provide access and temporary relocated roads as necessary to maintain traffic.
 - .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
 - .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
 - .4 Protect travelling public from damage to person and property.
 - .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
 - .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
 - .7 Construct access roads necessary.
 - .8 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
 - .9 Dust control: adequate to ensure safe operation at all times.
 - .10 Location, grade, width, and alignment of access roads: subject to approval by Departmental Representative.
 - .11 Lighting: to assure full and clear visibility for full width of access road and work areas during night work operations.
 - .12 Provide snow removal during period of Work.
 - .13 Remove, upon completion of work, access roads designated by Departmental Representative.

1.13 TEMPORARY BARRIERS AND ENCLOSURES

- .1 Maintain existing services to building and provide for personnel and vehicle access.
- .2 Hoarding:
 - .1 Design, erect and maintain temporary site enclosure, pedestrian walkways and provide protection, complete with signs and electrical lighting as required by authority having jurisdiction.
- .3 Weather Enclosures: protect work temporarily until permanent enclosures completed.
- .4 Dust Control:
 - .1 Provide dust tight screens or partitions to localize dust-generating activities, and for protection of workers, finished areas of work and public.
 - .2 Maintain and relocate protection until such work is complete.
 - .3 Protect all furnishings within work area with 0.102mm thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.

- .5 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- .6 Protection:
 - .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.
 - .5 Protect work against damage until take-over.
 - .6 Protect adjacent work against the spread of dust and dirt beyond the work areas.
 - .7 Protect operatives and other users of site from all hazards.

1.14 COMMON PRODUCT REQUIREMENTS

- .1 Quality of Work:
 - .1 Carry out work using qualified licenced workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.
 - .2 Permit employees registered in Provincial apprenticeship program to perform specific tasks only if under direct supervision of qualified licenced workers.
 - .3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.
- .2 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.
 - .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove packaging or bundling until required in work.
- .3 Manufacturer's Instructions: 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
- .4 Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - .1 Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - .2 Departmental Representative's Action: If necessary, Departmental Representative will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Departmental Representative will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or

- seven days of receipt of additional information or documentation, whichever is later.
- .1 Use product specified if Departmental Representative does not issue a decision on use of a comparable product request within time allocated.
 - .5 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, unless indicated otherwise, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
 - .6 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.
 - .7 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
 - .8 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
 - .9 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.
 - .10 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.

1.15 EXAMINATION AND PREPARATION

- .1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.
- .2 Before commencing work, establish location and extent of services lines in area of work and notify Departmental Representative of findings.
- .3 Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

- .1 Examine walls and floors for suitable conditions where products and systems are to be installed.
- .2 Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- .4 Preparation:
 - .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
 - .2 After uncovering, inspect conditions affecting performance of Work.
 - .3 Beginning of cutting or patching means acceptance of existing conditions.
 - .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
 - .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.
- .5 Start of construction or any part thereof constitutes acceptance of existing conditions and implies dimensions have been considered, verified and are acceptable.

1.16 EXECUTION

- .1 Cut, Patch and Make Good:
 - .1 Cut existing surfaces as required to accommodate new work.
 - .2 Remove all items so shown or specified.
 - .3 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.
 - .4 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 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.
- .2 Sleeves, Hangers and Inserts: co-ordinate setting and packing of sleeves and supply and installation of hangers and inserts. Obtain Departmental Representative's approval before cutting into structure.
- .3 Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from site.

- .4 Execution:
 - .1 Execute cutting, fitting, and patching to complete Work.
 - .2 Fit several parts together, to integrate with other Work.
 - .3 Uncover Work to install ill-timed Work.
 - .4 Remove and replace defective and non-conforming Work.
 - .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
 - .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
 - .7 Fit Work airtight and watertight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 - .8 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
 - .9 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.17 WASTE MANAGEMENT

- .1 Keep facility clean and clear of construction debris daily and on completion of Work.
 - .1 Clear and clean work site to satisfaction of, and in accordance with directions of Consultant.
- .2 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .3 Provide and use clearly marked separate bins for recycling wherever facilities are available.
 - .1 Dispose of recyclable materials, to appropriate facilities except where otherwise specified, in accordance with authority having jurisdiction.
- .4 Provide on-site containers for collection of waste materials and debris.
 - .1 Locate for least interference with work activities.
 - .2 Remove construction debris, waste materials, packaging material from work site daily.
- .5 Do not burn or bury waste materials.
- .6 Do not dispose of rubbish and waste in waterways, storm and sanitary sewers.
- .7 Store volatile, hazardous waste in designated covered metal containers, and remove from premises at end of each working day.
- .8 Dispose of unused paint, adhesive, caulking material, volatile materials at official hazardous waste material collections site.
- .9 Handle and transport hazardous and toxic waste in accordance with Transportation and Dangerous Goods Act, 1999.

- .10 Provide Consultant with shipping manifests and bills of lading to verify legal disposal of hazardous and toxic waste materials.

1.18 CLOSEOUT PROCEDURES

- .1 Review And Takeover Procedures:
 - .1 Prior to application for Certificate of Performance of the Work, carefully inspect the Work and ensure that it is complete, and that major and minor construction deficiencies are complete and corrected.
 - .1 Notify Departmental Representative in writing of satisfactory completion of inspection and request Departmental Representative's final review.
 - .2 If Departmental Representative determines that work is incomplete, a list of deficiencies will be provided to the Contractor.
 - .1 Incomplete Work will require additional site visit(s) by the Departmental Representative.
 - .2 Quantity and frequency of additional visits will be determined by Departmental Representative and Owner.
 - .3 Costs for additional visits borne by Contractor at no additional cost to Owner in accordance with Section 00 72 00 – General Requirements.
 - .1 Departmental Representative will submit costs to Owner in amount of \$3 500 per visit.
 - .2 Costs will be deducted from final payment certificate.
 - .2 Final Review For Completion Of The Contract:
 - .1 When satisfied that the entire work is complete, make a final inspection of the Work to confirm completion prior to requesting Departmental Representative's final review.
 - .2 Notify Departmental Representative in writing of satisfactory completion, and request a final review by the Departmental Representative.
 - .1 The Departmental Representative will in turn notify the Owner.
 - .2 Submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by authorities having jurisdiction have been submitted.
 - .5 As-built drawings and Operation and Maintenance manuals have been submitted.
 - .6 Service and maintenance contracts, spare parts and maintenance materials, etc. have been submitted.

- .7 Operation of systems have been demonstrated to Owner's personnel.
- .8 Warranty and Bond certificates have been submitted.
- .9 Work is complete and ready for final inspection.
- .3 When the Departmental Representative considers that all deficiencies have been corrected and it appears that requirements of the Contract have been performed, make application for Certificate of Performance of the Work.
- .4 Departmental Representative will complete final review of the Work within 10 calendar days of the receipt of written request from the Contractor.
 - .1 Departmental Representative's final review shall constitute the review before issuance of the Final Certificate for Payment.
- .5 The final review team shall include:
 - .1 The Departmental Representative and subconsultants as required.
 - .2 Contractor, and Subcontractors deemed necessary by the Contractor.
 - .3 Owner.
- .6 If required, Departmental Representative will list defects or deficiencies determined by this review, and will provide a copy to the Contractor.
 - .1 The list will be recognized as a final list for purposes of acceptance of the Work under the Contract.
 - .2 A re-review by the Departmental Representative of major defects and deficiencies as determined by the Departmental Representative shall be called for by the Contractor following its own inspection, to take place within 7 calendar days from the date of the request.
 - .1 Costs for re-review: borne by Contractor as noted under Review and Take-over procedures.
- .7 The Contractor shall thereafter submit invoice for Final Payment.
- .3 Departmental Representative's Final Payment Certificate
 - .1 When the Departmental Representative is satisfied that all defects and deficiencies have been corrected, the Departmental Representative shall issue to the Owner, with a copy to the Contractor, a Final Payment Certificate for the remaining moneys due the Contractor under the Contract.
 - .2 Final payment shall be made to the Contractor, who in turn shall make final payment to the Sub-Contractor.
- .4 Warranty Period
 - .1 The Owner will give prompt notice in writing to the Contractor of any defects, as defined by the Contract, noted during the warranty periods requesting him to remedy such defects promptly.
 - .2 During the month prior to the end of the one-year warranty period, the Owner, Departmental Representative and Contractor shall conduct a review of the project; the Contractor shall promptly remedy any defects due to faulty materials, equipment or workmanship of the Work of the Contract.

1.19 CLOSEOUT SUBMITTALS

- .1 Submittals:

- .1 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .2 Furnish evidence, if requested, for type, source and quality of products provided.
- .3 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .4 Pay costs of transportation.
- .2 Operational and Maintenance Manuals:
 - .1 Two (2) weeks prior to final inspection of the work, submit to Departmental Representative four (4) copies of approved Operations Data and Maintenance Manual in both official languages, compiled as follows:
 - .1 Bind data in vinyl hard cover 3 "D" ring type loose-leaf binders for 212 x 275mm size paper. Binders must not exceed 75mm thick or be more than 2/3 full.
 - .2 Enclose title sheet labelled "Operation Data and Maintenance Manual," project name, date and list of contents. Project name must appear on binder face and spine.
 - .3 Organize contents into applicable sections of work to parallel project specifications breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.
 - .2 Include following information plus data specified:
 - .1 Maintenance instruction for finished surface and materials.
 - .2 Copy of hardware schedules.
 - .3 Maintenance: use clear drawings, diagrams or manufacturers' literature which specifically apply and detail the following:
 - .1 lubrication products and schedules;
 - .2 trouble shooting procedures;
 - .3 adjustment techniques; and
 - .4 operational checks.
 - .4 Suppliers' names, addresses and telephone numbers and components supplied by them must be included in this section. Components must be identified by a description and manufacturers part number.
 - .5 Guarantees showing:
 - .1 name and address of projects;
 - .2 guarantee commencement date (date of Interim Certificate of Completion);
 - .3 duration of guarantee;
 - .4 clear indication of what is being guaranteed and what remedial action will be taken under guarantee; and
 - .5 signature and seal of Guarantor.
 - .6 Additional material used in project listed under various Sections showing name of manufacturer and source of supply.
 - .3 Spare parts: list all recommended spares to be maintained on site to ensure optimum efficiency. List all special tools appropriate to unique application. All

parts/tools detailed must be identified as to manufacturer, manufacturer part number and supplier (including address).

.4 Include one complete set of final shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.

.3 Records:

.1 As work progresses, maintain accurate records to show deviations from contract drawings. Just prior to Departmental Representative's inspection for issuance of final certificate of completion, supply to the Departmental Representative one (1) set of white prints and one (1) copy of project manual with all deviations neatly inked in. The Departmental Representative will provide two sets of clean white prints for this purpose.

.4 Guarantees and Warranties:

.1 Before completion of work collect all manufacturer's guarantees or warranties and submit to Departmental Representative.

1.20 CLEANING

.1 Clean up as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.

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

.3 Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage.

.4 Clean and polish glass, aluminum, stainless steel, baked or porcelain enamel, plastic laminate and other plastic surfaces, floors, and hardware. Clean manufactured articles in accordance with manufacturer's written instructions.

.5 Clean areas under contract to a condition equal to what previously existed and to approval of Departmental Representative.

.6 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

1.21 SECURITY CHECK

.1 All personnel employed on this project will be subject to security check. Obtain requisite clearance, as instructed, for each individual required to enter the premises.

.2 Personnel will be checked daily at start of work shift and given a pass, which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

1.22 SECURITY CLEARANCE

.1 Contractor's personnel will require satisfactory RCMP initiated security screening in order to complete Work in premises and on site.

- .2 Obtain requisite clearance, as instructed, for each individual required to enter premises.

1.23 COST BREAKDOWN

- .1 Before submitting first progress claim, submit breakdown of Contract Amount in detail as directed by Departmental Representative and aggregating the Contract Amount. After approval by Departmental Representative cost breakdown will be used as the basis of progress payments.

1.24 PRECEDENCE

- .1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

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Part 1 General

1.1 DEFINITIONS

- .1 Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos, PCBs, CFCs, HCFCs poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.
- .3 Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- .4 Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage. Store materials scheduled for reuse in the Work; include fasteners or brackets needed for reattachment elsewhere. Deliver salvaged materials scheduled for reuse to Departmental Representative-designated location.
- .5 Selective Demolition: Removal of a portion of an existing structure involving the systematic removal of some construction elements.

1.2 REFERENCES

- .1 National Building Code of Canada (NBC)
 - .1 Part 8, "Safety Measures at Construction and Demolition Sites", and Provincial requirements
- .2 National Fire Code of Canada (NFC)
 - .1 Section 5.6, Division B Construction and Demolition Sites

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Selective Demolition Meeting: Conduct meeting at Project site. Convene meeting at least one week prior to beginning work of this Section to:
 - .1 Verify project requirements.
 - .2 Review procedures for noise control and dust control.
 - .3 Review procedures for protection of adjacent building elements, components and finishes.
 - .4 Review requirements of work that rely on substrates exposed by selective demolition operations.
 - .5 Review areas where existing construction is to remain and requires protection.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 10 – General Instructions.

- .2 Proposed Protection Measures: Submit description of proposed measures for protecting individuals and property including but not limited to components and finishes scheduled to remain; and for dust control and noise control. Indicate proposed locations and construction of temporary barriers.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Dispose of materials that are not scheduled for salvage and cannot be recycled, in accordance with applicable codes at licensed facilities.

1.6 ENVIRONMENTAL PROTECTION

- .1 Ensure that selective demolition work does not adversely contribute to excess air and noise pollution.
- .2 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout Work.

1.7 EXISTING CONDITIONS

- .1 Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent areas without written permission from Departmental Representative or authorities having jurisdiction.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 EXAMINATION

- .1 Examine existing conditions to ascertain full extent of work and determine existing conditions as well as requirements for protection of adjacent work, and items to remain.
- .2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

3.2 PROTECTION

- .1 Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Departmental Representative, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- .2 Do not damage or deface existing construction, equipment or finishes indicated to remain.
- .3 Provide temporary dust screens, covers, railings, supports and other protection as required. Refer to Section 01 00 10 – General Instructions.

3.3 SELECTIVE DEMOLITION

- .1 Selectively demolish and remove existing construction only to extent required by future construction and as indicated.
- .2 Except for items specifically noted for salvage or requested by Departmental Representative, waste and abandoned materials and equipment are the Contractor's property. Promptly remove from site.
- .3 Carry out demolition in an orderly and careful manner.
- .4 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.
- .5 Protect interiors of parts not to be demolished from exterior elements at all times.
 - .1 Provide plywood closures acceptable to Departmental Representative for openings in exterior building enclosure.
- .6 Lower waste materials in controlled manner; do not drop or throw materials from heights.
- .7 Contain fibrous materials (e.g. insulation) to minimize release of airborne fibres while being transported within facility.
- .8 Demolish to minimize dusting. Keep materials wetted.

3.4 REMOVAL FROM SITE

- .1 Remove and dispose of demolished materials off-site in accordance with authorities having jurisdiction, and Section 01 00 10 – General Instructions.
- .2 Burning of materials on site is not permitted.

3.5 CLEANING AND RESTORATION

- .1 Waste Management: Separate waste materials for reuse or recycling and dispose of waste materials in licensed facility.
- .2 Divert excess materials from landfill.
- .3 Keep site clean and organized throughout demolition procedure.
- .4 Upon completion of project, reinstate areas affected by Work to condition which existed prior to beginning of Work.

END OF SECTION

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Part 1 General

1.1 SUMMARY

- .1 Section includes infill of existing concrete slab depression.

1.2 REFERENCES

- .1 National Building Code of Canada 2015.
- .2 ASTM International (ASTM)
 - .1 ASTM C260-01, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C494/C494M-05, Standard Specification for Chemical Admixtures for Concrete.
 - .3 ASTM D1751-04(2008) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- .3 Canadian Standards Association (CSA)
 - .1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-A3000-03, Cementitious Materials.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 – General Instructions.
- .2 Provide testing and inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .4 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 00 10 – General Instructions.
- .2 Use trigger operated spray nozzles for water hoses.
- .3 Designate cleaning area for tools to limit water use and runoff.

- .4 Carefully coordinate the specified concrete work with weather conditions.
- .5 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .6 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal. Dispose of waste in accordance with applicable local, provincial and national regulations.
- .7 Choose least harmful, appropriate cleaning method which will perform adequately.

1.5 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 MATERIALS

- .1 Portland cement to CSA-A3001.
- .2 Supplementary cementing materials: to CSA A3001.
- .3 Cementitious hydraulic slag: to CAN/CSA A3000.
- .4 Water: to CAN/CSA-A23.1.
- .5 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density, except as otherwise specified.
- .6 Air entraining admixture: to ASTM C260.
- .7 Chemical admixtures: to ASTM C494. Obtain Departmental Representative approval before using accelerating or set retarding admixtures during cold and hot weather placing.
- .8 High Range Water-Reducing Admixtures (HRWRA): Conform to ASTM C1017/C
- .9 Pozzolanic Mineral: conforming to CAN/CSA-A23.1.
- .10 Concrete retarders: to ASTM C494 water based, low VOC, solvent free. Do not allow moisture of any kind to come in contact with retarder film.

- .11 Shrinkage Reduction Admixture: non-chloride based chemical admixture designed to reduce concrete drying shrinkage conforming to requirements of ASTM C494.
- .12 Grout: Portland Cement based non-shrink, non-metallic composition, meeting following requirements:
 - .1 Not exhibit bleeding or segregation at pumpable consistency.
 - .2 Compressive Strength: 25 MPa at 1 day.
 - .3 Bond Strength (ASTM C882) 13 MPa @ 28 days.
 - .4 Positive expansion confirmed by ASTM C827.
 - .5 Not produce a vapour barrier.
- .13 Non-premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 35 MPa at 28 days.
- .14 Cure and sealing compound: to CSA-A23.1 and ASTM C309, Type 1.
 - .1 Maximum VOC Content: 100 g/L (less water)
- .15 Pre-moulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
- .16 Polyethylene film: 0.254 mm thickness to CAN/CGSB-51.34 under slabs on grade.
- .17 Structural Epoxy Adhesive: two component epoxy resin for crack injection, to ASTM C881, Type IV, Grade 1, Class B&C.

2.2 MIXES

- .1 General: Provide concrete mix to the following requirements:
 - .1 Exposure Class: N
 - .2 Compressive Strength: 30 MPa @ 28 days
 - .3 Hydraulic Cement Type: GU – General Use
 - .4 Aggregate Size: 20mm maximum
 - .5 Slump: 90mm ± 30mm
- .2 Toppings: Provide proprietary self-consolidating concrete mix incorporating pozzolanic minerals, high range water-reducing admixtures, and shrinkage reducing admixtures; suitable for self-leveling topping thickness indicated with following properties:
 - .1 Exposure Class: N
 - .2 Compressive Strength: minimum 30 MPa @ 28 days.
 - .3 Visual Stability Index: Stable or Highly Stable as follows:
 - .1 Highly Stable: No evidence of segregation in slump flow test, mixer drum or wheelbarrow.

- .2 Stable: No mortar halo or aggregate pile in slump flow test, but some slight bleed or air popping on surface of concrete in mixer drum or wheelbarrow is permitted.
- .4 Slump Flow: 600mm ± 50mm tested as follows:
 - .1 Dampen standard slump cone and place on flat, moist, non-absorbent surface that has minimum radius of 510 mm from center of slump cone.
 - .2 Procure concrete sample in accordance with applicable section of ASTM C143.
 - .3 Using sampled concrete, fill slump cone in one lift to top without rodding. Strike off any excess concrete above slump cone.
 - .4 Remove slump cone by carefully raising it vertically distance of 300 mm over approximate time of 5 seconds. Ensure slump cone is raised directly upward with no lateral or twisting motion.
 - .5 Wait for flow to stop and measure spread in two places perpendicular to one another. Average of two readings expressed in millimetres shall be recorded as slump flow.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
 - .1 Provide 72 hours minimum notice prior to placing of concrete.
- .2 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .3 Pumping of concrete is permitted only after approval of equipment and mix.
- .4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 Protect previous Work from staining.
- .6 Clean and remove stains prior to application for concrete finishes.
- .7 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .8 Where concrete toppings are placed over existing concrete slabs, and new concrete infill, prepare concrete surface by mechanical abrasion to profile CSP 3 as described in the International Concrete Repair Institute (ICRI) Guideline 03732, and repair existing cracks as follows:
 - .1 Review existing concrete substrate in company of Departmental Representative to identify cracks requiring injection.

- .1 Schedule: perform review following abrasion and profiling of existing concrete substrate.
- .2 Measure length of cracks requiring injection. Include 10 linear metres of cracks to be repaired.
- .3 Record in written report to Departmental Representative, including location referenced by room number, location in room, and measured length.
- .4 Ensure substrate adjacent to crack is clean and sound to accept surface seal.
 - .1 Mechanically abrade where surface contaminants present that impair bond of sealing material.
- .5 Blow cracks clean with oil-free compressed air.
- .9 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2
- .2 Crack injection:
 - .1 Set injection ports into or onto cracks spaced in accordance with manufacturer's recommendation to allow injection of adhesive without restriction in crack.
 - .2 Apply manufacturer's surface sealer between injection ports.
 - .1 Allow sealer to cure sufficiently to resist subsequent injection pressures.
 - .3 Fill cracks, identified in company of Departmental Representative, with structural epoxy adhesive in accordance with manufacturer's written recommendations.
 - .4 Remove surface sealer once adhesive is sufficiently cured to prevent run-out or smearing on adjacent surfaces.
 - .5 Remove injection ports and remove adhesive protrusions flush to surface of substrate.
- .3 Toppings.
 - .1 Topping mixture to meet following requirements:
 - .1 Bonded overlay, thickness indicated on drawings.
 - .2 In pouring base course, make allowance for bonded overlay topping thickness.
 - .3 Place bonded topping over base course in accordance with CAN/CSA-A23.1 and topping manufacturer's recommendations.
 - .4 Follow instructions by Departmental Representative in case conflicting requirements arise between CAN/CSA-A23.1 and manufacturer's recommendations.
 - .5 Apply manufacturer's recommended epoxy bonding agent to base course in accordance with CAN/CSA-A23.1 and manufacturer's recommendations before placing bonded topping. Observe manufacturer's safety recommendations.
 - .6 Locate joints in topping to match those in base course.
- .4 Joint fillers.

- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .2 Locate and form isolation expansion joints as indicated. Install joint filler.

3.3 FINISHING HORIZONTAL SURFACES

- .1 Following consolidation and screeding, immediately bull-float surface to close and smooth the surface.
 - .1 Toppings: comply with manufacturer's written instructions for consolidation.
- .2 Under adverse conditions only, excess bleed water may be removed from surface using procedures acceptable to DCC Representative and those noted in CSA-A23.1. Ensure surface is not damaged.
- .3 It is imperative that finishing be completed before surface of concrete dries, otherwise extensive cracking will result. Follow CPCA and CSA-A23.1 procedures and recommendations.
- .4 Ensure uniform, level surface is obtained.
- .5 Immediately after final finishing, apply additional coat of evaporation reducer to prevent drying shrinkage. Apply at manufacturer's recommended coverage. Do not apply evaporation reducer during any finishing operation nor should it be worked into surface.
- .6 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
 - .1 Specified finish: Class A as defined by CSA-A23.1, and meeting following requirements:
 - .1 FF = 20
 - .2 FL = 15
 - .3 SWI = 4
 - .4 Surface texture: Steel trowel finish as per CSA-A23.1 Section 7.5.4.3.
 - .5 Surface free of all trowel marks and ridges.

3.4 JOINTS

- .1 Install control joints at locations shown on the drawings.
- .2 Where slabs on fill abut curbs, walls and other vertical surfaces use pre-moulded joint filler.
- .3 Round edges, including edges of joints with a 10 mm radius edging tool.
- .4 Control joints in flatwork and curbs shall be formed at locations specified on the drawings or alternatively sawcut via specialized dry-process cutting (e.g. Soff Cut) to depth indicated on the structural drawings.

- .1 Dry-process saw cutting to occur immediately upon initial set of concrete. Timing of dry-process saw cutting will vary with weather conditions however are typically completed within 1 to 4 hours after final finishing.
- .2 Timing of dry-process saw cutting will be responsibility of Contractor.
- .3 Sawcutting 24 hours following placement will not be permitted.
- .4 Upon minimum 28 day cure, re-cut joints to 12 mm wide by 10 mm deep. Prepare surface and infill with sealant in accordance with Section 07 92 00 – Joint Sealants.
- .5 Unless otherwise indicated, fill control and construction joints with pre-moulded joint filler.

3.5 CURING

- .1 Cure and protect concrete in accordance with requirements of Section 7.4 of CSA A23.1.
- .2 Concrete surfaces to be cured at a minimum temperature of 10°C for the entire curing period.
- .3 Curing regime shall conform to Table 20 of CSA A23.1 and shall depend upon class of exposure.
- .4 Upon final finishing of concrete, and once concrete has hardened sufficiently to prevent surface damage, curing shall commence. Curing of concrete surfaces for curing Types 1 and 2 in Table 20 of CSA A23.1 shall be achieved using one or more of following methods:
 - .1 Curing compound as per section 2.1.11. Apply curing compound per manufacturer's recommendations.
 - .2 Waterproofing paper or plastic film;
 - .3 Forms in contact with concrete surface;
- .5 Additional curing requirements are required for concrete containing a high volume of supplementary cementing materials, such as fly ash, per CSA A23.1 Section 8.8.
- .6 Workers shall not be allowed on concrete for 12 hours after placement. Ensure that curing method does not interfere with concrete placing operations, or damage surface of freshly placed concrete.

3.6 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by inspection/testing agency in accordance with CAN/CSA-A23.2.
- .2 Inspection and testing of concrete and concrete materials by Testing Laboratory designated and paid for by Departmental Representative.
- .3 Take three test cylinders from each 75 cubic metres of each class of concrete placed or for each day of concrete placement if the latter is less than 75 cubic metres. Testing shall be as follows:

- .1 One 7 day laboratory cured test.
- .2 Two 28 day laboratory cured tests.
- .4 Take one additional test cylinder during cold weather concreting. Cure cylinder on job site under same conditions as concrete which it represents.
- .5 Make at least one slump test for each set of test cylinders taken.
- .6 Cure concrete test cylinders in location designated by testing agency for a minimum of 48 hours prior to transporting to laboratory.
- .7 Additional testing required due to low, inaccurate or otherwise questionable results shall be paid for by this Section.
- .8 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2M.
- .9 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve him/her of contractual responsibility. Testing agency shall report all results of testing found to be outside specified amounts to the Contractor and the Departmental Representative.
- .10 Number of trial mixes employed shall be sufficient to satisfy Departmental Representative that specified air dry density will be met or exceeded.
- .11 Test each type aggregate for gradation, other properties to CAN/CSA-A23.2. Minimum 22.68 kg samples.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .2 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
 - .3 ASTM F2329-13, Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
- .2 Canadian Standards Association (CSA International)
 - .1 CSA O112 Series-M1977 R06, CSA Standards for Wood Adhesives.
 - .2 CSA O121-08, Douglas Fir Plywood.
 - .3 CSA O141-05 R09, Softwood Lumber.
 - .4 CSA O151-09, Canadian Softwood Plywood.
 - .5 CSA O325-07 R12, Construction Sheathing.
- .3 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2005.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions

1.3 QUALITY ASSURANCE

- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling and dispose of waste materials in licensed facility.

Part 2

Products

2.1 FRAMING AND STRUCTURAL MATERIALS

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

2.2 PANEL MATERIALS

- .1 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.0.
- .2 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .3 Canadian softwood plywood (CSP): to CSA O151, standard construction.

2.3 ACCESSORIES

- .1 General purpose adhesive: Polyurethane based moisture curing adhesive compatible with materials being adhered.
- .2 Nails, spikes and staples: to ASTM F1667-11ae1.
- .3 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .4 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.
- .5 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001coating designation.

2.4 FASTENER FINISHES

- .1 Galvanizing: to ASTM A153, Class D, and ASTM F2329, use galvanized fasteners for exterior work, interior highly humid areas, and pressure-preservative treated lumber.

Part 3 Execution

3.1 INSTALLATION

- .1 Comply with requirements of NBC 2010 Part 3 supplemented by following paragraphs.

- .2 Install members true to line, levels and elevations, square and plumb.
- .3 Construct continuous members from pieces of longest practical length.
- .4 Install spanning members with "crown-edge" up.
- .5 Select exposed framing for appearance. Install materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
- .6 Install furring and blocking as required to space-out and support casework, cabinets, electrical equipment mounting boards, and other work as required.
 - .1 Concealed Blocking: Provide 19 mm CSP panel material in accordance with requirements of other sections except provide dimensional lumber blocking where required by manufacturer of product being supported.
- .7 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .8 Install wood fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
- .9 Use dust collectors and high quality respirator masks when cutting or sanding wood .

3.3 ERECTION

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

END OF SECTION

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Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Wood trim and cladding.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .2 Architectural Woodwork Institute (AWI)/Architectural Woodwork Manufacturers Association of Canada (AWMAC)/Woodwork Institute (WI)
 - .1 AWI/AWMAC/WI Architectural Woodwork Standard, Edition 2 (AWS)
- .3 National Hardwood Lumber Association (NHLA)
 - .1 Rules for the Measurement and Inspection of Hardwood and Cypress, 2007.
- .4 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber, 2010.

1.3 QUALITY ASSURANCE

- .1 Perform work in accordance with AWI/AWMAC AWS Edition 2, Custom grade, unless specified otherwise.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials of this section in accordance with Section 01 00 10 – General Instructions.
- .2 Protect millwork against dampness and damage during and after delivery.
- .3 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials and dispose of waste materials in licensed facility.
- .2 Do not burn scrap at the project site.

1.6 SITE CONDITIONS

- .1 Environmental Limitations: Do not deliver or install architectural woodwork and interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- .2 Do not install architectural woodwork and finish carpentry materials that are wet, moisture damaged, or mould damaged.
- .3 Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.

Part 2 Products

2.1 MATERIALS

- .1 General: Provide materials that comply with requirements of AWI/AWMAC's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- .2 Wood materials: products containing no added urea-formaldehyde.
- .3 Softwood lumber: unless specified otherwise, S4S, moisture content 15% or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 AWMAC custom grade, moisture content as specified.
- .4 Hardwood lumber: moisture content 4 to 9% or less in accordance with following standards:
 - .1 National Hardwood Lumber Association (NHLA).
 - .2 AWMAC custom grade, moisture content as specified.
- .5 Douglas fir plywood (DFP): to CSA O121, 7-ply veneer core, G1S, S4S, moisture content 4 to 9% or less.
- .6 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .7 Nails and staples: To ASTM F1667.
- .8 Wood screws: material, type and size to suit application.
- .9 Sealant: To ASTM C920 Type S, Grade NS, Class 25, use NT, silicone, mildew-resistant.

2.2 FABRICATION, GENERAL

- .1 Interior Woodwork Grade: Unless otherwise indicated, provide custom-grade interior woodwork complying with referenced quality standard.

- .2 Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- .3 Set nails and countersink screws apply stained wood filler to indentations, sand smooth and leave ready to receive finish.

2.3 INTERIOR WOOD BASE

- .1 Grade: Custom
- .2 Wood species to match existing cladding.
- .3 Profiles and dimensions as shown on drawings..
- .4 Finish: Stain finish to Section 09 91 00 - Painting.

2.4 INTERIOR WOOD CLADDING AND TRIM

- .1 Grade: Custom
- .2 Install existing T&G wood cladding removed under Section 02 41 19 Selective Demolition.
- .3 Provide new cladding to match existing as required.
- .4 Finish: Stain finish to Section 09 91 00 - Painting.

2.5 FINISHING

- .1 Grade: Provide finishes of same grades as items to be finished.
- .2 General: Finish architectural woodwork on site as specified in this Section.
- .3 Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

Part 3 Execution

3.1 INSTALLATION

- .1 Do architectural woodwork to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
- .2 Install new prefinished millwork and Owner furnished salvaged millwork at locations shown on drawings. Position accurately, level, plumb straight.
- .3 Fasten and anchor millwork securely.
- .4 Scribe and cut as required to fit abutting walls and to fit properly into recesses.

- .5 Apply bituminous coating over wood framing members in contact with masonry or cementitious construction.
- .6 Wood Cladding Installation:
 - .1 Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints min of 150mm.
 - .2 Do not use pieces less than 24” long, except where necessary.
 - .3 Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - .1 Install cladding after millwork installation and wall repair and finishing operations are completed.
 - .2 Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
 - .3 Fasten to prevent movement or warping.
 - .4 Countersink fastener heads on exposed carpentry work and fill holes.

3.2 CLEANING

- .1 Clean work, in accordance with Section 01 00 10 – General Instructions.

3.3 PROTECTION

- .1 Protect work from damage until final inspection.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes: plastic-laminate-clad casework as indicated on the drawings, as specified herein and as required for a complete project.
- .2 Related Requirements:
 - .1 Section 06 10 00 - Rough Carpentry.
 - .2 Section 08 56 59 – Service Windows

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI):
 - .1 ANSI A208.1-2009, Particleboard.
 - .2 ANSI A208.2-2009, Medium Density Fiberboard for Interior Applications.
- .2 Architectural Woodwork Manufacturers' Association of Canada (AWMAC):
 - .1 Architectural Woodwork Standards, 1st. Edition, 2009 (AWS).
- .3 Canadian Standards Association (CSA):
 - .1 CSA B35.4-1972, Wood Screws.
 - .2 CSA-B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .3 CSA-O121-08, Douglas Fir Plywood.
- .4 National Electric Manufacturers Association (NEMA):
 - .1 ANSI/NEMA LD3-2005, High-Pressure Decorative Laminates (HPDL).
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 DEFINITIONS

- .1 Plywood: Layers or plies of wood veneer, permanently bonded together in panels with the grain of each layer at 90 degrees to adjacent layers. The outer plies are called face and back. The inner plies are called the "core". The term "plywood", as used in this specification, does not include assemblies manufactured with particleboard, hardboard or fibreboard cores.
- .2 Composite wood products: Includes plywood, MDF and particleboard.

1.4 COORDINATION

- .1 Coordinate installation of service window with section 08 56 59.
-

1.5 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 General Instructions.
- .2 Action Submittals:
 - .1 Shop Drawings: Submit shop drawings in accordance with AWS Section 1.
 - .1 Shop drawings to include complete dimensioned drawings of each cabinetwork and millwork item, including locations of on-site joints in countertops, details of construction, profiles, jointing, fastening and other related details.
 - .2 Indicate all materials, thicknesses, finishes and hardware.
 - .3 Indicate locations of all service outlets in casework, typical and special installation conditions, and all connections, attachments and anchorage.
 - .3 Informational Submittals:
 - .1 Maintenance Data: Provide maintenance data for HPDL work for incorporation into the operation and maintenance manual specified in Section 01 00 10 – General Instructions

1.6 PRODUCT HANDLING AND STORAGE

- .1 Handle and store products in accordance with AWS Section 2.
- .2 Cover finished surfaces with heavy kraft paper or put in cartons during shipment. Protect installed laminated surfaces by approved means. Do not remove protection until immediately before final inspection.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle materials in accordance with Section 01 00 10 – General Instructions

1.8 WARRANTY

- .1 For work of this Section, 12-months warranty prescribed in General Conditions of Contract, is extended to 3 years.

Part 2 Products**2.1 LUMBER MATERIALS**

- .1 Softwood lumber: Pine species: 6 to 12% moisture content, grades in accordance with AWS, as follows:
 - .1 Grade: Custom
 - .2 Finger-jointed lumber is not acceptable.
-

- .2 Hardwood lumber (concealed work only): 6 to 12% moisture content. In accordance with AWS, species at option of fabricator, Economy Grade or better.

2.2 PANEL MATERIALS

- .1 Softwood plywood: Douglas Fir Plywood (DFP) to CSA-O121, G1S or G2S sanded grade, as applicable.
- .2 Medium density fibreboard (MDF) to ANSI A208.2, 769 kg/m³ density.
- .3 Thermofused Melamine (TFM) Panels: MDF core, finished on both faces with high wear-resistant thermally fused, melamine-impregnated decorative paper complying with NEMA LD 3.
 - .1 Colour: Selected by Departmental Representative.
- .4 High Pressure Decorative Laminate (HPDL): in accordance with AWS Section 4, based on grades established by NEMA LD3, Grade HGP, horizontal grade postforming, 1.2 mm thick, no added urea-formaldehyde.
 - .1 Colours: Allow for six colours selected by Departmental Representative from full range of manufacturer's lines.
- .5 Edge-banding: PVC, colour and pattern-through; with colour, pattern, and finish matched to each selected HPDL colour and pattern;
 - .1 Thickness: 3 mm
 - .2 Allow for full rolls or minimum order quantity of each specified pattern, colour, and thickness.

2.3 FASTENERS AND ADHESIVES

- .1 Nails and staples: CSA-B111, hot dipped galvanized for exterior work, and areas subject to high humidity, plain finish elsewhere.
- .2 Wood screws: to CSA-B35.4, electroplated, type and size to suit application.
- .3 Draw bolts and splines for countertops: as recommended by fabricator.
- .4 Adhesives:
 - .1 Generally: As recommended by architectural wood casework fabricator.
 - .1 Maximum VOC content: 30 g/L (less water). Urea-formaldehyde-free.
 - .2 HPDL adhesive: contact adhesive to CAN/CGSB-71.20.
 - .1 Maximum VOC content: 80 g/L (less water).

2.4 CABINET HARDWARE

- .1 Hinges: 170 degree concealed, self-closing, all-metal with three-way hinge arm adjustment, and mounting plate. Provide doors up to 810 mm high with two hinges, doors between 810 and 1200 mm with three hinges, and doors over 1200 mm high with four hinges.
 - .1 Acceptable Products: Blum Clip Top Hinge, Grass 3000 series, Hafele A-Series.
- .2 Regular Drawer Slides: for drawers up to 150 mm high and 400 mm wide, 45 kg capacity, roller carriage, 508 mm length or to suit cabinet, side-mounted, full extension, steel ball rollers and self-closing action.
- .3 File Drawer Slides: for drawers more than 150 mm high or 600 mm wide, 45 to 68 kg capacity, roller carriage, length to suit cabinet, side-mounted, full extension, steel ball rollers and self-closing action.
- .4 Door and Drawer Pulls: Back-mounted, solid metal, 8 mm dia. D-style wire pull, 96 mm c.c., chrome finish.
- .5 Pilaster Strips and Clips – recessed.
 - .1 Acceptable Products: Knappe & Vogt 255 and 256, Richelieu #120 Series standards, c/w #CP21-2G shelf supports, Stanley #79-1352.
- .6 Shelf Supports (pre-drilled holes): typical for cabinets unless otherwise noted; pre-drilled type, shelf support and socket, nickel-finish steel
- .7 Case Door Locks (master-keyed): matte nickel finish, keyed alike/room, flush mounted. Mark, tag, itemize by number at factory, indicating keying and room numbers per architectural drawings. Stamp code on face of lock. Provide 3 keys
- .8 Magnetic catches: fabricator's option.

2.5 ACCESSORIES

- .1 Sealer for HPDL: Water resistant sealer or glue acceptable to laminate manufacturer.
 - .1 Maximum VOC content: 200 g/L (less water). Urea-formaldehyde-free.
- .2 Sealer: Latex based primer from approved products list for MPI #39.
 - .1 Maximum VOC content: 150 g/L (less water).
- .3 Sealant of back of countertops at wall: mildew-resistant silicone to Section 07 92 00 – Joint Sealants.

2.6 HPDL CASEWORK FABRICATION

- .1 Fabricate casework in accordance with AWS Custom grade, flush overlay type, except where otherwise indicated.
-

- .2 Furring, blocking, nailing strips, grounds and rough bucks, sleepers and concealed framing: Softwood lumber, pine species.
- .3 Base: 19 mm DFP faced with room base material.
- .4 Concealed casework framing: Hardwood, species at option of fabricator.
- .5 Case bodies (ends, divisions, bottoms, shelves, backs): TFM.
- .6 Applied drawer fronts and cabinet doors: MDF faced with HPDL.
- .7 Finished edge banding, exposed and semi-exposed edges: 3 mm PVC.

2.7 DRAWERS

- .1 Fabricate drawers to AWS Custom grade.
- .2 Material: TFM

2.8 COUNTERTOPS

- .1 Fabricate countertops in accordance with AWS Custom grade
- .2 Laminated Plastic: Where not otherwise indicated, fabricate countertops and vanities from HPDL flatwork on specified core. Provide post-formed square wrap front edge and backslashes at counter backs and ends against walls.
 - .1 Core:
 - .1 Countertops: 19 mm particleboard.

2.9 CASEWORK FABRICATION: GENERAL

- .1 Fabricate casework in accordance with AWS Custom grade, flush overlay type, except where otherwise indicated.
- .2 Except where otherwise indicated, provide adjustable cabinet shelves.

2.10 HPDL APPLICATION

- .1 Comply with CAN3-A172, Appendix "A".
 - .2 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.
 - .3 Ensure adjacent parts of continuous laminate work match in colour and pattern.
 - .4 Veneer HPDL to core material in accordance with adhesive manufacturer's instructions and as follows:
-

- .1 Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface.
- .5 Where not otherwise indicated, 3 mm PVC edge-banding to cover exposed edge of core material.
- .6 Apply laminate backing sheet to reverse side of core of HPDL work.

2.11 SHOP FINISHING

- .1 Grade: Provide finishes of same grades as items to be finished.
- .2 General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touch-up, cleaning, and polishing until after installation.
- .3 Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
- .4 Sealer: Shop prime all faces and edges of furring, blocking, shims, hanging strips, and blind framing.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine areas and conditions under which work is to be performed and notify the Departmental Representative in writing of conditions detrimental to the proper and timely completion of the work.
- .2 Do not proceed with the work until unsatisfactory conditions have been corrected to the satisfaction of the installer.
- .3 Take field measurements to verify or supplement dimensions.
- .4 Commencement of the installation will be construed as acceptance of the site conditions and, thereafter, the Subcontractor shall be fully responsible for satisfactory work as specified herein.

3.2 INSTALLATION

- .1 Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
 - .2 Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
 - .3 Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 3 mm in 2400 mm.
-

- .4 Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - .1 Seal site cuts with specified shop applied sealer except transparent finish where required to match specified final finish.
- .5 Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- .6 Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to centre doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - .1 Install cabinets with no more than 3 mm in 2400-mm sag, bow, or other variation from a straight line.
 - .2 Fasten wall cabinets through back, near top and bottom, at ends and not more than 400 mm o.c. with No. 10 wafer-head screws sized for 25-mm penetration into wood framing, blocking, or hanging strips.
- .7 Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - .1 Install countertops with no more than 3 mm in 2400-mm sag, bow, or other variation from a straight line.
 - .2 Caulk space between countertop and wall with specified sealant.
- .8 Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

END OF SECTION

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Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Mineral wool insulation blankets for thermal protection.
- .2 Related Requirements:
 - .1 Section 09 21 16 - Gypsum Board: for blanket insulation used for sound attenuation in acoustical assemblies.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM C665-12, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .2 ASTM C1320-10, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
 - .3 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CGA-B149.1-05, Natural Gas and Propane Installation Code Handbook.
 - .2 CAN/CGA-B149.2-10, Propane Storage and Handling Code.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S604-M91, Standard for Type A Chimneys.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions
- .2 Action Submittals:
 - .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.

Part 2 Products

2.1 INSULATION

- .1 Batt and blanket mineral fibre (BATT INSULATION): to ASTM C665.
 - .1 Type: 1
 - .2 Flame Spread: maximum 25, to ASTM E84.
-

- .3 Smoke Development: maximum 50, to ASTM E84.
- .4 Thickness: full depth of stud cavity, except as indicated.

Part 3 Execution**3.1 MANUFACTURER'S INSTRUCTIONS**

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

3.2 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces and to ASTM C1320.
- .2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .3 Do not compress insulation to fit into spaces.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC S604 Type A chimneys and CAN/CGA B149.1 and CAN/CGA B149.2 Type B and L vents.
- .5 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.3 CLEANING

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Foamed-in-place insulation.
 - .2 Foamed-in-place sealant.
 - .3 Cementitious thermal barrier.
- .2 Related Requirements:
 - .1 Section 07 27 10 - Air/Vapour Barriers
 - .2 Section 08 51 13 – Aluminum Windows

1.2 REFERENCES

- .1 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S710.1-11, Standard For Thermal Insulation – Bead-Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions.
- .2 Action Submittals:
 - .1 Product Data: Submit manufacturer's printed product literature, specifications and datasheet for each product specified in Part 2 of this Section.
- .3 Informational Submittals:
 - .1 Compatibility: Submit letter, provided and signed by manufacturer of insulation material, indicating products used on the project are compatible with adjacent materials, and materials with which the insulation will be in contact or sealed.
 - .2 Manufacturer's Instructions: Submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 AMBIENT CONDITIONS

- .1 Apply foamed-in-place sealants only when substrate and ambient temperatures are within manufacturer's written prescribed limits. Ensure temperature is maintained throughout curing period.

Part 2 Products

2.1 MATERIALS

- .1 Use of insulation products manufactured with CFCs as blowing agents is prohibited.

- .2 Spray Foam Sealant – General Purpose: one-component, semi-rigid polyurethane sealant, to CAN/ULC-710.1, 16 to 24 kg/m³, minimum RSI 0.67 per 25 mm thickness:
 - .1 Maximum VOC Content: 250 g/L (less water).
 - .2 Locations: gaps and cracks up to 75 mm in size.
- .3 Spray Foam Sealant – Low Pressure: one-component, semi-flexible polyurethane sealant, to CAN/ULC-S710.1, 27 kg/m³:
 - .1 Maximum VOC Content: 250 g/L (less water).
 - .2 Locations: gaps and cracks adjacent to door, window and curtain wall framing.

Part 3 Execution

3.1 PREPARATION

- .1 Clean surfaces which are to receive insulation, of dirt, dust, grease, loose material or other foreign matter which may inhibit adhesion.
- .2 Provide sufficient ventilation during and until insulation has cured.
- .3 Temporarily brace door frames as may be required to prevent possible bowing of frames due to over expansion of the foamed-in-place insulation.
- .4 Examine substrate surfaces for conditions ready to accept Work.
- .5 Report unsatisfactory conditions in writing.
 - .1 Proceed with Work once unsatisfactory conditions are corrected.
 - .2 Start of Work implies acceptance of conditions.

3.2 INSTALLATION, GENERAL

- .1 Where spray-foam insulation or sealant is used to maintain continuity of thermal barrier, and is installed in conjunction with membrane air seal/vapour barrier around frames including metal and aluminum frames or protrusions, ensure that foamed-in-place insulation is installed on exterior side of membrane air seal/vapour barrier.
- .2 Finished surface: free of voids and imbedded objects.

3.3 INSTALLATION AROUND WINDOWS AND ENTRANCE FRAMING

- .1 Install spray foam sealant around window frames, and entrance frames to maintain continuity of thermal barrier, after air/vapour barrier has been installed and sealed to framing.
 - .2 Ensure that spray foam sealant completely fills spaces, without voids, and that foam is continuous at corners.
 - .3 Provide thermal barrier to interior spaces as indicated and required by NBCC.
-

3.4 PROTECTION

- .1 Provide temporary enclosures to prevent spray and noxious vapour from contaminating air beyond application area.
- .2 Protect workers in accordance with manufacturer's written instructions.
- .3 Protect adjacent surfaces and equipment from damage by over spray, fall-out, and dusting of insulation materials.
- .4 Dispose of waste foam daily and decontaminate empty drums in accordance with foam manufacturer's instructions.

3.5 CLEAN-UP

- .1 Remove masking materials and overspray from adjacent areas immediately after foam surface has hardened.
- .2 Repair damaged areas in accordance with manufacturer's instructions.

END OF SECTION

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Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Air/vapour barrier materials to provide continuous seal between components of building envelope and building penetrations.
- .2 Related Requirements:
 - .1 Section 08 51 13 – Aluminum Windows

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .2 ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
 - .3 ASTM E1186-03(2009), Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
- .2 NBCC, Part 5 – Environmental Separation

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Sequencing: Sequence work to permit installation of materials in conjunction with related materials and seals.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions.
- .2 Action Submittals:
 - .1 Product Data: for each type of product specified.
- .3 Informational Submittals:
 - .1 Manufacturer's installation instructions.
 - .2 Compatibility: Provide letter(s), provided and signed by manufacturer of membrane air/vapour barrier material(s), that products used on the project are compatible with adjacent materials, and materials with which the membrane will be in contact or sealed.
 - .3 Quality Assurance Submittals.
 - .4 Field quality control reports.
 - .5 Closeout Submittals: Field quality control reports.

1.5 QUALITY ASSURANCE

- .1 Compatibility: Provide letter(s), provided and signed by the manufacturer of air/vapour barrier material(s), certifying products used are compatible with adjacent materials, and materials to which air/vapour barrier materials will be in contact with or sealed.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Provide forced air circulation during installation and curing periods for enclosed applications.
- .2 Exercise caution for proper adhesion, curing when temperatures approach manufacturer's prescribed low temperature limit.
- .3 Do not install solvent curing sealants or vapour release adhesive materials in enclosed spaces without ventilation.
- .4 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

Part 2 Products

2.1 DESIGN AND PERFORMANCE CRITERIA

- .1 Construct air/vapour barrier system with transitions between building components to provide continuous, structurally supported plane of materials to contain indoor air (exfiltration) and to prevent outdoor air from entering the building (infiltration) in accordance with following requirements:
 - .1 Incorporate continuous air/vapour barrier system, meeting or exceeding requirements of NBCC, Part 5.
 - .2 Maximum air leakage for exterior wall air/vapour barrier material from grade to roof: $0.02 \text{ L/s}\cdot\text{m}^2 @ 75 \text{ Pa}$ pressure differential.
 - .3 Maximum water vapour permeance: $2.9 \text{ ng/Pa}\cdot\text{m}^2\cdot\text{s}$ (0.05 perms).
 - .4 Maximum air leakage through joints between the air/vapour barrier and components of various assemblies (window frames, curtain wall, door frames, roof junction to walls, each other) not to exceed $0.2 \text{ L/s}\cdot\text{m}^2 @ 75 \text{ Pa}$ pressure differential.

2.2 SHEET MATERIALS

- .1 Membrane air/vapour barrier (AVB): Polyethylene film to CAN/CGSB-51.34, 0.15 mm thick.

- .2 AVB Transition Strip: Glass scrim reinforced SBS modified bitumen membrane or rubberized asphalt coated polyethylene or cross-laminated polyethylene bonded to modified asphalt, self-adhesive grade, 1.0 mm minimum thickness, 0.1 mm thickness polyethylene face.
 - .1 Acceptable Products: Bakor Blueskin SA, Carlisle CCW-705, IKO Superseal Type III, Soprema Sopraseal Stick 1100T, W.R. Grace Perm-A-Barrier, W.R. Meadows Air-Shield.

2.3 ACCESSORIES

- .1 Joint sealing tape: Air resistant pressure sensitive adhesive tape, type recommended by vapour retarder manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
- .2 Sealant: Acoustical sealant to ASTM C 919, compatible with vapour retarder, acceptable to manufacturer.
- .3 Staples: Minimum 6 mm leg.
- .4 Moulded box vapour retarder: Factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.
- .5 Transition strip termination mastic: rubberized asphalt-based mastic
- .6 Transition Strip tape: Double-sided butyl tape, minimum 50mm wide.
- .7 Substrate Cleaner: Non-corrosive type recommended by membrane manufacturer compatible with adjacent materials.
- .8 Transition Strip Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- .9 Foam Seal: Spray Foam Sealant – Low Pressure to Section 07 21 19 – Foamed-in-Place Insulation:
 - .1 Location: for use around perimeter of window and door frames, and other exterior wall penetrations.

Part 3 Execution

3.1 EXAMINATION AND PREPARATION

- .1 Verify that surfaces and conditions are ready to accept the Work of this Section.
- .2 Report unsatisfactory conditions to the Departmental Representative in writing.
- .3 Do not start Work until deficiencies have been corrected.
 - .1 Commencement of Work implies acceptance of conditions.

- .4 Ensure surfaces are clean, free from oils and grease, dry, sound, smooth, and continuous, and comply with air/vapour barrier manufacturer's requirements.
- .5 Remove loose or foreign matter which might impair adhesion of materials.
- .6 Ensure metal components are free of sharp edges and burrs.

3.2 INSTALATION - VAPOUR RETARDER

- .1 Install vapour retarder on warm side of exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous retarder.
- .2 Use sheets of largest practical size to minimize joints.
- .3 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.
- .4 Openings: Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.
- .5 Vapour Barrier Applied Directly to Framing:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Press sheet into sealant.
 - .3 Install staples through sheet at sealant bead into wood substrate. Apply continuous strip of joint sealing tape along top edge of sheet to face of top plate.
- .6 Seams and Sealing:
 - .1 Lap sheets minimum 75 mm and seal seams with continuous bead of sealant and joint sealing tape.
 - .2 Bed vapour retarder in continuous bead of sealant along top and bottom edges abutting adjacent construction.
 - .3 Ensure no gaps exist in sealant bead.
 - .1 Smooth out folds and ripples occurring in vapour retarder over sealant.
- .7 Electrical Boxes: Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
 - .1 Install moulded box vapour retarder.
 - .2 Apply sealant to seal edges of moulded box flange to main vapour retarder and seal wiring penetrations through moulded box.

3.3 INSTALLATION – TRANSITION STRIP

- .1 Apply primer by brush or heavy nap, natural-material roller at rate recommended by manufacturer prior to membrane installation.
 - .2 Install membrane air/vapour barrier to dry surfaces at air and surface temperatures of -4 deg C and above in accordance with manufacturer's recommendations, to locations indicated.
-

- .3 Overlap adjacent pieces 50 mm, and roll seams.
- .4 Continue membrane into openings in walls, including but not limited to doors and windows. Terminate at points that will prevent visibility from interior. Continue membrane over junctions, at changes in wall construction, and other construction. Reinforce corners with additional piece of membrane cut and formed to seal corners. Caulk to ensure complete seal. Position lap seal over firm bearing.
- .5 When required by dirty or dusty site conditions; by surfaces having irregular or rough texture, or if difficulty is encountered in adhering air/vapour barrier to substrate, apply surface conditioner by spray, brush, or roller at rate recommended by manufacturer, before membrane installation. Allow surface conditioner to dry completely before applying primer or membrane.

3.4 PROTECTION OF WORK

- .1 Do not permit adjacent work to damage work of this Section.
- .2 Ensure finished Work is protected from climatic conditions.

END OF SECTION

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Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 21 16 – Blanket Insulation
- .2 Section 07 27 10 – Air/Vapour Barriers
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A1003/A1003M-13, Standard Specification for Steel Sheet, Carbon, Metallic-and Nonmetallic-Coated for Cold-Formed Framing Members
 - .2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .3 ASTM C 920-11, Standard Specification for Elastomeric Joint Sealants
 - .4 ASTM C1311-10, Standard Specification for Solvent Release Sealants
 - .5 ASTM D523-08, Standard Test Method for Specular Gloss
- .2 Canadian General Standards Board, (CGSB)
 - .1 CAN/CGSB-93.2-M91, Prefinished Aluminum Siding, Soffits and Fascia, for Residential Use.
 - .2 CGSB 93.5-92, Installation of Metal Residential Siding, Soffits and Fascia.
- .3 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI 20M-99, Standard for Sheet Steel Cladding for Architectural, Industrial and Commercial Building Applications

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions
- .2 Product data: submit manufacturer's printed product literature, specifications and data sheet for each product specified.
- .3 Shop Drawings:
 - .1 Submit shop drawings indicating dimensions, profiles, attachment methods, trim and closure pieces, metal furring, and related work.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples of siding material, of colour and profile selected to confirm match to existing.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions.

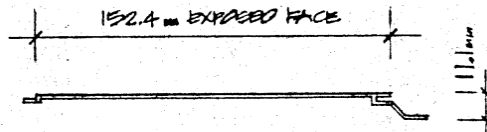
Part 2 Products

2.1 SYSTEM DESCRIPTION

- .1 Single-skin exposed fastener metal panel and associated supporting girt framing assembly applied as exterior component of wall system. System includes Air Barrier located outboard of substrate specified in Section 07 27 00 - Air Barriers, and Board Insulation specified in Section 07 21 13 - Board Insulation.

2.2 CLADDING AND COMPONENTS

- .1 Aluminum Plank: extruded or plate aluminum alloy nominal thickness 3.2 mm, face dimension 152 mm, depth 11 mm to match existing extruded aluminum cladding materials.
 - .1 Finish: exposed aluminum surfaces: AA-M12C22A44, 0.7 mils thickness, prepared with no mechanical pre-treatment, chemical etched to medium matte pre-treatment, two step anodized to Class I, Medium Bronze, to match existing cladding as acceptable to Departmental Representative.
 - .2 Profile:



- .2 Existing Cladding: Salvaged cladding removed during demolition activities.
- .3 Exposed trim: In accordance with Section 07 62 00 – Metal Trim and Flashing, same material, colour and gloss as cladding, with fastener holes pre-punched.
- .4 Insulation: Mineral fibre insulation in accordance with Section 07 21 13 - Board Insulation.
- .5 Air Barrier: to Section 07 27 00 - Air Barriers.

2.3 FASTENERS

- .1 Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates
- .2 Panel Fasteners: manufacturer standard, screw type bolt head, sized to meet load requirements, complete with EPDM, PVC or neoprene sealing washers. Exposed heads colour matched to attached materials by means of factory-applied coating

2.4 CAULKING

- .1 Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
- .2 Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.
- .3 Colour matched to adjacent materials

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install new and existing cladding in accordance with CGSB 93.5, and manufacturer's written instructions
- .2 Install continuous starter strips, edgings, drip, cap, sill and window/door opening flashings as indicated.
- .3 Install outside corners, fillers and closure strips with carefully formed and profiled work.
- .4 Maintain joints in exterior cladding, true to line, tight fitting, hairline joints.
- .5 Attach components in manner not restricting thermal movement.
- .6 Caulk junctions with adjoining work with sealant. Do work in accordance with Section 07 92 00 - Joint Sealants.

3.3 CLEANING

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

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 The Aluminum Association Inc. (AA)
 - .1 Aluminum Sheet Metal Work in Building Construction
 - .2 AA DAF45, Designation System for Aluminum Finishes
- .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A653/A653M-01a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A792/A792M-02, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .3 ASTM B32-00, Standard Specification for Solder Metal.
 - .4 ASTM D1187-97 (E11), Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.29, Rubber-Asphalt Sealing Compound
 - .2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .3 CSA B111-1974(R1998), Wire Nails, Spikes and Staples.
- .4 Sheet Metal and Air Conditioning Contractors' National Association Inc. (SMACNA)
 - .1 SMACNA Architectural Sheet Metal Manual – Seventh Edition

1.2 SAMPLES

- .1 Submit shop drawings in accordance with Section 01 00 10 – General Instructions
- .2 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, colour and finish.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 00 10 – General Instructions
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
-

Part 2 Products**2.1 METAL MATERIALS**

- .1 Type C: Sheet aluminum: ASTM B209M, Aluminum Association alloy AA1100, minimum 1.22 mm thickness except otherwise indicated and required by design requirements.
 - .1 Finishes:
 - .1 Clear anodic: AAMA AA A41 anodized to AAMA 611 and AA DAF-45, AA-M12C22A41, Class I, minimum 18 microns thickness.
 - .2 Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
 - .1 Colours: Selected by Departmental Representative from manufacturer's standard range, allow for three colours.

2.2 ACCESSORIES

- .1 Isolation coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- .2 Sealing compound: To CAN/CGSB-37.29, rubber asphalt type.
- .3 Underlay for metal flashing: Dry sheathing to CAN/CGSB-51.32.
- .4 Sealants: as specified in Section 07 92 10 - Joint Sealing.
- .5 Cleats: Of same material, thickness, and temper as sheet metal flashing being secured, minimum 75 mm high.
- .6 Fasteners: Of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for application.
- .7 Washers: Of same material as sheet metal, 1 mm thick with rubber packings.
- .8 Touch-up paint: as recommended by prefinished material manufacturer.

2.3 FABRICATION

- .1 Fabricate aluminum flashings and other sheet aluminum work in accordance with AA-Aluminum Sheet Metal Work in Building Construction
 - .2 Form pieces in 3 050 mm maximum lengths.
 - .1 Make allowance for expansion at joints.
 - .2 Underflash at joints.
 - .3 Hem exposed edges on underside 12 mm.
 - .1 Mitre and seal corners with sealant.
-

- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Seams:
 - .1 Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.
- .6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.4 METAL FLASHINGS

- .1 Form exposed flashings, drip edges, copings and fascias to profiles indicated from materials indicated.

Part 3 Execution

3.1 INSTALLATION

- .1 Install sheet metal work in accordance with SMACNA's "Architectural Sheet Metal Manual," and as indicated.
 - .2 Use concealed fastenings except where approved before installation.
 - .3 Provide underlay under metal flashings.
 - .1 Secure in place and lap joints 100 mm.
 - .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
 - .1 Flash joints using S-lock forming tight fit over hook strips.
 - .5 Lock end joints and caulk with sealant.
 - .6 Metal protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
 - .1 Coat back side of uncoated aluminum sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - .2 Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install course of underlayment and cover with slip sheet.
 - .1 Secure in place and lap joints 100 mm.
 - .7 Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
 - .1 Space movement joints at a maximum of 3 m with no joints allowed within of corner or intersection.
-

- .2 Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with sealant concealed within joints.

3.2 CLEANING AND PROTECTION

- .1 Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- .2 Clean off excess sealants.
- .3 Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- .4 On completion of installation, remove unused materials and clean finished surfaces.
- .5 Maintain in a clean condition during construction.
- .6 Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Firestop systems consisting of a material, or combination of materials installed to retain integrity of fire-rated construction by maintaining a barrier against spread of flame, smoke, and hot gases through penetrations, blank openings, construction joints, or at perimeter fire containment in or adjacent to fire-rated barriers in accordance with the requirements of the National Building Code.

1.2 REFERENCES

- .1 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-1995, Fire Tests of Firestop Systems.

1.3 PERFORMANCE REQUIREMENTS

- .1 Penetrations: firestopping systems produced to resist spread of fire and passage of smoke and other gases according to requirements indicated, including but not limited to:
 - .1 Firestop penetrations passing through fire resistance rated wall and floor assemblies, and other locations as indicated.
- .2 Where there is no specific third party tested and classified firestop system is available for a particular firestop configuration, obtain Engineering Judgement (EJ) or Equivalent Fire Resistance Rated Assembly (EFFRA) for submittal from firestop manufacturer.

1.4 SUBMITTALS

- .1 Submit samples, product data, and shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Informational Submittals:
 - .1 Submit system design listings, including illustrations from qualified testing and inspection agency applicable to each firestop configuration. Indicate proposed material, reinforcement, anchorage, fastenings, and method of installation. Construction details should accurately reflect actual job conditions.
 - .2 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation.
 - .3 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL

- .4 Operations and maintenance manual in accordance with Section 01 00 10 – General Instructions. Include for each firestop system:
 - .1 Room number/name, location within room, rating, engineering judgements, product description, maintenance requirements.

1.5 QUALITY ASSURANCE

- .1 Fire-Test-Response Characteristics: Provide firestopping System Design Listing by testing and inspection agency in accordance with appropriate ASTM standard(s).
 - .1 Qualified testing and inspection agencies include UL, ULC, cUL, Intertek Testing Services, or another agency performing testing and follow-up inspection services for firestop materials that is acceptable to authority having jurisdiction.
- .2 Installer qualifications:
 - .1 Firestop Contractors International Association Contractor (FCIA) Member in good standing.
 - .2 Licensed by local authority, where applicable.
 - .3 Shown to have successfully completed not less than five comparable scale projects.
- .3 Single Source Responsibility: Obtain firestop systems for each kind of penetration and construction conditions indicated from a single primary firestop systems manufacturer.
 - .1 Do not intermix materials of different manufacture than allowed by tested and listed system in the same firestop system or opening.
 - .2 Tested and listed firestop systems are to be used first. If such systems are not possible, install an Engineering Judgement (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA).
- .4 Schedule pre-construction meeting for parties involved prior to start of construction.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver firestopping products to Project Site in original, unopened containers, or packages with intact and legible manufacturer's labels identifying product and manufacturer.
- .2 Store and handle firestopping materials in accordance with manufacturer's written instructions.

1.7 SITE CONDITIONS

- .1 Environmental Conditions: Install firestopping in accordance with manufacturers written instructions.
 - .2 Ventilation: Ventilate in accordance with firestopping manufacturers' instructions or Material Safety Data Sheet (MSDS).
-

1.8 SEQUENCING AND SCHEDULING

- .1 Do not cover up firestopping installations until Departmental Representative or Authorities Having Jurisdiction have examined installation.

1.9 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 00 10 – General Instructions.

Part 2 Products

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with ULC-S115.
 - .1 Firestop system rating: FT.
 - .2 Firestop products produced by FCIA Manufacturer Members in good standing
 - .3 Service penetration assemblies: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.
 - .4 Service penetration firestop components: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.13 and ULC Guide No.40 U19.15 under the Label Service of ULC.
 - .5 Fire-resistance rating of installed fire stopping assembly in accordance with Manitoba Building Code.
 - .6 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
 - .7 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
 - .8 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
 - .9 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
 - .10 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
-

Part 3 Execution**3.1 EXAMINATION**

- .1 Examine substrates and conditions with installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping.
 - .1 Notify Departmental Representative of unsatisfactory conditions.
 - .2 Do not proceed with installation until unsatisfactory conditions have been corrected.
- .2 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.
- .3 Verify that field dimensions are as indicated and as recommended by manufacturer.

3.2 PREPARATION

- .1 Prepare surfaces in contact with firestopping materials and smoke seals to manufacturer's instructions.
- .2 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .3 Mask where necessary to avoid spillage and over coating onto adjoining surfaces.
- .4 Remove masking as soon as it is possible to do so without disturbing the firestopping seal with substrates.
- .5 Remove stains on adjacent surfaces.

3.3 INSTALLATION

- .1 General:
 - .1 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.
 - .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
 - .3 Tool or trowel exposed surfaces to a neat finish.

- .2 Penetration Firestops:
 - .1 Coordinate with other trades to ensure pipes, conduit, cable, and other items, which penetrate fire rated construction, have been permanently installed prior to installation of firestop assemblies.
 - .2 Schedule Work to ensure partitions and other construction that conceals penetrations are not erected prior to installation of firestop and smoke seals.
 - .3 Install fill materials for through-penetrations firestop systems to produce the following result:
 - .1 Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 - .2 Install materials so they contact and adhere to substrates formed by opening and penetrating items.
 - .3 For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces.
- .3 Firestop Joint Systems:
 - .1 Install joint fillers to provide support of firestop materials during application and at position required to produce cross-sectional shapes and depths of installed firestop material relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
 - .2 Install systems by proved techniques that result in firestop materials:
 - .1 Directly contacting and wetting joint substrates.
 - .2 Filling recesses provided for each joint configuration.
 - .3 Providing uniform, cross-sectional shapes and depths relative to joint width that optimize movement capability.
 - .3 Tool non-sag firestop materials immediately after application and prior to skinning. Form smooth, uniform beads of configuration indicated or required to:
 - .1 Produce fire-resistance rating.
 - .2 Eliminate air pockets.
 - .3 Ensure contact and adhesion with sides of joint.

3.4 FIELD QUALITY CONTROL

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

3.5 CLEANING

- .1 Proceed in accordance with Section 10 00 10 – General Instructions.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.6 SCHEDULE

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Sealants.
- .2 Related Requirements:
 - .1 Section 07 84 00 – Firestopping, for sealing joints in fire-resistance-rated construction

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals:
 - .1 Product Data: for products indicated.
 - .2 Samples:
 - .1 Submit duplicate colour samples of each type of material and colour.
 - .2 Where custom colours are requested, submit colour samples of actual product for review by Departmental Representative.
- .3 Informational Submittals:
 - .1 Statement of Compatibility: Compatibility between sealants and substrates is essential. Provide written declaration to Departmental Representative stating that materials meet this requirement.

1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.
- .2 Waste Management:
 - .1 Deposit packaging materials in appropriate container on site for recycling or reuse.
 - .2 Avoid using landfill waste disposal procedures when recycling facilities are available.

1.4 PROJECT CONDITIONS

- .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 5 degrees C.
 - .2 When joint substrates are wet.
 - .3 Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - .4 Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.5 AMBIENT CONDITIONS

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

Part 2 Products

2.1 GENERAL

- .1 Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- .2 Do not use sealants that emit strong odours, contain toxic chemicals or are not certified as mould resistant in air handling units.
- .3 Where sealants are qualified with primers use only those primers.

2.2 MATERIALS

- .1 Neutral cure, one part silicone, for exterior and interior use on concrete, masonry, stone, metals, glass, porcelain, control joints, expansion joints; to ASTM C920, Type S, Grade NS, Class 50, colour selected by Departmental Representative.
- .2 One component, polyurethane, for interior, exterior use in aluminum, window frame joints, heel beads, toe beads, and air seals; to ASTM C920, Type S, Grade NS, Class 25, colour selected by Departmental Representative.
- .3 Mildew-resistant, one part silicone, for interior use in wet areas around mop sink bases, and lavatories, toilets, and other plumbing fixtures; to ASTM C920, Type S, Grade NS, Class 25, Colour selected by Departmental Representative.
- .4 Mildew-resistant, one part silicone, paintable, for interior use around countertops, other counter surfaces adjacent to painted surfaces; to ASTM C920, Type S, Grade NS, Class 25.
- .5 Acrylics: general purpose, one part acrylic, paintable translucent, movement range $\pm 10\%$, for interior use in dry areas around windows, door frames, interior caulking to gypsum board, masonry, and metals; to ASTM C834.
- .6 Joint Cleaner: Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .7 Primer: as recommended by manufacturer.

- .8 Back-up Materials:
 - .1 Backer rod: polyethylene, closed cell foam backer rod, compatible with sealant, recommended by manufacturer, diameter oversize 30% to suit joint.
 - .2 Bond breaker tape: polyethylene, pressure sensitive bond breaker tape which will not bond to sealant.
- .9 Preformed Foam Joint Sealant: Manufacturer's standard preformed, pre-compressed, open-cell foam sealant manufactured from urethane foam with minimum density of 160 kg/m³ and impregnated with non-drying, water-repellent agent. Factory produce in pre-compressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine joints indicated to receive joint sealants, with installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .2 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.
- .3 Ensure joint surfaces are dry and frost free.
- .4 Prepare surfaces in accordance with manufacturer's directions.
- .5 Test materials being sealed, caulked for staining, adhesion.
- .6 Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal

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 For multi-component sealants, 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.
 - .9 Apply non-paintable silicone sealants after wall surfaces have been painted.
- .2 Curing:
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.
- .3 Cleanup:
 - .1 Clean adjacent surfaces immediately and leave Work neat and clean.
 - .2 Remove excess and droppings, using recommended cleaners as work progresses.
 - .3 Remove masking tape after initial set of sealant.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Exterior and interior hollow metal doors and frames.
- .2 Related Requirements:
 - .1 Section 08 71 00 - Door Hardware

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/ A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .2 ASTM B29-14, Standard Specification for Refined Lead.
 - .3 ASTM B749-14, Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating
 - .3 Canadian Standards Association (CSA International)
 - .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
 - .2 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding)
 - .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Commercial Steel Doors and Frames, 2009
 - .2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 2009
 - .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80-2016, Standard for Fire Doors and Other Opening Protectives
 - .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN4-S104-M80 (R1985), Standard Method for Fire Tests of Door Assemblies
-

1.3 SUBMITTALS

- .1 Provide product data, shop drawings, and samples in accordance with Section 01 00 10 – General Instructions
- .2 Shop Drawings:
 - .1 Indicate elevation of each door and frame type.
 - .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, glazed openings, arrangement of hardware, fire rating, and finishes.
 - .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, reinforcing, fire rating, and finishes.
 - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

1.4 COORDINATION

- .1 Coordinate hardware preparation requirements with Sound Control Doors

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions

Part 2 Products**2.1 DESIGN REQUIREMENTS**

- .1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 for ratings specified or indicated.
- .2 Provide fire labelled frames for openings requiring fire protection ratings.
 - .1 Test products in conformance with CAN4-S104 for door frames, transom and sidelight assemblies and listed by nationally recognized agency having factory inspection services.

2.2 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A653M, CS, Type B, coating designation ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
 - .2 Door Core Materials:
-

- .1 Honeycomb: Structural small cell 25.4 mm maximum kraft paper 'honeycomb'. Weight: 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum, sanded to required thickness.
- .2 Polystyrene: Rigid extruded fire retardant, closed cell board. Density; 16 to 32 kg/m³, thermal values; RSI 1.0 minimum, Type 1, in accordance with ASTM C578
- .3 Reinforcement: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653M, ZF75.

2.3 PRIMER

- .1 Touch-up prime CAN/CGSB-1.181.

2.4 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Metallic paste filler: to manufacturer's standard.
- .3 Fire thickness labels: metal riveted.
- .4 Frame Thermal Breaks: Rigid PVC extrusion conforming to CGSB 41-GP-19MA.

2.5 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Exterior frames: 1.6 mm welded type construction, thermally broken.
- .4 Interior frames: 1.6 mm welded type construction.
- .5 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier.
 - .1 Reinforce frames for surface mounted hardware.
- .6 Protect mortised cutouts with steel guard boxes for masonry construction.
- .7 Prepare frame for door silencers as follows:
 - .1 Three for single door openings
 - .2 Two at head for double door openings
- .8 Manufacturer's nameplates on frames are not permitted.
- .9 Conceal fastenings except where exposed fastenings are indicated.
- .10 Factory-apply touch up primer at areas where zinc coating has been removed during fabrication.

2.6 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
-

- .2 Accurately mitre or mechanically join frame product and securely weld on inside of profile.
- .3 Perimeter corner joints: as defined in Appendix 2 of CSDMA, “Recommended Specifications for Commercial Steel Door and Frame Products”, except as specified otherwise:
 - .1 Face welded: continuously welded on inside of frame on profile faces. Fill exposed faces and grind smooth to uniform seamless surface.
 - .2 Tack welded: not permitted.
- .4 Joints at mullions, sills and centre rails:
 - .1 Accurately coped, butted and tightly fitted.
 - .2 At intersecting flush profile faces: securely welded on inside of frame, filled and ground to smooth, uniform, seamless surface.
 - .3 At intersecting recessed profile faces: securely welded on inside of frame to concealed reinforcements, with exposed hairline face seams.
 - .4 At other intersecting profile elements: exposed hairline face seams.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.7 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide two anchors for rebate opening heights up to 1 520 mm and one additional anchor for each additional 760 mm of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.8 DOOR FABRICATION, GENERAL

- .1 Doors: swing type, flush, laminated core construction.
 - .2 Fabricate doors with longitudinal edges mechanically interlocked, adhesive assisted, with visible edge seams, except as otherwise indicated.
 - .3 Blank, reinforce, drill doors and tap for mortised, templated hardware, and electronic hardware.
 - .4 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
 - .5 Reinforce doors where required, for surface mounted hardware.
 - .1 Provide closer reinforcement both sides all doors, including doors not scheduled to receive closers.
 - .6 Provide inverted, recessed, welded steel channels for top and bottom of doors.
-

- .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .8 Provide fire labeled doors for those openings requiring fire protection ratings, as scheduled.
 - .1 Test such products in strict conformance with CAN/ULC-S104, ASTM E152 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .9 Manufacturer's nameplates on doors are permitted only on hinge side of door, concealed from view.

2.9 DOORS: LAMINATED CORE CONSTRUCTION

- .1 Exterior Doors (HMI): Form face sheets from 1.60 mm sheet steel with polystyrene core, laminated under pressure to face sheets
- .2 Interior Doors (HM): Form each face sheet from 1.30 mm thick ZF75 coated steel with honeycomb core laminated under pressure to face sheets.

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 Check floor flatness in area where frame is to be installed, and within door swing path. Correct irregularities.
- .2 Remove temporary shipping spreaders prior to installation.
- .3 Check door and frame product for correct size, swing, rating and opening number.
- .4 Verify substrate conditions are as detailed in Contract Documents, and are acceptable for product installation in accordance with manufacturer's instructions.

3.3 INSTALLATION GENERAL

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

3.4 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
 - .2 Secure anchorages and connections to adjacent construction.
 - .3 Brace frames rigidly in position while building-in.
-

- .1 Install temporary horizontal wood spreader at third points of door opening to maintain frame width.
- .2 Provide vertical support at centre of head for openings over 1 200 mm wide.
- .3 Remove temporary spreaders after frames are built in.
- .4 During setting of frame product, check and correct for opening width, opening height, square, alignment, twist, and plumb in accordance with CSDMA, "Recommended Dimensional Standards for Commercial Steel Doors and Frames".
- .5 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .6 Caulk perimeter of frames between frame and adjacent material with sealant specified in Section 07-92-00 - Joint Sealants.

3.5 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions, NFPA 80, and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latchside and head: 1.5 mm.
 - .3 Finished floor, noncombustible sill, and thresholds: 13 mm.
- .3 Adjust operable parts for correct function.

3.6 FINISH REPAIRS

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Related Requirements:
 - .1 Section 08 71 00 – Door Hardware

1.2 SECTION INCLUDES

- .1 Non-rated acoustic pressed steel frames.
- .2 Non-rated acoustic hollow metal doors.
- .3 Perimeter and bottom acoustic seals, threshold, and astragal.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A653/A653M-15e1 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .2 ASTM E90-09 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- .2 Canadian Standards Association (CSA)
 - .1 CSA G40.20-13/G40.21-13 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
- .3 Canadian Steel Door Manufacturers Association (CSDMA)
 - .1 CSDMA Selection and Usage Guide for Steel Doors and Frames

1.4 PERFORMANCE REQUIREMENTS

- .1 Acoustic performance: minimum Sound Transmission Class (STC) 51 tested to ASTM E90. Label indicating sound transmission class shall be applied to the door and door frame.

1.5 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions
- .2 Product data: provide manufacturer's product data on door and frame construction.
- .3 Shop drawings: indicate door and frame elevations, anchor types and closure methods, finishes, and location of cut-outs for hardware.
- .4 Samples: submit manufacturer's door finish sample, frame corner sample, as well as perimeter acoustic gasket.

- .5 Test data:
 - .1 Submit test data indicating compliance with the Sound Transmission Class (STC) requirements. Include laboratory name, test report number, and date of test.
 - .2 Submit certification from test laboratory qualified under the National Voluntary Accreditation Program (NVLAP) of the U.S. Bureau of Standards.
- .6 Installation instructions: submit manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

- .1 Perform work to requirements of CSDMA standards.
- .2 Manufacturer: minimum five (5) years documented experience manufacturing acoustic steel door and frame assemblies.

1.7 DELIVERY, STORAGE AND PROTECTION

- .1 Deliver, store and protect acoustic steel doors and frames in accordance with manufacturer's recommendations.
- .2 Weld minimum two temporary jamb spreaders per frame prior to shipment.
- .3 Remove doors and frames from wrappings or coverings upon receipt on site and inspect for damage.
- .4 Store in vertical position, spaced with blocking to permit air circulation between components.
- .5 Store materials out of water and covered to protect from damage.
- .6 Clean and touch up scratches or disfigurement caused by shipping or handling with zinc-rich primer.

1.8 WARRANTY

- .1 Provide manufacturer's limited warranty for five (5) years from date of supply, covering material and workmanship.

Part 2 Products

2.1 MANUFACTURER

- .1 Basis of design: Assa Abloy/Fleming Door Products, STC 51 Whisper Core Door Series.
- .2 Acceptable alternate manufacturer: Ambico Ltd., Acoustic Steel Doors and Frames.

2.2 CONSTRUCTION

- .1 Door shall be a 44mm(1-3/4") nominal thickness up to STC 51 18 gauge minimum face sheets. No visible seams shall be permitted on door faces. Face gauges, internal sound retardant core and perimeter door edge construction to be manufacturer's standard for

the specified door rating. No asbestos or lead shall be permitted in door construction to achieve STC performance.

- .2 Hardware reinforcements: factory mortise, reinforce, drill and tap doors and frames for all mortise hardware as required by hardware manufacturer's template. Provide necessary reinforcement plates as required for surface mounted hardware; all drilling and tapping to be done in field by installer.
- .3 Assemblies shall be complete with metal frame, sound sealing system and threshold.
- .4 STC frames shall be 16 gauge minimum fully welded (face and web) units shipped with temporary shipping bars. Knockdown frames are not acceptable. Frames are to be backfilled with mortar or other flank proof material prior to installation.
- .5 Provide dust cover boxes on all frame mortises.

2.3 ACCESSORIES

- .1 Anchors: provide suitable anchors to properly install frames in partitions types as shown on drawings.

2.4 FINISHES

- .1 Factory door finish: factory applied zinc chromate primer to be applied to all exposed surfaces.
- .2 Finish painting: refer to Section 09 91 00 – Painting.

Part 3 Execution

3.1 INSTALLATION

- .1 Install components to manufacturer's written instructions.
- .2 Install steel doors and frames to CSDMA standards and local authority having jurisdiction.
- .3 Set frames plumb, square, level and at correct elevation.
- .4 Allow for deflection to ensure that structural loads are not transmitted to frame.
- .5 Adjust operable parts for correct clearances and function.
- .6 Install and adjust perimeter and bottom acoustic seals.

3.2 ERECTION TOLERANCES

- .1 Installation tolerances of installed frame for squareness, alignment, twist and plumbness are to be no more than $\pm 1.5\text{mm}$.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions
- .2 Action Submittals:
 - .1 Product Data: Submit manufacturer's printed product literature, specifications and data sheets
 - .2 Shop Drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.
- .3 Informational Submittals
 - .1 Submit manufacturer's installation instructions.

Part 2 Products

2.1 MATERIALS

- .1 Counter Barrier window frame: Aluminum extrusions min. 3mm wall thickness 100 x 45 mm (H x W) two piece snap together aluminum channel for retaining burglar resistant glazing, with EPDM sponge gaskets.
 - .1 Horizontal sliding panel: to be hung by two heavy duty roller brackets, each having self-lubricating nylon wheel and ball bearing assembly; running in an extruded aluminum track assembly. Provide extruded aluminum door guides and retainer clips along bottom
 - .2 Recessed pull handle (install on office side).
 - .3 Provide slam shut lock locking device with thumb turn on office side. Basis of design Sobinco spring loaded Transom Latch Model #865.
- .2 Transaction Tray: 1.367 mm stainless steel drop –in type deal tray with flip lid, designed to fit flush into countertop cutout below transaction window.
- .3 Burglar Resistant Glazing: Laminated Safety Glass: to CAN/CGSB-12.1, Type 1 - laminated, tempered, Class B – float, transparent, made up of 12 mm clear tempered float glass each side of Polyvinyl butyral interlayer.
 - .1 Edges: ground and polished.
 - .2 Polyvinyl butyral (PVB) interlayer, 1.52 mm thick.
 - .3 Passing UL972.
 - .4 Provide speaker port on all fixed glazing panels. Opening to be 120mm diam.
- .4 Glazing Gasket: Clear extruded silicone gasket designed for use with laminated glazing products to prevent laminate blushing, 12 mm thickness.

2.2 FINISHES:

- .1 Aluminum: Clear Anodized

- .2 Stainless Steel: Brushed, No 6

Part 3 Execution

3.1 INSTALLATION

- .1 Install frames, glazing, transom tray and hardware in accordance with manufacturer's printed instructions and recommendations.

.1 Location: Where indicated on drawings as Service Window.

- .2 Install butt glazing with 6 mm joints to suit glazing gasket dimension. Provide two gaskets per joint, installed back to back to match laminate glass assembly thickness. Install continuous one-piece gaskets from head to sill of window. Roll gaskets into joint from each side glass assembly.

3.2 CLEANING AND PROTECTION

- .1 Clean frame and glazing surfaces after installation, in accordance with manufacturer's instructions. Remove excess glazing sealant compounds, dirt and other substances.
- .2 Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- .3 Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- .4 Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

1. GENERAL

1.1 SUMMARY

1. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2. SECTION INCLUDES

1. Furnishing of all items of finish hardware as hereinafter specified or obviously necessary for all swinging, sliding, folding and other doors as indicated including installation of low energy automatic door operators and system components. Excluding, items which are specifically excluded from this section of the specification or are of unique hardware specified in the same sections as the doors and frames on which they are installed.

3. RELATED SECTIONS

1. 08 11 00 – Metal Doors and Frames
2. 26 05 00 – Common Work Results for Electrical

1.2 REFERENCES

1. CODES AND STANDARDS

1. ANSI A117.1 – Accessible and Usable Buildings and Facilities
 2. ANSI A156.1 – Butts and Hinges
 3. ANSI A156.3 – Exit Devices
 4. ANSI A156.4 – Door Controls – Closers
 5. ANSI A156.5 – Cylinders and Input Devices for Locks
 6. ANSI A156.6 – Architectural Door Trim
 7. ANSI A156.7 – Template Hinge Dimensions
 8. ANSI A156.8 – Door Controls – Overhead Stops and Holders
 9. ANSI A156.13 – Mortise Locks and Latches Series 1000
 10. ANSI A156.15 – Release Devices – Closer Holder, Electromagnetic and Electromechanical
 11. ANSI A156.16 – Auxiliary Hardware
 12. ANSI A156.17 – Self Closing Hinges and Pivots
 13. ANSI A156.18 – Materials and Finishes
 14. ANSI A156.19 – Power Assist and Low Energy Power Operated Doors
 15. ANSI A156.21 – Thresholds
 16. ANSI A156.22 – Door Gasketing and Edge Sealing Systems
 17. ANSI A156.25 – Electrified Locking Devices
 18. ANSI A156.26 – Continuous Hinges
 19. ANSI A156.28 – Recommended Practices for Mechanical Keying Systems
 20. ANSI A156.29 – Exit Locks, Exit Alarms, Alarms for Exit Devices
 21. ANSI A156.30 – High Security Cylinders
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22. ANSI A156.31 – Electric Strikes and Frame Mounted Actuators
23. ANSI A156.36 – Auxiliary Locks
24. ANSI A250.4 – Steel Doors and Frames Physical Endurance
25. NFPA 80 – Standard for Fire Doors and Other Opening Protectives
26. NFPA 101 – Life Safety Code
27. MBC 2010 – Manitoba Building Code
28. Local Accessibility Codes, etc.
29. SDI 122-07 – Installation and Troubleshooting Guide for Standard Steel Doors and Frames
30. Door and Hardware Institute Publication – Sequence and Format for the Hardware Schedule (1996)
31. Door and Hardware Institute Publication – Keying Systems and Nomenclature (1989)

1.3 SUBMITTALS

1. GENERAL REQUIREMENTS

1. Submit all documentation and samples in accordance with Section 01 00 10 – General INstructions

2. SCHEDULES AND DATA

1. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
2. Door Hardware Schedule: Prepared and submitted within 2 weeks of receipt of purchase order by or under the supervision of supplier and coordinated with all drawings and related documents to ensure; size, thickness, hand, function, finish and application of hardware. All approved hardware changes shall be incorporated in the hardware schedule and kept current throughout the duration of the project.
 1. Format: Vertical format and sequence as detailed in the Door and Hardware Institute (DHI) publication "Sequence and Format for the Hardware Schedule".
 2. Content: Include the following information for each opening:
 1. Location of each hardware set cross-referenced to identifying mark(s) on Architectural floor plans and in door and frame schedule.
 2. Handing and degree of swing of each door.
 3. Keying information.
 4. Quantity, type, style, function, size and finish of each hardware item.
 5. Complete methods of operation for all openings containing electronic components with detailed operational descriptions of each items function(s) during all typical conditions and ingress/egress situations.
 6. Elevation drawings of all openings with electronic hardware systems identifying locations of components, conduit, back boxes, junction boxes and miscellaneous system requirements.
 7. Name and manufacturer of each hardware item.
 8. Fastenings and other pertinent installation information.
 9. Hardware mounting locations when different from standard.

3. Samples: Provide each type of hardware in finish indicated as requested. Items will be returned in original packaging and working order to the supplier to be incorporated into the project scope of work.
 4. Templates: Furnish a complete, indexed list with templates and finish hardware schedule to the Contractor for each trade supplying materials requiring hardware preparations.
 5. Electronic Hardware Systems:
 1. Wiring Diagrams: Prepared and submitted within 2 weeks of receipt of purchase order by or under the supervision of supplier and coordinated with all drawings and related documents to ensure accurate function and coordination.
 1. Elevations: Provide diagrams for each unique opening with electronic hardware components indentifying individual item locations, conduits, back boxes, junction boxes and miscellaneous system requirements and devices.
 2. Risers: Provide diagrams detailing locations and infrastructure between door openings, power supplies, access control panels and system components.
 3. Point to Points: Provide diagrams detailing wiring terminations at all electrified devices as applicable to function of all openings. (inclusion depending on installation)
 4. Responsibility matrix: Provide documentation for approval detailing basic responsibilities inclusive of all related sections involved in the preparation for, installation and commissioning of electrified systems.
 2. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider and/or installer of specified integrated locking products.
 6. Keying Schedule: Prepare a separate schedule, in accordance with DHI publication “Keying Systems and Nomenclature”, detailing final keying instructions for all locksets and cylinders. Include; keying system explanation, door numbers, keyset symbols, hardware set numbers, and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
 7. Operations and Maintenance Manuals: Provide operating and maintenance manuals in accordance with Division 01, Section 01 78 00, Closeout Submittals. Manuals to include; complete manufacturer and distributor contact information, manufacturers documentation for care and maintenance of all products and finishes, manufacturers product parts lists, manufacturers installation and adjustment instructions, manufacturers/service representatives warranty documentation, and ‘as built’ copies of all submittal documentation.
 8. Warranties and Maintenance Agreements; Provide manufacturers/service representatives special warranties and maintenance agreements specified in this Section.
-

1.4 QUALITY ASSURANCE

1. SUPPLIER QUALIFICATIONS

1. A recognized Architectural door hardware supplier who has maintained an office and has minimum of five (5) years documented experience in providing consulting services and supplying mechanical and electromechanical hardware comparable in material, design and extent to that required for this project.
2. Have an office and warehouse facilities to accommodate this project.
3. Authorized factory distributor in good standing of all products herein specified.
4. Have in their employment a minimum of one (1) Architectural Hardware Consultant (AHC) accredited in the Continuing Education Program (CEP) as administered and certified by The Door and Hardware Institute, Chantilly VA. AHC shall be responsible for preparation of finish hardware/keying schedules.

2. INSTALLER QUALIFICATIONS

1. Trained by the primary product manufacturers with a minimum of five (5) years documented experience in the installation of both mechanical and electromechanical hardware comparable in material, design and extent to that required for this project.

3. SOURCE LIMITATIONS

1. Electrified modifications and enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

4. FIRE-RATED OPENINGS

1. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of Authorities Having Jurisdiction (AHJ). Provide only items that are listed/labelled by Underwriter's Laboratories (UL) or Warnock Hersey (WH) for use on types and sizes of doors indicated.

5. KEYING CONFERENCE

1. Conduct conference to comply with requirements in Division 01, Section 01 31 19, Project Meetings. Keying conference to incorporate the following criteria into the final keying schedule document:
 1. Function of building, purpose of each area and degree of security required.
 2. Plans for existing and future key system expansion.
 3. Requirements for key control storage and software.
 4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.
-

1.5 DELIVERY, STORAGE AND HANDLING

1. MARKING AND PACKAGING

1. Mark items according to the approved hardware schedule indicating hardware set and door number.
2. Items to be sorted, verified and repackaged in manufacturer's original packaging complete with necessary screws, accessories, templates, installation instructions and any specialized tools required for installation.

2. DELIVERY

1. Schedule delivery times for receipt of door hardware with Contractor. Contractor to check deliveries against accepted list and provide written acceptance assuming responsibility for storage and care. Immediately identify any shortages or damaged items in writing.
2. Hardware items to be jointly inventoried on site by representatives from hardware supplier, installer and Contractor.
3. Deliver permanent keys, cylinders, software and related accessories directly to the Owner via registered mail or as established at the 'Keying Conference'.
4. Do not store electronic access control hardware, software or accessories at project site without prior authorization.
5. Construction master keys to be separately packaged from all other items and delivered to Contractor as previously coordinated.

1.6 COORDINATION

1. Obtain and distribute templates for doors, frames and other work specified to be factory prepared for installing standard and electrified hardware. Review shop drawings of related sections to ensure that adequate provisions and modifications are made for locating and installing hardware.
 2. Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required power connections, conduit, fire alarm connections, junction boxes, back boxes, reinforcing and mounting locations for low voltage power supplies, detection/monitoring hardware, power transfer devices and all other listed components.
 3. Upon completion of installation, provide written documentation that components were applied as per manufacturer's instructions and recommendations according to the approved hardware schedule. Identify any defective or damaged materials.
-

1.7 WARRANTY

1. General Warranty in accordance with Division 01, General Requirements. Special warranties specified in this article shall not deprive the Owner of other rights under other provisions of the Contract Documents and shall be in addition to, and run concurrent with other warranties made by Contractor under requirements of the Contract Documents.
2. Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period of one (1) year from date of Substantial Completion, unless otherwise indicated. Failures include, but are not limited to:
 1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of hardware.
 3. Deterioration of metals, finishes and other materials beyond normal weathering.
 4. Electrical component defects and failures within system operation.
3. Special Warranty Periods:
 1. Hinges - Lifetime
 2. Mortise Locksets – Seven (7) years
 3. Exit Devices – Five (5) years
 4. Door Closers – Ten (10) years
 5. Electric Strikes – Five (5) years
 6. Electromechanical Locksets – Two (2) years
 7. Power Supplies - Lifetime

2. PRODUCTS

2.01 MANUFACTURERS

1. Manufacturers as listed below have been determined as the acceptable standard. Obtain each type of finish hardware (hinges, latch and locksets, exit devices, door closers, etc.) from a single manufacturer.
2. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.02 MATERIALS

1. KEYING

1. KEYING

1. Keying: All permanent cylinders to be master-keyed or grandmaster-keyed as directed by the owner. The factory shall key all locks and cylinders and maintain keying records. The factory shall establish a System Information Document (SID) to designate primary system administrators and require a separate letter of authorization for all future shipments of keyed products.
2. Provide temporary cylinders for all locksets and other locking devices factory master keyed in groups as directed by the contractor for use during construction.
3. The contractor shall be responsible to remove all construction cores and install all permanent cores. Unless otherwise directed by the owner.
4. Construction master/change keys are to be delivered to the contractor directly. Do not ship construction keys with locksets.
5. Ship all permanent cylinders and keys separately. Identify door number and keyset symbol on each envelope for direct factory delivery to the owner.
6. Furnish the following:
 - 1) Two (2) permanent change keys per lock. Determine final quantities during keying meeting.
 - 2) Allow for 25 extra permanent cut keys. Determine quantity per key set during keying meeting.
 - 3) Five (5) cut master keys – divide between MK groups. Confirm quantity with owner at keying meeting.
 - 4) Five (5) construction master keys delivered directly to the contractor.
 - 5) Three (3) control keys.
 - 6) Master keys and all high-security permanent change keys shall be sealed in tamper-proof packaged boxes when shipped from the factory. The boxes shall be shrink wrapped and imprinted to ensure the integrity of the packaging. Deliver all keys and key blanks directly to owner's representative as directed.

2. KEY CABINET

1. Provide a two tag key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall expansion capacity of 150% of the number of locks required for the project. Hardware Supplier shall assist owner with the set up of the key cabinet.
 - 1) Specified Manufacturer: Lund, Telkee

2. ELECTRIC STRIKES

1. STANDARD STRIKES

1. Doors with mortise locks use HES model 1006 with appropriate KM faceplate.
2. Non fire rated doors with rim exit devices use HES model 9600 - 24VDC
3. Fire rated doors with rim exit devices use HES model 9500 - 24VDC
4. Stainless steel 32D/ 630 finish
5. Applicable standards ANSI/BHMA A156.31 - Grade 1
 - 1) Acceptable Manufacturers: HES 1006 and 9500, Von Duprin, Rutherford Controls

1. AUTOMATIC DOOR OPERATORS

1. Surface mounted ADO - Low Energy handicap operators.
2. Applicable standards: ANSI/ BHMA A156.19
3. ADO shall have the ability to operate the door via a proximity card reader with built-in interface module.
4. Install an ADO button on a stand-alone post to activate a set pair of doors.
5. ADO actuator shall be 114mm x 114mm minimum dimension, stainless steel material, with the international symbol of accessibility displayed blue in colour.
6. The maximum total open time for a door shall be 13 seconds of which a maximum of 10 seconds being held in the fully open position in accordance with ANSI/BHMA A156.19.

1) Specified Manufacturer: Besam SW200i, Hunter HA-8 LP

2. PEDESTALS FOR AUTOMATIC DOOR OPERATORS/CARD ACCESS

1. Freestanding pedestals for automatic door operators and/or card access devices.
2. To be constructed of 14 gauge stainless steel welded at all corners.
3. Dimensions: 1320mm tall, 150mm x 150mm.
4. Provide with service plate in rear base for simple mounting.

1) Specified Manufacturer: Chase Security Systems, COE Stainless Tower, Curran Engineer.

3. DOOR TRIM AND PROTECTIVE PLATES

1. Supply door trim as listed in the hardware schedule. Pulls are supplied with back to back (BTB) or through bolt mounting as required. When push plates are listed with door pulls, counter-sink through bolts and install the push plate to conceal the through bolt. Verify all heights of full length door pulls prior to ordering. Co-ordinate heights with related door hardware products.
2. Kick plates shall be installed:
 1. 1-1/2" narrower than door width for single doors and 1" narrower than door width for double doors.
 2. Stainless steel US32D finish.
 3. Fastened with 2-sided 3M tape.

1) Specified Manufacturer: Rockwood, Gallery Specialty Hardware, Standard Metal Products

4. GASKETING AND THRESHOLDS

1. On exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide seals as required to meet UL10C. Provide only those units where silicon seal strip is easily replaceable and readily available from stocks maintained by manufacturer. Provide head seal as solid aluminum extrusion suitable for stop applied hardware ie P/A closers or surface overhead door stops.
 2. Door Sweeps: House nylon brush seal in extruded aluminum case. Surface applied and adjusted to suit gap at bottom of door, complete with snap cover.
-

3. Auto Door Bottoms: Surface automatic door bottoms housed in aluminum case and equipped with nylon brush or silicone inserts. Each unit sized to suit the door width and meets the requirements of ANSI/BHMA 156.22-2003 for latching force and air infiltration.
4. Meeting Stiles: House nylon brush seal in extruded aluminum case. Surface applied, meeting stile astragal, consisting of two pieces attached to pull side face of door. Adjust during installation for proper seal prior to attaching snap cover.
5. Provide threshold units not less than 4” wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames. All threshold units shall comply with the Americans with Disabilities Act (ADA).

1. Acceptable Manufacturers: Pemko, KN Crowder, National Guard Products

5. SILENCERS

1. Furnish rubber door silencers for all hollow metal frames; two (2) per pair and three (3) per single door frame.

6. ELECTRONIC PRODUCTS AND ACCESSORIES

1. POWER SUPPLIES

1. Power supplies shall furnish regulated 24VDC and shall be UL class 2 listed. LED's shall monitor zone status (voltage/no voltage) and slide switches shall be provided to connect or disconnect the load from power; 1, 4 or 8 separate output circuit breakers shall be provided to divide the load. Power supplies shall have the internal capability of charging optional 24VDC sealed lead acid batteries in addition to operating the DC load. Power supplies shall be supplied complete requiring only 120VAC to the fused input and shall be supplied in an enclosure. Power supplies shall be provided with emergency release terminals that allow the release of all devices upon activation of the fire alarm system.

- 1) Specified Manufacturer: Securitron BPS, Rutherford Controls

3. EXECUTION

3.1 EXAMINATION

1. Examine scheduled openings, with installer present, for compliance with requirements for; installation tolerances, labelled fire door assembly construction, wall and floor conditions, and other site conditions affecting performance. Notify Architect in writing of any discrepancies or conflicts between the door schedule, door types, drawings or scheduled hardware. Discrepancies and conflicts to be resolved in writing prior to installation of hardware.
 2. Examine hardware to ensure it is free from defects prior to installation.
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3. Ensure that building is secured and free from weather elements prior to installation of interior door hardware.

3.2 PREPARATION

1. Door and Frame Preparation: Field prepare doors and frames for all function holes and fasteners under 25.4mm (1”) as per the manufacturer(s) templates and installation instructions provided. Drill and tap as required.

3.3 INSTALLATION

1. Install each item of mechanical and electromechanical hardware and access control equipment to comply with the manufacturer’s written instructions and according to specifications. All items to be installed with fasteners identified by manufacturer’s installation instructions unless otherwise noted.
 2. Mounting Heights: Install door hardware at heights indicated in the following applicable publications unless; specifically indicated or required by local governing regulations, requirements to match for special templates, necessary coordination with door elevations, and or to ensure consistency with pairs of doors.
 1. DHI’s “Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames”
 2. DHI’s “Recommended Locations for Architectural Hardware for Wood Flush Doors”
 3. ANSI A117.1 “Accessibility Guidelines for Buildings and Facilities”
 4. NWWDA
 3. Power door operator products and accessories are required to be installed by an AAADM certified technician as approved by the manufacturer. Adjust for proper opening and closing operation after final balancing of HVAC system.
 4. Wall stops: Locate wall stops to contact door pulls/levers at mounting post connecting to door. Ensure existence of necessary wall reinforcing where specified for installation on drywall, plaster or clad wall conditions prior to installation.
 5. Closers: Size closers as per manufacturer’s installation instructions. Adjust all closers after final balancing of HVAC system to ensure; proper latching of doors, proper closing/latch speed, adequate backcheck and opening force in accordance with referenced accessibility requirements.
 6. Protection plates – Install on clean surface, and in temperature range of 5-25 degrees Celsius where tape applied. Pre-drill pilot holes doors when using mechanical fasteners.
 7. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 7, Section 07 92 00, Joint Sealants.
 8. Architectural Seals – Install prior to other soffit mounted door hardware as indicated in hardware schedule. Ensure continuous seal of gasketing to door without impeding latching.
-

9. Door Bottoms – Ensure continuous seal to threshold or finished floor.
10. Electronic hardware systems: Install all electronic hardware as per electrical elevations and point-to-point drawings furnished under Submittals.

3.4 FIELD QUALITY CONTROL

1. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures for coordinating all portions of work under the Contract, unless the Contract Documents give other specific instructions.
2. The Contractor will conduct periodic inspections to ensure that door frames are installed plumb, level and square with verification by installer prior to installation of doors and door hardware.
3. Hardware supplier to attend site meetings as required to ensure proper execution of the guidelines set forth herein.
4. Hardware supplier will perform final field inspection of installed door hardware after final adjustment of all products and will document and report any deficiencies or omissions for correction and written acceptance by the Contractor.

3.5 ADJUSTING

1. Adjust and verify proper operation and function of each operating item of hardware (including electromechanical) on all doors prior to acceptance and occupancy. Replace units that cannot be adjusted to operate freely and as intended for the application made.

3.6 CLEANING AND PROTECTION

1. Contractor to protect all hardware, as it is stored on construction site in a covered, dry and secure place. Protect exposed hardware installed on doors and frames during the construction phase. Install any and all hardware at the latest possible time frame.
2. Remove manufacturer's protective coating from items after written acceptance of installation by Contractor.
3. Clean operating items as necessary to restore to proper function and finish of hardware and doors.
4. Clean adjacent surfaces soiled by door hardware installation.

3.7 DEMONSTRATION

1. Instruct Owner's maintenance personnel in the proper adjustment, operation and maintenance of mechanical and electromechanical door hardware, electronic devices and maintenance of finishes.

END OF SECTION

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Hardware Sets

Set: 1.0

3 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Faculty/Hotel/Restroom Lock	L9485 P 07N	626	SC
1 Door Closer	281 P10	EN	SA
1 Kick Plate	K1050 10"	US32D	RO
1 Door Stop	441H	US26D	RO

Notes: Supply standard cylinder for use during construction. Owner will supply and install final cylinder.

Set: 2.0

3 Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK
1 Corridor Lock	L9456 P 07N	626	SC
1 Electric Strike	1006CDB	630	HS
1 Auto Operator	Besam SW200i c/w actuators*	689	BM
1 Kick Plate	K1050 10"	US32D	RO
1 Threshold	272A		PE
1 Sweep	315CN		PE
1 Gasketing	316AS		PE

Notes: Supply standard cylinder for use during construction. Owner will supply and install final cylinder. When deadbolt is retracted pushing actuator on either side of door will release the electric strike and power open the door. Operator to be manually turned on/off.

*Confirm actuator type with owner prior to ordering.

Set: 3.0

3 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Corridor Lock	L9456 P 07N	626	SC
1 Door Closer	281 P10	EN	SA
1 Kick Plate	K1050 10"	US32D	RO
1 Door Stop	441H	US26D	RO

Notes: Supply standard cylinder for use during construction. Owner will supply and install final cylinder.

Set: 4.0

4 Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1 Faculty/Hotel/Restroom Lock	L9485 P 07N	626	SC
1 Door Closer	281 P10	EN	SA
1 Kick Plate	K1050 10"	US32D	RO
1 Door Stop	441H	US26D	RO
1 Seals and Threshold	By Door Supplier		OT

Notes: Supply standard cylinder for use during construction. Owner will supply and install final cylinder.

Set: 5.0

3 Hinge	TA2714 4-1/2" x 4"	US26D	MK
1 Privacy Set	L9040 07N	626	SC
1 Closer	1431 UO	EN	SA
1 Kick Plate	K1050 10"	US32D	RO
1 Door Stop	441H	US26D	RO

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Non-load bearing steel stud framing, and suspension systems.
 - .2 Gypsum board.
- .2 Related Requirements:
 - .1 Section 06 10 00 - Rough Carpentry
 - .2 Section 09 22 16 - Non-structural Metal Framing
 - .3 Section 09 30 13 - Ceramic Tiling: joint treatment of tile backing board

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C475-12, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C 645-13, Standard Specification for Nonstructural Steel Framing Members.
 - .3 ASTM C 754-11, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - .4 ASTM C840-13, Specification for Application and Finishing of Gypsum Board.
 - .5 ASTM C954-11, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .6 ASTM C1002-07r13, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .7 ASTM C1047-14, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .8 ASTM C1280-13, Specification for Application of Gypsum Sheathing Board.
 - .9 ASTM C1177-13, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .10 ASTM C 1178-13, Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
 - .11 ASTM C 1396-14, Standard Specification for Gypsum Board.
 - .12 ASTM D 3273-12, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - .2 Association of the Wall and Ceilings Industries International (AWCI)
 - .3 Canadian General Standards Board (CGSB)
-

- .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .4 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.
- .2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.
- .3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.4 SITE ENVIRONMENTAL REQUIREMENTS

- .1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 00 10 – General Instructions

Part 2 Products

2.1 MATERIALS

- .1 Exterior Gypsum Sheathing: To ASTM C1177M, with fibreglass mat laminated to both sides, and with manufacturer's standard edges, 16 mm except where thickness indicated, 1 220 mm wide by maximum practical length.
 - .2 Interior Gypsum Board: To ASTM C1396M, Type X, 16 mm except where thickness indicated, 1 200 mm wide by maximum practical length, ends square cut, long edges beveled.
 - .1 Location: All locations except where interior moisture-resistant gypsum board, interior glass-mat water-resistant gypsum backing board or abuse-resistant gypsum board is indicated.
-

- .3 Interior Moisture-Resistant Gypsum Board (GB-MR): To ASTM C1396, moisture-resistant, treated core, mould resistance rating 10 to ASTM D 3273. Type X, 16 mm thick for walls, 12 mm thick for ceilings by 1200 mm wide by maximum practical length, ends square cut, long edges bevelled.
 - .1 Location: Within 1200 mm of plumbing fixtures.
- .4 Steel drill screws:
 - .1 For wood framing and metal framing less than 0.91 mm thick: To ASTM C 1002.
 - .2 For metal framing 0.91 mm and thicker: To ASTM C 954.
- .5 Laminating compound: As recommended by manufacturer, asbestos-free.
- .6 Casing beads, corner beads, control joints and edge trim: To ASTM C1047, zinc-coated by hot-dip process, 0.5 mm base thickness, laminated to paper tape, one piece length per location.
- .7 Sound Attenuation Batts: to CAN/ULC-S702, mineral fibre or mineral wool with flame spread and smoke developed requirements in conformance with NBCC, CAN/ULC-S102-M. Listed as non-combustible in accordance with requirements of CAN4-S114-M. Thickness to meet STC rating indicated, width to suit metal framing spaces.
- .8 Strip Impalement Clips: 25 mm wide strip fabricated from 0.455mm galvanized sheet metal with punch-out insulation securement arrows.
- .9 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .10 Polyethylene: To CAN/CGSB-51.34, Type 2.
- .11 Joint compound: To ASTM C475, asbestos-free.
- .12 Joint Tape:
 - .1 Interior Gypsum Board: Paper, except where fibreglass mesh tape is indicated.
 - .2 Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - .3 Interior Glass-Mat Water-Resistant Gypsum Backing Board: fibreglass mesh tape.

Part 3 Execution

3.1 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
 - .2 Do application of gypsum sheathing in accordance with ASTM C1280.
-

- .3 Do application of fire rated, mould-resistant, shaftliner board in accordance with ASTM C754, ASTM C840, and manufacturer's recommendations.
- .4 Acoustic insulation – STC rated assemblies:
 - .1 Install insulation to maintain continuity acoustical separation.
 - .2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
 - .3 Do not compress insulation to fit into spaces.
 - .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604 Type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 Type B and L vents.

3.2 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
 - .2 Apply gypsum board to metal furring and framing using screw fasteners for first layer, and laminating adhesive for additional layers in multi-layer applications, unless otherwise indicated. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .1 Exception: Apply gypsum board on fire rated and sound rated partitions prior to application of gypsum board on ceilings.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
 - .3 Apply moisture resistant gypsum board within 1200 mm of plumbing fixtures and shower.
 - .1 Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads.
 - .4 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components.
 - .1 Seal full perimeter of cut-outs around gypsum board penetrations, in partitions where perimeter sealed with acoustic sealant.
 - .5 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints 250 mm minimum.
 - .6 Install gypsum board on walls vertically to avoid end-butt joints.
 - .7 Install gypsum board with face side out.
 - .8 Do not install damaged or damp boards.
-

- .9 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.
- .10 Sealant application - STC-Rated Assemblies: Seal construction at perimeters, behind control joints, at openings, and at penetrations with a continuous bead of acoustical sealant.
 - .1 Install acoustical sealant at both faces of partitions.
 - .2 Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around and through assemblies, including sealing partitions above acoustical ceilings

3.3 INSTALLATION - ACCESSORIES

- .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. Seal joints with sealant.
- .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 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.
- .6 Provide continuous polyethylene dust barrier behind and across control joints.
- .7 Locate control joints at changes in substrate construction, at approximate 10 000 mm spacing on long partition runs, and at approximate 15 000 mm spacing on ceilings.
- .8 Install control joints straight and true.
- .9 Align ceiling and wall joints at coincident locations.
- .10 Install access doors to electrical and mechanical fixtures where indicated.
 - .1 Rigidly secure frames to furring or framing systems.

3.4 FINISHING – GYPSUM BOARD

- .1 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.
 - .2 Gypsum Board Finish: Finish gypsum board walls and ceilings to following levels in accordance with ASTM C840:
-

- .1 Levels of finish:
 - .1 Level 0: No taping, finishing or accessories required.
 - .1 Location: temporary construction, interior .
 - .2 Level 1: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.
 - .1 Location: Gypsum board above ceilings.
 - .3 Level 3: Embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
 - .1 Location:
 - .1 In non-public areas, service rooms including electrical, mechanical, telecom rooms.
 - .4 Level 4: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
 - .1 Location: Public areas except otherwise indicated.
- .3 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .4 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.
- .5 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .6 Completed installation to be smooth, level and plumb, free from waves and other defects and ready for surface finish.
- .7 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 92 00 - Joint Sealants.
- .2 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM C645-13, Specification for Nonstructural Steel Framing Members.
 - .2 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process
 - .3 ASTM C754-11, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - .4 ASTM C1513-13, Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
 - .5 ASTM E119-12, Standard Test Methods for Fire Tests of Building Construction and Materials.
 - .6 ASTM E814-13 Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- .2 Canadian Standards Association (CSA)
 - .1 CSA S136-12, North American Specification For The Design Of Cold-Formed Steel Structural Members.

1.3 DEFINITIONS

- .1 Steel Thickness:
 - .1 Thickness: In accordance with CSA S136, thickness of base steel exclusive of coatings
 - .2 Design Thickness: Target or "nominal" thickness used to determine structural properties of the cold formed Products.
 - .3 Delivered Minimum Thickness: Design thickness minus minimum allowable under-tolerance permitted by CSA S136 (95% of design thickness) or material specification; whichever is more stringent.
 - .4 Designation Thickness: For the purposes of this specification; thicknesses provided will be base steel thicknesses in accordance with CSA S136.
-

Designation Thickness	Minimum Base Steel Thickness		Gauge No. (For reference Only)	Colour
	(mils)	(in)		
18	0.0179	0.455	25	Not Painted
33	0.0329	0.836	20	White
43	0.0428	1.087	18	Yellow
54	0.0538	1.367	16	Green

1.4 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 Products

- .1 Non-load bearing channel stud framing: to ASTM C645, stud size indicated, roll formed from hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centres. Minimum base steel thickness as follows:
 - .1 General interior framing:
 - .1 64 mm stud size: minimum 0.836 mm thick, based on 359 N/m² (7.5 psf) lateral load and L/240 deflection.
 - .2 92 mm stud size: minimum 0.836 mm thick, based on 359 N/m² (7.5 psf) lateral load and L/240 deflection.
 - .3 152 mm stud size: minimum 0.455 mm thick, based on 359 N/m² (7.5 psf) lateral load and L/240 deflection.
 - .2 Jamb framing: 0.836 mm.
- .2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32 mm flange height.

- .3 Deflection systems:
 - .1 Single track: To ASTM C645, roll formed from hot dipped galvanized steel sheet, Z120 coating designation to ASTM A653, single slotted ceiling track.
 - .1 Movement: Allowing up to 25 mm vertical movement
 - .2 Dimensions: 1.087 mm thick x width required.
 - .3 UL classification: 1 and 2 hour fire rating, to ASTM E119 and ASTM E814 for fire and hose stream testing.
 - .4 Metal channel stiffener: 13.5 x 38 mm size, 1.367 mm thick cold rolled steel, coated with rust inhibitive coating.
 - .5 Metal furring runners, hangers, tie wires, inserts, anchors: to ASTM C1280, galvanized.
 - .6 Drywall furring channels: 0.455 mm core thickness galvanized steel channels for screw attachment of gypsum board.
 - .7 Concealed Reinforcing:
 - .1 Canadian softwood plywood (CSP): to Section 06 10 00 - Rough Carpentry.
 - .2 Sheet Steel Reinforcing: To ASTM A653/A653M, 1.087 mm thick sheet steel, zinc-coated commercial steel Type B, coating designation Z275.
 - .8 Acoustical sealant: to Section 07 92 00 – Joint Sealants.
 - .9 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, full width of stud, with self-sticking permanent adhesive on one face, lengths as required.
 - .10 Metal Framing Fasteners: To ASTM C1513, self-drilling tapping screws, and self-piercing tapping screws, corrosion resistant, head style and size to suit application.

Part 3 Execution

3.1 ERECTION

- .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 Install insulating strips under stud shoe tracks of partitions on slabs on grade.
 - .4 Place studs vertically at spacing indicated and not more than 50 mm from abutting walls, and at each side of openings and corners.
 - .1 Position studs in tracks at floor and ceiling.
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- .2 Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
 - .5 Erect metal studding to tolerance of 1:1000.
 - .6 Framing shall not exceed L/360 deflection for tile applications and L/240 for flexible finishes like paint.
 - .7 Attach studs to bottom and ceiling track and deflection system using metal framing screws.
 - .8 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
 - .9 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
 - .10 Install two jamb studs at openings for door openings up to 1 220 mm wide.
 - .1 Extend from floor to ceiling at each side of opening.
 - .2 Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
 - .11 Specially design jamb framing for openings larger than 1 220 mm wide.
 - .12 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.
 - .13 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
 - .14 Install steel studs or furring channel between studs for attaching electrical and other boxes.
 - .15 Extend partitions to ceiling height except where noted otherwise on drawings.
 - .16 Maintain clearance under beams and structural elements occurring above steel stud partitions to avoid transmission of structural loads to studs.
 - .1 Provide deflection system accommodating dimensions indicated.
 - .17 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.
 - .18 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C 840 except where specified otherwise.
-

- .1 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, and grilles.
- .2 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .19 Concealed Reinforcing: Install backing in metal framed assemblies to support elements mounted to metal framed assembly including but not limited to behind lavatory basins, toilet and bathroom accessories, and other fixtures including architectural woodwork, accessories, and equipment attached to steel stud partitions.:
 - .1 Provide 19 mm plywood blocking secured between studs for attachment of items.
 - .1 Cut plywood to fill space between webs of adjacent studs, kerf plywood as required to nest in stud flanges.
 - .2 Locate where required by work of other Sections.

3.2 CLEANING

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

END OF SECTION

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Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Sheet vinyl flooring and base.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM D2047-11, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
 - .2 ASTM F710-11, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
 - .3 ASTM F1869-11, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - .4 ASTM F2170-11, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
- .2 Resilient Floor Covering Institute
 - .1 FloorScore Certified Flooring Products.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions.
 - .2 Action Submittals:
 - .1 Product Data: For each type of product specified.
 - .2 Shop Drawings: Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - .3 Show details of special patterns.
 - .4 Samples:
 - .1 Submit duplicate 300 by 300 mm sample pieces of each type and colour of sheet material, with specified seam in centre of sample. Mount sample on rigid backing. Provide samples of inside and outside corners of integral base.
 - .2 Submit duplicate 300 mm long samples of reinforced integral base.
 - .1 Provide sample with specified resilient sheet finish. Colour and pattern are representative only and will not be used for purposes of reviewing materials installed.
 - .3 Informational Submittals:
 - .1 Qualification Data: for installers.
-

1.4 CLOSEOUT SUBMITTALS

- .1 Maintenance Data: For flooring to include in operation and maintenance manuals. Include the following:
 - .1 Cleaning and maintenance recommendations for Departmental Representative's use and suggested schedule for cleaning. Provide detailed information regarding properties of stain resistance and recommended procedures for removal.

1.5 EXTRA STOCK MATERIALS

- .1 Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- .2 Sheet Flooring: Provide 2% additional material of each colour and type of flooring for maintenance use. Provide in full width roll goods.
- .3 Store where directed by Departmental Representative.
- .4 Provide written receipt signed by Contractor, stating date and quantity delivered.

1.6 QUALITY ASSURANCE

- .1 Installer Qualifications: Employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation and seaming method indicated with following:
 - .1 Comparable Projects: Minimum three successfully completed projects of similar scale and scope for materials of this Project. Provide reference project information as follows:
 - .1 Project name and location
 - .2 Flooring materials and quantities.
 - .3 Owner name and contact information.
 - .4 Consultant name and contact information.
 - .5 Completion date.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Deliver packaged materials in original unopened containers free from damage, with identification labels intact.
 - .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 Replace defective or damaged materials with new.
-

1.8 SITE CONDITIONS

- .1 Ensure high ventilation rate, with maximum outside air, during installation.
 - .1 Vent directly to outside.
 - .2 Do not let contaminated air recirculate through air distribution system.
- .2 Maintain air temperature and structural base temperature at flooring installation area between 10 and 20 degrees C for 48 hours before, during and for 48 hours after installation.
- .3 Before installation, store materials for three days in area of installation to achieve temperature stability.
- .4 Close spaces to traffic during floor covering installation.
- .5 Close spaces to traffic for 48 hours after floor covering installation.
- .6 Install floor coverings after other finishing operations, including painting, have been completed.

1.9 WARRANTY

- .1 Provide warranty against defects in workmanship including lifting, separation from substrate, buckling, wrinkling, and open curling.
 - .1 Warranty period: 2 years from the date of Substantial Performance of the Work.
- .2 Submit written warranty on manufacturer's letterhead stating that flooring materials will be free of manufacturing defects and will not wear through the colour and pattern.
 - .1 Warranty period: five years from the date of Substantial Performance of the Work.

Part 2 Products

2.1 RESILIENT SHEET FLOORING MATERIALS

- .1 Resilient Sheet Flooring (RSF): to ASTM F 1913, homogeneous single layered floor covering, lifetime no-wax, dry buff finish.
 - .1 Pattern: Non-directional.
 - .2 Sheet Width: 1 830 mm minimum
 - .3 Wearing surface: Smooth.
 - .4 Thickness: 2.0 mm.
 - .5 Seaming Method: Heat-welded.
 - .6 Slip Resistance: To ASTM D 2047, static coefficient of friction >0.6.
 - .7 Allow for one colour selected by Departmental Representative from manufacturer's standard colour range.
-

- .8 Acceptable Products: Johnsonite Melodia, Johnsonite Aria, Armstrong Medintec, Armstrong Medintone, Polyflor Classic Mystique PUR.
- .2 Resilient Sheet Safety Flooring (Non-skid finish): to ASTM F1303, Type 2, Grade 1, Class A moisture resistant backing. Combination of high quality vinyl content, aluminum oxide and coloured quartz grains throughout thickness; non-woven polyester/cellulose backing with glass fibre reinforcement; heat weld seams.
 - .1 Roll Width: 2 000 mm nominal.
 - .2 Thickness: 2.5 mm
 - .3 Slip Resistance: D .81 / W .89
 - .4 Colour: Allow for one colour selected by Departmental Representative from manufacturer's complete range.
 - .5 Provide material for prefabricated cove base where indicated.

2.2

ACCESSORIES

- .1 Resilient Base: to ASTM F1861, Type TS (rubber thermoset), Group I (solid homogeneous), in coils of manufacturer's standard lengths. Outside and inside corners: job-formed.
 - .1 Style: Standard cove, 3 mm thick, exposed face height: 101.6 mm.
 - .2 Colours: As selected by Departmental Representative from full range of industry colours. Allow for three colours.
 - .2 Welding Rod: Manufacturer's solid-strand product for heat welding seams. Colour selected by DCC Representative from manufacturer's standard colour range.
 - .3 Primers and Adhesives: Water-resistant urethane recommended by manufacturer to suit floor covering and substrate conditions indicated.
 - .4 Sub-floor filler and leveller: Polymer-modified, Portland cement based or blended hydraulic-cement-based formulation approved by flooring manufacturer for applications indicated. Gypsum-based products are not permitted.
 - .1 Spot patching compound: for smoothing, patching, filling cracks, holes, voids and depressions.
 - .1 Acceptable Products: Ardex Feather Finish, Mapei Planipatch, Laticrete NXT Patch and NXT Skim, Penetron Surfex SKM.
 - .2 Self-levelling underlayment: for leveling and filling uneven substrates.
 - .1 Acceptable Products: Ardex V 1200, Mapei UltraPlan, Laticrete NXT Level, Penetron Leveline 15.
 - .5 Crack and Joint Repair Compound: Two-part, fast-setting 100% solids polyurethane repair compound, compatible with flooring adhesive, and moisture reduction barrier.
 - .1 Acceptable Products: Ardex Ardifix, Laticrete Spartacote Fast Fix.
 - .6 Metal Edge Strips: Extruded aluminum, smooth, mill finish, shoulder flush with top of adjacent floor finish. Profile selected by Departmental Representative from manufacturer's full range.
-

- .1 Acceptable Manufacturers: Bengard, Schluter, Blanke.
- .7 Sealants: mildew-resistant, paintable silicone, to ASTM C920, Type S, Grade NS, Class 25.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine conditions, substrates and work to receive work of this Section. Site verify dimensions.
- .2 Verification of Conditions: verify conditions of substrates previously installed under other Sections are acceptable for product installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative and flooring manufacturer of unacceptable conditions immediately upon discovery.
 - .3 For gypsum board partitions, verify that gypsum board joints are taped and filled to floor level.
 - .4 Proceed with installation only after unacceptable conditions have been remedied.
 - .5 Start of work implies acceptance of conditions.
- .3 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

3.2 PREPARATION

- .1 Prepare for installation in accordance with manufacturer's written recommendations.
 - .2 Concrete Substrate: Prepare according to ASTM F 710.
 - .1 Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - .2 Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - .3 Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - .4 Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - .3 Remove sub-floor ridges and bumps and fill low spots, cracks, joints, holes and other defects with sub-floor filler.
 - .4 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler is completely cured and dry.
-

- .5 Where floorings of different thickness abut, apply filler to build up a smooth gradual ramping to allow resilient flooring to meet adjacent material. Make smooth transitions between different floor finishes.
- .6 Do not install floor coverings until they are same temperature as space where they are to be installed.
 - .1 Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- .7 Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.
- .8 Prime or seal substrate as recommended by resilient flooring manufacturer's written instructions.

3.3 APPLICATION: FLOORING

- .1 Comply with manufacturer's written instructions for installing floor coverings.
 - .2 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive that can be covered by flooring before initial set takes place.
 - .3 Resilient sheet flooring:
 - .1 Unroll floor coverings and allow them to stabilize before cutting and fitting.
 - .2 Run sheets in direction of traffic, and parallel to building lines. Avoid cross seams.
 - .3 Maintain uniformity of floor covering direction.
 - .4 Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 150 mm away from parallel joints in floor covering substrates.
 - .1 Install flooring with seams located in accordance with reviewed shop drawings.
 - .5 Match edges of floor coverings for colour shading at seams.
 - .6 Border widths: 1/3 minimum width of full material.
 - .7 Double cut sheet seams.
 - .8 Heat-welded seams: Install RSF with heat welded seams compliant with ASTM F 1516. Route out seams and use welding bead to permanently fuse sections into seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.
 - .9 Butt edge seams: Install RSF Sport Flooring with butt edge seams perfectly closed without gaps or peaks caused by excess pressure.
 - .1 Tape and weight joints during adhesive cure period in accordance with manufacturer's written installation instructions.
 - .4 As installation progresses, and after installation roll flooring with 45 kg minimum roller to ensure full adhesion.
-

- .5 Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- .6 Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- .7 Install floor coverings in pan type floor access covers and similar items in installation areas. Maintain overall continuity of colour and pattern between pieces of floor coverings installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.
- .8 Continue flooring over areas which will be under built-in furniture.
- .9 Terminate resilient flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.
- .10 Install metal edge strips at unprotected or exposed edges where flooring terminates.

3.4 APPLICATION: RESILIENT BASE

- .1 Lay out base to keep number of joints at minimum. Base joints at maximum length available or at internal corners.
 - .2 Clean substrate and prime with one coat of adhesive.
 - .3 Apply adhesive to back of base with 100% coverage over 7/8th of full height of base.
 - .4 Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - .5 Install straight and level to variation of 1:1000. Align tops of adjacent pieces.
 - .6 Scribe and fit to door frames and other obstructions.
 - .7 On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
 - .8 Job-Formed Corners:
 - .1 Wrap base minimum 300 mm beyond corners. No joint at corners permitted.
 - .2 Outside corners: Form without producing discolouration (whitening) at bends. Scribe back of base at bend locations and remove strips perpendicular to length of base that are only deep enough to produce snug fit, without removing more than half wall base thickness.
 - .9 Inside corners: Form by cutting inverted V-shape notch in toe of wall base at point where corner is formed. Scribe back of base where necessary to produce snug fit.
-

3.5 CLEANING

- .1 Comply with manufacturer's written instructions for cleaning and protection of flooring, wall base, and accessories.
- .2 Initial Maintenance: Perform following operations immediately after completing flooring installation:
 - .1 Remove adhesive and other blemishes from exposed surfaces.
 - .2 Sweep and vacuum surfaces thoroughly.
 - .3 Damp-mop surfaces to remove marks and soil.

3.6 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 503R, Use of Epoxy Compounds with Concrete.
- .2 ASTM International (ASTM)
 - .1 ASTM C307-03(2012), Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing
 - .2 ASTM C579-01(2012), Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
 - .3 ASTM C580-02(2012), Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
 - .4 ASTM D2047-11, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
 - .5 ASTM D2240-15, Standard Test Method for Rubber Property-Durometer Hardness.
 - .6 ASTM D4060-14, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
 - .7 ASTM E84-15B, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials, 2006 Edition
- .4 International Concrete Repair Institute (ICRI)
 - .1 ICRI Guideline Number 03732, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Sequencing:
 - .1 The following must be installed prior to application of fluid-applied flooring:
 - .1 Concrete masonry units, interior partitions, doors and frames.
 - .2 The following must be installed after application of the fluid-applied flooring:
 - .1 Wall coatings, equipment, fixtures, and furniture.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 General Instructions
-

- .2 Action Submittals:
 - .1 Product Data: Submit product data and manufacturer's installation instructions including instructions for evaluating, preparing, and treating existing substrates.
 - .2 Samples: Submit duplicate 300 x 300 mm stepped sample of each colour and finish of flooring, applied to 13 mm thick cementitious board, complete with integral base. Indicate colour and texture.
- .3 Informational Submittals:
 - .1 Qualification Data: for installer.
 - .2 Statement of Compatibility: Provide written statement that components floor coatings, sealant and substrates are compatible.
 - .3 Field quality-control reports.
 - .4 Warranties: sample of warranty.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for coatings for incorporation into manual in accordance with Section 01 00 10 General Instructions
- .2 Provide complete instructions describing repair to physically damaged surfaces.
- .3 Certificate: Upon completion of flooring work, provide certification, signed by Contractor, and responsible officer of application company, stating:
 - .1 Installed flooring system complies with specifications, and manufacturer's instructions.
 - .2 Materials were properly selected for application.
 - .3 Installation methods complied with manufacturer's printed instructions.
 - .4 Manufacturer's field representative verbal instructions were proper and adequate for conditions and use in each case.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: Manufacturer's own forces, or applicator approved by flooring manufacturer, specializing in fluid-applied flooring installation with not less than 5 years' of experience in installation of project of similar size.
- .2 Single Source Responsibility:

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Label information shall identify product, lot numbers and shelf life expiration date for each component.
 - .2 Check for material completeness and damage before starting work. Remove damaged materials from site.
-

- .3 Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer, in dry lockable area.
- .4 Ensure health and fire regulations are complied with in storage area, and during handling and application.

1.7 SITE CONDITIONS

- .1 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of materials.
 - .2 Ensure no open flame heating devices are used.
 - .3 Discourage occupancy of treated space until volatile materials are no longer being emitted and there is no odour.
 - .4 Provide adequate respiratory protection to exposed individuals.
 - .5 Post “No Smoking” and “No Open Flame” warning signs at points of entry in which work of this Section is being applied.
 - .2 Ventilation:
 - .1 Provide ventilation continuously during and after fluid-applied flooring application. Run system 24 hours per day during application; provide continuous ventilation for 7 days after completion of application.
 - .3 Moisture Testing:
 - .1 Test for moisture using an electronic moisture meter. Proceed with installation only after substrates have maximum moisture-vapour-emission rate in accordance with manufacturer’s recommendations.
 - .4 Apply fluid-applied flooring only:
 - .1 In accordance with manufacturers recommendations.
 - .2 When substrates have been fully cured and cleaned.
 - .3 When ambient temperature is above 18 deg C, and relative humidity is less than 80%. Maintain temperature and humidity for 48 hours after application.
 - .4 Maintain minimum concrete surface temperature of 16 deg C for minimum 48 hours before, during, and after application or until fully cured.
 - .5 When substrate is within moisture and temperature limits recommended by the coating manufacturer.
 - .6 When no dust is being raised.
 - .7 In a ventilated, humidity, and temperature controlled environment.
 - .8 After materials have been acclimated under specified application conditions for minimum 48 hours immediately before installation.
-

1.8 WARRANTY

- .1 Provide single source warranty covering both product and workmanship in which manufacturer and installer agree to repair or replace defective fluid-applied flooring within specified warranty period, at no cost. Defects include, but are not limited to:
 - .1 Delamination from substrate.
 - .2 Premature wear.
 - .3 Crazing.
 - .4 Blistering.
 - .5 Fading.
 - .6 Discolouration.
- .2 Warranty Period: Five years from date of Substantial Performance of Work.

Part 2 Products**2.1 REGULATORY REQUIREMENTS**

- .1 Fluid-applied flooring shall meet fire hazard classification requirements CAN/ULC S114, and of jurisdictional authorities for each material in each installation location as applicable.

2.2 COMPATIBILITY

- .1 Compatibility between components of system and adjacent materials is essential.
 - .1 Provide written declaration to Departmental Representative stating that materials and components as assembled in system, meet this requirement. Do not mix products of multiple suppliers.

2.3 MATERIALS

- .1 Chemical-Resistant Seamless Resinous Flooring: self-leveling resin-based, abrasion-, impact-, and chemical-resistant monolithic flooring system consisting of binder resin, slurry aggregate, dry silica sand broadcast, and self-leveling epoxy seal coat.
 - .1 Properties:
 - .1 Abrasion Resistance: to ASTM D4060, CS17 wheel, 1000 cycles, 1 kg load; 30 mg loss.
 - .2 Adhesion: to ACI 503R, 300 psi.
 - .3 Hardness: to ASTM D2240, Shore D, 75.
 - .4 Tensile Strength: to ASTM C307, 550 psi minimum.
 - .5 Compressive Strength: To ASTM C579, 5000 psi
 - .6 Flexural Strength: to ASTM C580, 3700 psi.
 - .7 Impact Resistance: to MIL-D-3134, Sec 4.7.3, withstands 16 ft lbs without cracking, delamination, or chipping.

- .8 Coefficient of Friction: to ASTM D2047, > 0.80.
- .9 Water Absorption: Nil.
- .10 Surface Burning Characteristics: To ASTM E84/NFPA 255
 - .1 Flame Spread Index: 20
 - .2 Smoke Development Index: 90.
- .11 Chemical Resistance: coating exhibits following effects when exposed for 28 days at 20 deg C.
 - .1 Alcohol: No effect
 - .2 Fats, Oils, and Sugars: No effect.
 - .3 Lactic Acid: No effect.
 - .4 Organic Solvents: No effect.
 - .5 Potassium Hydroxide (<50%): No effect.
 - .6 Sodium Hydroxide (<50%): No effect.
- .12 Top coat final surface: Solid colour, smooth, even, non-porous.
- .13 Maximum VOC Content: 100g/L (less water)
- .14 Colour selected by Departmental Representative. Provide product from single batch.
- .2 Crack Filler: Manufacturer's recommended self-leveling, two component, sealant based on a flexible epoxy resin.
- .3 Cove Paste & Primer: Manufacturer's recommended epoxy designed for cove base applications, consisting of two component thixotropic binder resins and aggregates, sand aggregate.

2.4 MIXES

- .1 Thoroughly mix components using manufacturer approved mixing equipment prior to combining together. Mix components accordance with manufacturer's printed instructions.

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 EXAMINATION

- .1 Verify specified site conditions are established before commencing work.
 - .2 Verify new fluid-applied flooring is compatible with substrates scheduled to receive new fluid-applied flooring.
-

- .3 Test surfaces for moisture content to ensure that they are suitable for application. Maximum moisture content of substrate: 15%.
- .4 Ensure surfaces to receive fluid-applied flooring:
 - .1 Have been provided as specified in the work of other Sections
 - .2 Are sound, fully cured, clean, uniform and free from substances that would cause discolouration or be detrimental to adhesion
 - .3 Will not adversely affect execution, permanence, or quality of work
 - .4 Can be put into acceptable condition by means of preparation specified in this Section.
- .5 Report defects, and unsuitable conditions in writing. Provide copy to Departmental Representative and manufacturer's representative. Proceed only when defects, and unsuitable conditions have been corrected.
- .6 Following acceptance of surfaces, fluid-applied flooring applicator shall be responsible for surface preparation not specified under work of other Sections.

3.3 PROTECTION

- .1 Erect barriers to prevent the entry and presence of personnel not performing work of this Section during application of fluid-applied flooring, and for 24 hours following completion of application.
- .2 Protect existing building surfaces and adjacent structures from spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
- .3 Mask using "non-run" tape around adjacent surfaces, and at transitions to other surfaces, to provide neat, clean, true juncture lines.
- .4 Take every precaution to avoid causing fire.
- .5 Protect building occupants in and about the building.

3.4 PREPARATION

- .1 Remove surface mounted equipment, fittings and fastenings before undertaking coating operations. Identify and store items in secure location and re-install after flooring is completed.
 - .2 Prepare substrates according to manufacturer's written instructions, and in accordance with reviewed mock-up.
 - .3 Obtain manufacturer's written approval of surface preparation including mechanical abrasion of each area before application of flooring.
-

- .4 Grind down uneven joints, rough areas, projections, and foreign matter from concrete surfaces to receive flooring and base.
- .5 Prepare concrete surfaces by mechanical abrasion method as approved by floor manufacturer for surface removal. Provide IRCI 03732, CSP 4 to 6.
- .6 Patch, repair, fill cracks, bug holes, and cavities in concrete substrate with manufacturer recommended epoxy crack filler.
 - .1 Route out cracks in concrete exposed after mechanical abrasion of floor.
 - .2 Fill cracks level with self-levelling crack filler.
 - .3 Allow crack filler to dry before application of fluid-applied flooring.
- .7 Perform other preparations necessary to ensure proper fluid-applied flooring applications to Departmental Representative's acceptance.
- .8 Ensure surfaces to receive fluid-applied flooring systems are dry and moisture content is within manufacturer's recommended limit.

3.5 APPLICATION – FLUID-APPLIED FLOORING

- .1 Apply fluid-applied flooring under supervision of manufacturer's representative.
 - .2 At projections through concrete, install bead of manufacturer's recommended sealant. Tool to form cove and allow to cure prior to coating.
 - .3 Slurry Coat:
 - .1 Blend materials in accordance with manufacturer's written instructions.
 - .2 Pour materials onto prepared substrate, spread using rake or trowel. Backroll to assist leveling.
 - .3 Allow material to level prior to broadcasting.
 - .4 Broadcast sand to saturation at rates indicated in manufacturer's written instructions. Use manufacturer's recommended techniques for sand distribution.
 - .5 Cure before removing excess sand.
 - .6 Smooth high spots to produce level surface prior to application of seal coat.
 - .4 Seal Coat:
 - .1 Apply coat of sealer using trowel, squeegee, or grout float, and back roll to provide uniform texture and finish.
 - .2 Apply coverage rates indicated in manufacturer's written instructions.
 - .5 Install continuous crack repair at control joints, and shrinkage cracks.
 - .6 Cove Base: Install cove base where indicated on room finish schedule and as follows:
 - .1 Apply primer and cove paste in accordance with manufacturer's written instructions to provide a 25 mm radius cover at floor / wall junction.
-

- .2 Install cove base to height of 150 mm with 25 mm radius, on vertical surfaces. Cut back taper top edge back to substrate per manufacturer's approved detail. Cove base same colour as adjacent fluid-applied flooring.
- .7 Carry fluid applied flooring under thresholds.
- .8 Where fluid applied flooring abuts other floor finishes, feather out flooring or build up to meet adjacent floor finish flush.
- .9 Verify cured flooring thickness at random locations chosen by and in presence of Departmental Representative.
- .10 Where drains occur in floor provide metal angle at junctions with such items. Feather out edges of fluid applied flooring at drain edges. Ensure no areas of finished flooring are lower than tops of floor drains. Provide minor build up to ensure proper slopes to drain.
- .11 Form external and internal corners plumb and true, and radiused to match corners on wall surface.

3.6 INDEPENDENT INSPECTION AND TESTING

- .1 Provide inspection and testing of materials and workmanship by an independent inspection and testing company acceptable to DCC Representative. Testing company shall be certified by CSA.
- .2 Pay costs for independent inspection company.
- .3 Include following for inspections:
 - .1 General inspection of work required by other trades.
 - .2 Written reports covering materials, workmanship and progress of work.
 - .3 Record of temperature and humidity of substrates at time of application.
 - .4 Thickness of installation of each layer of system.
- .4 Inspection and testing company is responsible only for sampling, testing and reporting and will not supervise work or instruct Contractor. Testing and inspection company shall advise Contractor and DCC Representative by telephone and subsequent report.
- .5 Advise testing and inspection company minimum 24 hours in advance of each installation sequence or greater as required by inspector.
- .6 Remove and replace non-conforming areas to DCC Representative's acceptance.

3.7 MANUFACTURER'S FIELD SERVICES

- .1 Arrange for fluid-applied flooring manufacturer's representative to periodically review installation to:
 - .1 Verify and analyze condition of surfaces to be coated.
-

- .2 Make recommendations necessary to ensure proper applications.
- .3 Inspect installations in progress.
- .4 Verify that specified materials and methods are used and procedures agreed upon at the pre-installation meeting are followed.
- .5 Notify Departmental Representative in writing should adverse conditions exist, occur.
- .6 Provide copy of written report after each visit to Contractor, and Departmental Representative.
- .7 Provide hand written observation report to Contractor before leaving site.
- .2 Remove and replace non-conforming areas to Departmental Representative's approval.

3.8 PROTECTION

- .1 Provide temporary protection until flooring areas fully cured.
- .2 Allow fluid applied flooring to cure minimum 7 days or longer as required by manufacturer's written instructions before putting into service.

3.9 CLEANING

- .1 Clean flooring to manufacturer's printed instructions.

3.10 RESTORATION

- .1 Remove protective coverings and warning signs as soon as practical after operations cease.
- .2 Remove splashings on exposed surfaces that were not coated. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .3 Restore areas used for storage, cleaning, mixing and handling of coatings to clean condition as approved by Departmental Representative.

END OF SECTION

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Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Interior painting.

1.2 REFERENCES

- .1 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, Master Painters Institute
 - .2 MPI Maintenance Repainting Manual

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions.
- .2 Product data: submit list of brand name products that Contractor intends to use on each part of the Work.
- .3 Samples:
 - .1 Submit three drawdowns of each product and colour combination. Drawdowns shall be applied using 4 mil WFT drawdown bar on Leneta form WD plain white coated cards, size 100 by 150 mm, mounted on 216 by 280 mm sheets.
 - .2 Label each card with the following:
 - .1 Job name.
 - .2 Date.
 - .3 Product name.
 - .4 Product number.
 - .5 Colour number as stated in the colour schedule.
 - .6 Name, address, and phone number of the supplying facility.
 - .3 Submit full range of available colours where colour availability is restricted.
- .4 WHMIS MSDS.

1.4 CLOSEOUT SUBMITTALS

- .1 Maintenance Data: Submit maintenance data for incorporation into Operations and Maintenance Manual.
- .2 Submit records of products used. List products in relation to finish system and include the following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI environmentally friendly classification system rating.
 - .5 Manufacturer's Material Safety Data Sheets (MSDS).

1.5 QUALITY ASSURANCE

- .1 Conform to latest MPI requirements for painting work including materials, preparation, and quality of work.
- .2 Obtain approval of paints, varnishes, protective coatings and materials for mixing and thinning from the Departmental Representative prior to application.
- .3 Standard of Acceptance:
 - .1 No defects visible from a distance of 1 000 mm at 90 degree to surface.
 - .2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.6 DELIVERY, HANDLING AND STORAGE

- .1 Deliver and store materials in original containers, sealed, with labels intact. Labels shall clearly indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with accepted sample.
- .2 Remove damaged, opened and rejected materials from site.
- .3 Coordinate with Departmental Representative for dry, temperature controlled, secure storage.
- .4 Observe manufacturer's recommendations for storage and handling.
- .5 Remove paint materials from storage only in quantities required for same day use.
- .6 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .7 Fire Safety Requirements:
 - .1 Provide 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 the National Fire Code of Canada.
- .8 Take necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Dispose materials that cannot be reused. Treat as hazardous waste in appropriate manner.
- .2 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .3 Reduce amount of contaminants entering waterways, sanitary/storm drain systems as follows:

- .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. Do not clean equipment using free draining water.
- .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
- .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
- .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
- .5 Dry empty paint cans before recycling or disposing.
- .6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
- .7 Collect waste paint by type and provide for delivery to recycling or collection facility or dispose of at hazardous waste facility.

1.8 SITE REQUIREMENTS

- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces.
 - .2 Where required, provide continuous ventilation after completion of application of paint.
 - .3 Perform no painting work unless adequate and continuous ventilation and is in place to maintain ambient air and substrate temperatures above 15 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .4 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .5 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Do not paint when:
 - .1 Substrate and ambient air temperatures are expected to fall outside paint manufacturer's prescribed limits.
 - .2 Do not paint when the maximum moisture content of the substrate exceeds:
 - .1 15% for wood.
 - .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter.
- .3 Surface and Environmental Conditions:
 - .1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint only when previous coat of paint is dry or adequately cured.

Part 2 Products

2.1 MATERIALS

- .1 Materials (primers, paints, coatings, fillers, thinners, solvents, etc.): highest quality product of an approved manufacturer, and from a single manufacturer for each system used.
- .2 Lead- and mercury-free, low or no VOC content where possible.
- .3 Where required, paints and coatings shall meet flame spread and smoke developed ratings designated by local Code requirements or authorities having jurisdiction.

2.2 COLOURS

- .1 Unless otherwise specified, provide MPI Premium Grade paint system.
- .2 Departmental Representative will select colours from manufacturers' full range.
- .3 Quantity of colours and finishes shall be based on following criteria:
 - .1 Interior colours will be based on three colours with a maximum of one deep or bright colour.
 - .2 Unless otherwise indicated, paint trim the same colour within a given area.
- .4 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. Re-mix paint in containers before and during application to break-up lumps, and ensure complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

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

Gloss Level Category	Units @ 60 deg	Units @ 85 deg
G5 - semi-gloss finish	35 to 70	

2.5 INTERIOR PAINTING SYSTEMS

- .1 Non-insulated metal pipes conduit, valves, fittings and equipment:
 - .1 INT 5.1Q, G2 finish.
 - .1 Maximum VOC Content: 150 g/L (less water).
- .2 Dressed lumber: wall paneling and trim, architectural woodwork, wood doors:
 - .1 INT 6.3E - Polyurethane varnish G5 finish (over stain).
 - .2 INT 6.3A – High performance architectural latex G5 finish.
 - .3 Maximum VOC Content: 350 g/L (less water)

- .3 Plastic: Piping
 - .1 INT 6.8AA - High performance architectural latex (over w.b. bonding primer), G2 finish.
 - .1 Maximum VOC Content: 150 g/L (less water).
- .4 Plaster and gypsum board:
 - .1 INT 9.2B - High performance architectural latex G4 finish.
 - .2 Maximum VOC Content: 150 g/L (less water)
- .5 Canvas and cotton covering:
 - .1 INT 10.1A - Latex – no sheen finish.
 - .1 Maximum VOC Content: 150 g/L (less water).

Part 3 Execution

3.1 GENERAL

- .1 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report damages, defects, unsatisfactory or unfavourable conditions to Departmental Representative before proceeding with work.
- .2 Do not start work until adverse conditions and defects have been corrected and surfaces and conditions are acceptable.

3.3 PROTECTION

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative.
- .2 Occupied areas:
 - .1 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .2 As painting operations progress, place "WET PAINT" signs to approval of Departmental Representative.

3.4 PREPARATION

- .1 Clean and prepare surfaces as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, brushes or wiping with dry, clean cloths.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

- .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
- .2 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.
 - .3 Where possible, prime 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.
 - .4 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.5 EXISTING CONDITIONS

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
 - .1 Gypsum Board, concrete, concrete masonry, brick: 12%.
- .4 For existing surfaces, assess degree of surface deterioration in accordance with MPI Maintenance Repainting Manual
 - .1 Include costs of repair of DSD-1 through DSD-3 defects in the Work.
 - .2 Do not repaint surfaces until DSD-4 defects have been corrected.

3.6 APPLICATION

- .1 Method of application to be as approved by Departmental Representative. Apply paint by brush or roller. Conform to manufacturer's application instructions unless specified otherwise.

- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush or roller of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Departmental Representative.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Departmental Representative.
- .4 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .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 1 000 mm.
- .7 Number of coats of paint specified are intended to cover surface completely. If necessary apply additional coats until satisfactory coverage is obtained. Additional coats without cost to the Departmental Representative.

3.7 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks unless required for service identification specified elsewhere.
- .2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
 - .1 Do not paint over nameplates.
 - .2 Do not paint transformers and substation equipment.
 - .3 Keep sprinkler heads free of paint.
- .3 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .4 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .5 Paint both sides and edges of backboards for telephone and electrical equipment before installation.
 - .1 Leave equipment in original finish except for touch-up as required.

END OF SECTION

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Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Washroom accessories.
- .2 Related Requirements:
 - .1 Section 09 22 16 – Non-Structural metal Framing: concealed reinforcing in partitions.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM B456, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

1.3 ADMINISTRATION

- .1 Coordinate with work of other sections for location of concealed reinforcing in metal framed partitions.
- .2 Obtain direction from Departmental Representative on final location of all accessories.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions
- .2 Action Submittals:
 - .1 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Shop Drawings:
 - .1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 00 10 – General Instructions
-

1.6 MAINTENANCE MATERIAL SUBMITTALS

- .1 Tools:
 - .1 Provide special tools required for assembly, disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 00 10 – General Instructions
 - .2 Deliver special tools to Departmental Representative.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions 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.

Part 2 Products**2.1 MATERIALS**

- .1 Stainless steel sheet metal: To ASTM A167, Type 304, with No. 4 finish.
- .2 Stainless steel tubing: Type 304, commercial grade, seamless welded, minimum 1.2 mm wall thickness.
- .3 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.
 - .1 Mechanical fasteners: minimum #8 screw or minimum 4.7 mm threaded by length appropriate for substrate.

2.2 COMPONENTS

- .1 Framed mirror (M): Wall mounted unit, stainless steel channel frame with 20 mm face, mitred corners, 6 mm tempered glass with corrosion protected steel back. 100mm stainless steel shelf, front return edge hemmed for rigidity. Corrosion protected steel bracket for concealed wall mounting with tamper proof fixing screw.
 - .1 Acceptable manufacturers: Bobrick, ASI Group Watrous, Bradley, Frost.
 - .2 Sizes:
 - .1 M1: 460 x 750 mm
 - .2 Soap dispenser (SD): Wall surface mounted liquid soap dispenser with refillable soap cartridge suitable for liquid soaps. Lockable Cover: Stainless steel Type 304, No 4 finish, with pictogram instructions. Secure to wall with mechanical fasteners.
 - .3 Toilet Paper Dispenser (TPD): Double roll type, surface mounted, stainless steel frame, capacity of two 133 mm double ply rolls. Door complete with tumbler lock. Extra roll
-

shall automatically drop in place when bottom roll is depleted. Two theft-resistant, heavy-duty, one-piece, molded ABS spindles.

- .1 Acceptable product: Bobrick B-4288, ASI Group Watrous model 20030, Bradley 5A10 Series, Frost Code 165.
- .4 Wall Mounted Waste Receptacle (WR): Surface-mounted, satin finish Type 304 stainless steel, welded construction. Seamless curved front, top edges hemmed. Capacity: 48 litres.
 - .1 Acceptable Products: Bobrick B-277, ASI Group Watrous Model 20826, Bradley Model 3565, Frost Code 326.
- .5 Coat Hook (CH): Surface mounted hook strip, stainless steel with satin finish. 100mm high mounting strip with 6mm return.
 - .1 Acceptable product: Bobrick, B-232X2, ASI Group Watrous 1307, Bradley Model 9943, Frost Code 1147.

2.2 FABRICATION

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .3 Brake form sheet metal work with 1.5 mm radius bends.
- .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .5 Back paint components where contact is made with building finishes to prevent electrolysis.
- .6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CAN/CSA-G164.
- .7 Shop assemble components and package complete with anchors and fittings.
- .8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .9 Provide steel anchor plates and components for installation on studding and building framing.

2.3 FINISHES

- .1 Chrome and nickel plating: to ASTM B456, satin finish.
 - .2 Stainless steel: finish as noted.
 - .3 Manufacturer's or brand names on face of units not acceptable.
-

Part 3 Execution**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet and bathroom accessories previously installed under other Sections are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.
- .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 and secure accessories rigidly in place as follows:
 - .1 Stud walls: Install plywood blocking between studs prior to gypsum board finish.
 - .2 Hollow masonry units, existing plaster or drywall: use toggle bolts drilled into cell or wall cavity.
 - .3 Solid masonry, or concrete: use bolt with lead expansion sleeve set into drilled hole.
 - .4 Toilet and shower compartments: use male to female through bolts.
- .2 Install grab bars on built-in anchors provided by bar manufacturer.
- .3 Use tamper proof screws/bolts for fasteners.
- .4 Fill units with necessary supplies shortly before final acceptance of building.

3.3 ADJUSTING

- .1 Adjust toilet and bathroom accessories components and systems for correct function and operation in accordance with manufacturer's written instructions.
- .2 Lubricate moving parts to operate smoothly and fit accurately.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions
 - .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 00 10 – General Instructions

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
-

- .2 Repair damage to adjacent materials caused by toilet and bathroom accessories installation.

3.6 SCHEDULE

- .1 Locate accessories where indicated on drawings Exact locations determined by Departmental Representative.
- .2 Provide Mirrors (M#) in following locations:
 - .1 M1:
 - .1 Shower B-03, Washroom B-04

END OF SECTION

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Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 – General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada where specified.
 - .2 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .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 00 50 - General Instructions.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.

- .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .5 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .8 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

- .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Furnish spare parts as follows:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each size pump.
 - .3 One glass for each gauge glass.
- .3 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 00 50 - General Instructions

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 EXAMINATION

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

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

3.2 PAINTING REPAIRS AND RESTORATION

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

3.3 SYSTEM CLEANING

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

3.4 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 00 50 - General Instructions and submit report as described in PART 1 -ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.5 DEMONSTRATION

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

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.

- .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 00 50 - General Instructions.
- .3 Waste Management: in accordance with Section 01 00 50 - General Instructions .
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for plumbing pumps.

1.2 REFERENCES

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 00 50 - General Instructions.
- .2 Coordinate submittal requirements and provide submittals required by Section 01 00 50 - General Instructions.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
 - .2 Submit WHMIS MSDS in accordance with Section 01 00 50 - General Instructions. Indicate VOC's for adhesive and solvents during application and curing.
- .4 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.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Instructions: submit manufacturer's installation instructions.
- .7 Manufacturers' Field Reports: manufacturers' field reports specified.
- .8 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 00 50 - General Instructions, 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.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 00 50 - General Instructions.
- .2 Construction requirements: in accordance with Section 01 00 50 - General Instructions.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 00 50 - General Instructions.
- .2 Waste Management and Disposal in accordance with Section 01 00 50 - General Instructions.

Part 2 Products

2.1 MATERIALS

- .1 Materials and resources in accordance with Section 01 00 50 - General Instructions.

2.2 BILGE AND SEWAGE PUMP – (PREASSEMBLED)

- .1 Capacity: as scheduled.
- .2 Construction: Manufacturer preassembled duplex system. Pump, vertical extended shaft, single stage centrifugal, designed to handle 50 mm solids and for sump capacity of 110 US gallons minimum.
- .3 Motor: as scheduled, drip-proof, with overload and under voltage protection.
- .4 Control: copper ball float operated heavy duty switch. Automatic electric alternator with selector relays to alternate or activate both pumps. Adjustable float stops (minimum 3) on stainless steel rod.
- .5 Alarm: low voltage powered audible and visual alarm located as indicated controlled by float or pressure operated switch.
- .6 Sump: Polyethylene one piece, to manufacturers standard. Complete with powder coated steel cover.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Make piping and electrical connections to pump and motor assembly and controls as indicated.

- .2 Ensure pump and motor assembly do not support piping.
- .3 Align vertical pit mounted pump assembly after mounting and securing cover plate.
- .4 Place 150 mm sand under sump pit tank.

3.3 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.
- .4 Adjust flow from water-cooled bearings.
- .5 Adjust impeller shaft stuffing boxes, packing glands.
- .6 Verification requirements in accordance with Section 01 00 50 - General Instructions.

3.4 START-UP

- .1 General:
 - .1 In accordance with Section 01 00 50 - General Instructions: General Requirements, supplemented as specified herein.
 - .2 Procedures:
 - .1 Check power supply.
 - .2 Check starter O/L heater sizes.
 - .3 Start pumps, check impeller rotation.
 - .4 Check for safe and proper operation.
 - .5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.
 - .6 Test operation of hands-on-auto switch.
 - .7 Test operation of alternator.
 - .8 Adjust leakage through water-cooled bearings.
 - .9 Adjust shaft stuffing boxes.
 - .10 Adjust leakage flow rate from pump shaft stuffing boxes to manufacturer's recommendations.
 - .11 Check base for free-floating, no obstructions under base.
 - .12 Run-in pumps for 12 continuous hours.
 - .13 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
 - .14 Adjust alignment of piping and conduit to ensure full flexibility.
 - .15 Eliminate causes of cavitation, flashing, air entrainment.
 - .16 Measure pressure drop across strainer when clean and with flow rates as finally set.

- .17 Replace seals if pump used to degrease system or if pump used for temporary heat.
- .18 Verify lubricating oil levels.

3.5 REPORTS

- .1 In accordance with Section 01 00 50 - General Instructions: reports, supplemented as specified.
- .2 Include:
 - .1 PV results on approved PV Report Forms.
 - .2 Product Information report forms.
 - .3 Pump performance curves (family of curves) with final point of actual performance.

3.6 TRAINING

- .1 In accordance with Section 01 00 50 - General Instructions: Training of O M Personnel, supplemented as specified.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15-13, Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-12, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-13, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-11, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 ASTM International Inc.
 - .1 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM A536-84(2014) Standard Specification for Ductile Iron Castings.
 - .3 ASTM B88M-13 Standard Specification for Seamless Copper Water Tube (Metric).
- .3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
 - .1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA B242-05 (R2016), Groove and Shoulder Type Mechanical Pipe Couplings.
- .5 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-67-11 Butterfly Valves.
 - .2 MSS-SP-70-11, Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71-11, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80-13, Bronze Gate, Globe, Angle and Check Valves.
- .8 National Research Council (NRC)/Institute for Research in Construction
 - .1 NRCC 38728, National Plumbing Code of Canada (NPC) – 2010.
- .9 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 00 50 - General Instructions.
- .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 00 50 - General Instructions.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 00 50 - General Instructions.
- .2 Packaging Waste Management: in accordance with Section 01 00 50 - General Instructions.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Handle and dispose of hazardous materials in accordance with CEPA , TDGA, Regional and Municipal regulations.

1.4 SUSTAINABLE REQUIREMENTS

- .1 Construction:
 - .1 Construction requirements detailed in Section 01 00 50 - General Instructions form integral part of this project including materials and products of this Section. Sustainable construction requirements include:
 - .1 Specific construction requirements for project.
 - .2 Specification text to ensure that project will comply with green design process and sustainability requirements.
 - .3 Administrative, temporary and procedural requirements for the use of materials and methods of construction.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 00 50 - General Instructions

2.2 PIPING

- .1 Domestic hot, cold and recirculation systems, within building.
 - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

2.3 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .5 NPS 2 and larger: ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.
- .6 NPS 1 and smaller :wrought copper to ANSI/ASME B16.22, cast copper to ANSI/ASME B16.18.

2.4 JOINTS

- .1 Rubber gaskets, 1.6 mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 [Solder: 95/5 tin copper alloy.
- .4 Teflon tape: for threaded joints.
- .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.
- .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.5 BALL VALVES

- .1 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 Bronze body, chrome plated brass ball, stainless steel stem, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, soldered:
 - .1 To ANSI/ASME B16.18, Class 150.

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.

- .2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.3 VALVES

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

3.4 PRESSURE TESTS

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

3.5 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 Federal potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

3.6 PRE-START-UP INSPECTIONS

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

3.7 DISINFECTION

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

3.8 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 Commission water conditioning specified Section 22 31 13 - Residential Domestic Water Softeners.
 - .4 Bring HWS storage tank up to design temperature slowly.
 - .5 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
 - .6 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

3.9 PERFORMANCE VERIFICATION

- .1 Scheduling:
 - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify that flow rate and pressure meet Design Criteria.
 - .2 TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
 - .4 Sterilize HWS and HWC systems for Legionella control.
 - .5 Verify performance of temperature controls.
 - .6 Verify compliance with safety and health requirements.
 - .7 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.
 - .8 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 00 50 - General Instructions: Reports, using report forms as specified in Section 01 00 50 - General Instructions: Report Forms and Schematics.
 - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.10 OPERATION REQUIREMENTS

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

3.11 CLEANING

- .1 Clean in accordance with Section 01 00 50 - General Instructions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM D2235-04(R2011), Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
 - .2 ASTM D2564-12, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada Reference Guide for Green Building Design and Construction (BD+C) 2009
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-Series B1800-15, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.
- .4 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36-11, Commercial Adhesives.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-A2011, Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 - General Instructions.
- .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.
 - .2 Provide two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 00 50 - General Instructions.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 00 50 - General Instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Store at temperatures and conditions recommended by manufacturer.
- .4 Packaging Waste Management: in accordance with Section 01 00 50 - General Instructions.

Part 2 Products

2.1 MATERIAL

- .1 Sustainable Requirements: materials and products in accordance with Section 01 00 50 - General Instructions.

2.2 PIPING AND FITTINGS

- .1 For buried and above ground DWV piping to:
 - .1 CAN/CSA B1800.
 - .2 Piping shall be tested and listed in accordance with CAN/ULC-S102.2 and clearly marked with the certification logo indicating a flame spread rating of 25.

2.3 JOINTS

- .1 Solvent weld for PVC: to ASTM D2564.
- .2 Maximum VOC Content: 510g/L (less water) as per SCAQMD Rule 1168

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

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

3.3 TESTING

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

3.4 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .2 Open, cover 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 (storm, 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 00 50 - General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62-15, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2 American Water Works Association (AWWA)
 - .1 ANSI/AWWA C700-09, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada Reference Guide for Green Building Design and Construction (BD+C) 2009
- .4 CSA International
 - .1 CSA-B64 Series-11, Backflow Preventers and Vacuum Breakers.
 - .2 CSA B79-08, Commercial and Residential Drains and Cleanouts.
 - .3 CAN/CSA-B356-10 (R2015), Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .5 Efficiency Valuation Organization (EVO)
 - .1 International Performance Measurement and Verification Protocol (IPMVP).
 - .1 IPMVP 2007 Version.
- .6 Plumbing and Drainage Institute (PDI)
 - .1 PDI-G101-R2010, Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.
 - .2 PDI-WH201-R2010, Water Hammer Arresters Standard.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
 - .1 Indicate on drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details, accessories.

- .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Instructions: submit manufacturer's installation instructions.
- .5 Manufacturers' Field Reports: manufacturers' field reports specified.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .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.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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.
- .4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 00 50 - General Instructions.

Part 2 Products

2.1 FLOOR DRAINS

- .1 Floor Drains and Trench Drains: to CSA B79.
- .2 Type 1: general duty; cast iron body round, adjustable head, nickel bronze strainer, integral seepage pan, and clamping collar.

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

2.3 WATER HAMMER ARRESTORS

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

2.4 TRAP SEAL PRIMERS

- .1 Brass, with integral vacuum breaker, NPS 1/2 solder ends, NPS 1/2 drip line connection.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialties and accessories installation in accordance with manufacturer's written instructions.
 - .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 National Plumbing Code of Canada and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.4 CLEANOUTS

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

3.5 WATER HAMMER ARRESTORS

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

3.6 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.7 TRAP SEAL PRIMERS

- .1 Install for floor drains and elsewhere, as indicated.
- .2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Departmental Representative.
- .3 Install soft copper tubing to floor drain.

3.8 START-UP

- .1 General:
 - .1 In accordance with Section 01 00 50 - General Instructions: General Requirements, supplemented as specified herein.
- .2 Timing: start-up only 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.
- .3 Provide continuous supervision during start-up.

3.9 TESTING AND ADJUSTING

- .1 General:
 - .1 Test and adjust plumbing specialties and accessories in accordance with Section 01 00 50 - General Instructions, supplemented as specified.
- .2 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Application tolerances:
 - .1 Pressure at fixtures: +/- [70] kPa.
 - .2 Flow rate at fixtures: +/- 20%.

- .4 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.
- .5 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removability of strainer.
 - .5 Clean out baskets.
- .6 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .7 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .8 Water hammer arrestors:
 - .1 Verify proper installation of correct type of water hammer arrester.

3.10 CLOSEOUT ACTIVITIES

- .1 Commissioning Reports: in accordance with Section 01 00 50 - General Instructions: reports, supplemented as specified.
- .2 Training: provide training in accordance with Section 01 00 50 - General Instructions: Training of O M Personnel, supplemented as specified.

3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .

3.12 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 REFERENCES

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada Reference Guide for Green Building Design and Construction (BD+C) 2009
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B45 Series-02(R2013) Plumbing Fixtures.
 - .2 CAN/CSA-B125.3-12, Plumbing Fittings.
 - .3 CAN/CSA-B651-12, Accessible Design for the Built Environment.
- .3 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36-11, Commercial Adhesives.
- .4 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-A2011, 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 washroom fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Indicate fixtures and trim:
 - .1 Dimensions, construction details, roughing-in dimensions.
 - .2 Factory-set water consumption per flush at recommended pressure.
 - .3 For water closets, urinals: minimum pressure required for flushing.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual specified in Section 01 00 50 - General Instructions.
- .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 00 50 - General Instructions.

- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: in accordance with Section 01 00 50 - General Instructions.

Part 2 Products

2.1 SUSTAINABLE MATERIAL

- .1 Sustainable Requirements:
 - .1 Sustainability Submittals: in accordance with Section 01 00 50 - General Instructions.
 - .1 Submit a VOC Declaration Form for all paints, coatings, adhesives, and sealants applied on site within the weatherproofing layer of the building envelope. Factory applied finishes do not need to be submitted.
 - .2 Adhesives and sealants: maximum VOC limit 70 g/L to SCAQMD Rule 1168 and in accordance with Section 01 00 50 - General Instructions.

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.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: as indicated.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
 - .1 WC-1 : Floor-mounted, flush tank for handicapped.
 - .1 Top of seat to be between 400 mm and 460 mm from finished floor.
 - .2 Bowl: vitreous china, floor mounted, syphon jet, elongated rim, close-coupled, bolt caps.
 - .3 Closet tank: vitreous china with tank liner, flapper type flush valve assembly low flush cycle: factory set to 4.2 litres/flush.
 - .4 Maximum performance (MAP) score >800
- .7 Water Closet Seats.
 - .1 Seat: white, elongated, open front, moulded solid plastic, less cover, stainless steel check hinges, stainless steel insert post.
- .8 Washroom Lavatories:
 - .1 LAV-1: Wall-hung, integral back with electronic faucet:
 - .1 Basin: Vitreous china, with splash lip, soap depressions, single hole, no overflow. Size: 500 x 450 mm.

- .2 Faucet: Chrome-plated cast brass, above deck temperature control/mixer, rigid gooseneck spout. single control, 100mm on center, ceramic cartridge with rotational limit stop, ADA compliant lever handle with color index.
- .9 Fixture piping:
 - .1 Hot and cold water supplies to fixtures:
 - .1 Chrome plated flexible supply pipes with screwdriver stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with clean out on fixtures not having integral trap.
 - .2 Chrome plated in exposed places.
- .10 Chair carriers:
 - .1 Factory manufactured floor-mounted carrier systems for wall-mounted fixtures.

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 heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
 - .1 Refer to architectural elevation drawings and DND Barrier-free standards.
 - .2 Wall-hung fixtures: as indicated, measured from finished floor.
 - .3 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA-B651.

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 Set controls of automatic flush valves for WCs and urinals to prevent unnecessary flush cycles.
- .3 Checks:
 - .1 Water closets, urinals: flushing action.

- .2 Aerators: operation, cleanliness.
- .3 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

- .1 Clean in accordance with Section 01 00 50 - General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada Reference Guide for Green Building Design and Construction (BD+C) 2009
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B45 Series-02(R2008), Plumbing Fixtures.
 - .2 CAN/CSA-B125.3-12, Plumbing Fittings.
 - .3 CAN/CSA-B651-12, Accessible Design for the Built Environment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 - General Instructions.
- .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 including monitoring requirements for incorporation into manuals specified in Section 01 00 50 - General Instructions.
- .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 00 50 - General Instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: in accordance with Section 01 00 50 - General Instructions.

Part 2 Products

2.1 SUSTAINABLE MATERIAL

- .1 Sustainable Requirements:

- .1 Materials and products in accordance with Section 01 00 50 - General Instructions.

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.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Individual shower stall & showerhead.
 - .1 SH-1: Shower stall and handshower
 - .1 Shower stall:
 - .1 Three piece vacuum formed acrylic reinforced with fibreglass, high gloss white finish. 1200x875x1875mm.
 - .2 Integral shower seat and soap shelf.
 - .2 Shower door:
 - .1 2-panel, 6mm, frameless pivot door
 - .1 Clear sealing joint around door
 - .2 Pivot hinge 76mm lateral adjustment
 - .3 Full length aluminum magnetic profile
 - .3 Shower drain:
 - .1 ANSI A112.21.1;
 - .2 50mm cast iron shower floor drain with stainless steel safety grate.
 - .4 Shower valve:
 - .1 ASME A112.18.1 / CSA-B125.1-05;
 - .2 Pressure-balanced shower valve, adjustable hot water limit stop. Lever handle with color code escutcheon plate.
 - .5 Handshower Package
 - .1 ASME A112.18.1 / CSA-B125.1; ASME A112.18.3
 - .2 Handshower with Shut-off Button and Integral Backflow Protection, 1.5 U.S.Gpm (5.7 L/min.) Flow Control. 1753 mm Long Double Spiral Metal Hose, 610mm SS Finish Sliding Handshower Bar w/Vertical Mounting Pin and Screws. CP Brass Swivel Handshower Elbow for Vertical Mounting Pin, integral ASSE Approved Vacuum Breakers.
 - .3 ADA / CSA B651:
 - .1 Barrier-free compliant when installed in conjunction with other requirements.

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 heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
 - .2 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA B651.

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.
 - .2 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

- .1 Clean in accordance with Section 01 00 50 - General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Air-Conditioning and Refrigeration Institute (ARI)
 - .1 ARI 1010-02, Self-Contained, Mechanically Refrigerated Drinking-Water Coolers.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada Reference Guide for Green Building Design and Construction (BD+C) 2009
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B45 Series-02(R2013), CSA Standards on Plumbing Fixtures.
 - .2 CAN/CSA-B125.3-12, Plumbing Fittings.
 - .3 CAN/CSA-B651-12, Accessible Design for the Built Environment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fountains and coolers, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
 - .2 Indicate, for all fixtures:
 - .1 Dimensions, construction details, roughing-in dimensions.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 00 50 - General Instructions.
- .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 00 50 - General Instructions.

- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: in accordance with Section 01 00 50 - General Instructions.

Part 2 Products

2.1 MATERIAL

- .1 Sustainable Requirements:
 - .1 Materials and products in accordance with Section 01 00 50 - General Instructions.

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.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.
- .5 Drinking fountains:
 - .1 DF-1 : Architectural stainless steel water fountain with integral bottle filler.
 - .1 Unit shall deliver 8 GPH or 50F drinking water.
 - .2 Front push button with flow regulator, safety bubblers.
 - .3 Integral bottle filler with no-touch actuator, 20s auto-shut off. 1.5 gpm fill rate, laminar flow. Rear drain system.
 - .4 Cooling system: Hermetically-sealed, reciprocating type, single phase, sealed-in lifetime lubrication.
- .6 Fixture piping:
 - .1 Hot and cold water supplies to each fixture:
 - .1 Chrome plated flexible supply pipes each with handwheel stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with cleanout 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 heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
 - .2 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA B651.
- .2 Drinking fountains:
 - .1 In accordance with ARI 1010.

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 water cooler, drinking fountain flow stream to ensure no spillage.
- .3 Checks:
 - .1 Refrigerated water coolers: operation, temperature settings.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

- .1 Clean in accordance with Section 01 00 50 - General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Reference Standards:
 - .1 National Air Duct Cleaners Association (NADCA)
 - .1 ACR Standard, 2013 edition: Assessment, Cleaning and Restoration of HVAC Systems

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Site Evaluation: conduct site visit 2 weeks before start of work to establish specific co-ordinated video survey and cleaning plan to establish specific co-ordinated video survey and cleaning plan determining how areas of facility and HVAC systems will be protected during cleaning operations.
 - .1 Organize and lay out plan for video survey and identify camera and cleaning apparatus insertion points.
 - .2 Ensure plan identifies sequence and schedule of survey and cleaning operations for each individual HVAC system and for complete facility.
 - .1 Take account of elbows, bends, turning vanes, dampers, transitions, take-offs, and other internal features.
 - .3 Departmental Representative to review video survey and cleaning plan 1 week minimum prior to start of work.
 - .1 Proceed with survey and cleaning work only after receiving written approval from Departmental Representative.
- .2 Scheduling: Hours of Operation: Coordinate with departmental representative.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 - General Instructions.
- .2 Submit video survey and cleaning plan developed during site evaluation.
 - .1 Ensure plan includes sequence of operation, identification of camera and cleaning apparatus insertion points and schedule for work.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 – General Instructions.
- .2 Post Cleaning Inspection Report: submit Final Inspection Report, including data collected, observations and recommendations as well as following information:
 - .1 Name and address of facility;
 - .2 Name and address of HVAC cleaning contractor;
 - .3 Description of HVAC systems with drawings identifying systems cleaned;
 - .4 Identification scheme for location points in systems that were inspected with accompanying notes describing methods of inspection or tests used;

- .3 Record post cleaning video survey: submit video survey on flash drive, and include on video survey following:
 - .1 Areas of special interest and location;
 - .2 Special internal features;
 - .3 Problems such as broken or damaged controls or components;
 - .4 Ensure system tested, locations, observations, actions taken and recommendations are clearly identified in English on video using text or voice over.

1.5 QUALITY ASSURANCE

- .1 Contractor: verification of 5 years minimum experience in work similar to or exceeding work of this Section.

Part 2 Products

2.1 ACCESS DOORS AND PANELS

- .1 Equipment Access Doors and Panels: construct from same materials as equipment panelling complete with sealing gasket and positive locking device.
 - .1 Size access doors and panels in equipment to allow for inspection and cleaning.
- .2 Ductwork Access Doors: construct access doors from 1.27 mm minimum galvanized sheet steel with gasketed seal.
 - .1 Ensure access door is 25 mm greater in every dimension than access opening.
 - .2 Access door size 200mm x 200 mm minimum.
 - .3 Secure access doors with sheet metal screws on 75 mm centres minimum. Ensure 3 screws per side minimum.
- .3 Access Doors and Panels Acoustic Lining:
 - .1 Install acoustic lining to match existing.
 - .2 Self-adhesive glass fibre tape capable of adhering to both acoustic lining and metal access door or panel materials.
 - .3 Water-based duct sealer for repairing cut acoustic lining.

2.2 AIR DUCT CLEANING EQUIPMENT

- .1 Manually propelled full contact brushes:
 - .1 Ensure brushes are specifically manufactured and shaped to fit individual ducts, equipment and components of HVAC system.
 - .1 Ensure brushes are sized to fit various duct sizes in HVAC system.
 - .2 Ensure brushes make scrubbing motion and full contact with HVAC system interior surfaces to be cleaned.
- .2 Brushes: manually propelled with integrally-mounted [motor] [drive] and [nylon] [polypropylene] [or other non-metallic material] bristles.

- .1 Ensure [motor] [drive] has capacity to continue to push brush after bristles are distorted.
- .2 Replace worn and ineffective brushes when required.

2.3 MULTI-FUNCTIONAL ROBOTIC CLEANING SYSTEM

- .1 Brushes: manually propelled with integrally-mounted drive and nylon, polypropylene or other non-metallic material bristles.
 - .1 Ensure drive has capacity to continue to push brush after bristles are distorted.
 - .2 Replace worn and ineffective brushes when required.

2.4 HEPA FILTER EVACUATION FAN

- .1 Evacuation Fan: includes fan, HEPA filter, flexible hose and motor capable of maintaining debris and particulates airborne in airstream until they reach evacuation fan and maintaining system under negative pressure.
 - .1 Ensure HEPA filters are clean and maintain evacuation fan and HEPA filter to run efficiently.

2.5 HEPA VACUUM UNIT

- .1 Vacuum Unit: includes vacuum fan, integral HEPA filter, suction hose and vacuum head, capable of maintaining HVAC System debris and particulates airborne in air stream until they reach vacuum unit and maintaining system under negative pressure.
 - .1 Ensure HEPA filters are clean and maintain vacuum unit and HEPA filter to run efficiently.

Part 3 Execution

3.1 PREPARATION

- .1 Close down HVAC system.
- .2 Locate and identify externally visible HVAC system features which may affect cleaning process including:
 - .1 Control devices;
 - .2 Fire and smoke control dampers;
 - .3 Balancing dampers: indicate and record positions for resetting;
 - .4 Air volume control boxes: indicate and record positions for resetting;
 - .5 Fire alarm devices;
 - .6 Monitoring devices and controls;
- .3 Make use of existing access doors to greatest extent possible. Cut additional openings in equipment panels and ductwork for access to system interior where necessary.
 - .1 Square or rectangular opening sizes: 200 mm minimum each side.
 - .2 Circular opening sizes: 200 mm minimum diameter.

- .4 Installation of Access Doors and Panels: install access doors and panels for equipment where required to facilitate system inspection and cleaning.
 - .1 Access door installation is not permitted in flexible ductwork.
- .5 When acoustically lined duct is cut for access, repair cut edges of acoustic lining using self-adhesive fibre glass tape and water based duct sealer.
 - .1 Adhere new acoustic lining to match existing to inside of access panel or door to ensure continuity of acoustic properties of system.
- .6 Remove and reinstall ceiling tiles to gain access to HVAC system as required.
 - .1 Replace ceiling tiles damaged or soiled by air duct cleaning procedures.

3.2 EXAMINATION / PRE-CLEANING INSPECTION

- .1 Verification of Conditions:
 - .1 Make visual inspection of interior of HVAC system using remote controlled robotic camera.
 - .2 Insert camera at pre-established strategic locations to evaluate condition and cleanliness of HVAC systems and components.
 - .3 Evaluate a minimum of 10% of the HVAC system to establish level of cleanliness, in accordance with NADCA standards.
- .2 Evaluation and Assessment:
 - .1 Identify level of cleanliness and make recommendation as to final cleaning procedures..

3.3 DUCT CLEANING

- .1 Do duct cleaning in accordance with NADCA ACR Standard.
- .2 Isolate and clean sections in zones to ensure that dirt deposits and debris from zone being cleaned does not pass through another zones which has already been cleaned.
 - .1 Isolate zone of duct using closed-cell polyurethane foam or air inflated zone bag before cleaning.
- .3 Ensure vacuum units and evacuation fans are securely in place before starting cleaning operation of isolated section of HVAC air duct system.
- .4 Install HEPA filter evacuation fan at one end of zone section and insert full contact brushes at other end.
- .5 Energize brushes to travel from insertion point to HEPA filter evacuation fan.
 - .1 Pass brushes through sections as often as necessary to achieve required cleanliness.
 - .2 Change brush sizes as required to ensure positive contact with duct and component interiors.
 - .3 Clean corners and pockets where dirt and debris can accumulate.
- .6 Remove perforated supply diffusers from suspended tee-bar ceiling.
 - .1 Dismantle and clean perforated plates and supply diffuser duct collars.

- .2 Re-assemble perforated plate diffusers and reconnect to HVAC system using supply diffuser duct collar after cleaning.

3.4 ACOUSTICALLY LINED DUCTWORK CLEANING

- .1 Clean glass fibre acoustically insulated ducts to NAIMA recommended practices.
 - .1 Use specifically designed robotic apparatus that has been demonstrated not to damage acoustic glass fibre lining.
 - .2 Monitor cleaning process progress by onboard camera.

3.5 FIELD QUALITY CONTROL/FINAL INSPECTIONS

- .1 Post Cleaning Inspection: carry out final inspection using robotic camera and other visual inspection methods after final cleaning has been completed.
 - .1 Carry out video survey as directed by Departmental Representative.
 - .2 Include in final survey areas inspected by Departmental Representative prior to cleaning.
 - .3 Identify on HVAC system record drawings access points used for inspection and cleaning.
 - .4 Reset components including dampers and sensors, which have been disturbed during cleaning operations.

3.6 SYSTEM STARTUP

- .1 Install new system filters after cleaning operations are completed.
- .2 Cover each inspection opening with access door or panel and secure in place after inspection and cleaning are completed.
- .3 Restart each HVAC system.

3.7 CLEANING

- .1 Clean in accordance with Section 01 00 50 - General Instructions.
- .2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
 - .2 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .4 In addition to transmittal letter referred to in Section 01 00 50 - General Instructions: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.2 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.

- .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .5 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .8 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

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

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 00 50 - General Instructions.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers.

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 00 50 - General Instructions.

Part 2 Products

2.1 MATERIALS

.1 Not Used.

Part 3 Execution

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative.

- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative].

3.2 PAINTING REPAIRS AND RESTORATION

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

3.3 SYSTEM CLEANING

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

3.4 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 00 50 - General Instructions and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.5 DEMONSTRATION

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

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.

- .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.1-12, Power Piping.
- .2 ASTM International
 - .1 ASTM A125-1996(2013), Standard Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307-14, 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.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada Reference Guide for Green Building Design and Construction (BD+C) 2009
- .4 Factory Mutual (FM)
- .5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58-2009, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP69-2009, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP89-2009, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .6 Underwriter's Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
 - .2 Submit shop drawings for:
 - .1 Bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.
- .4 Certificates:

-
- .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .5 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.
 - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.
- 1.3 CLOSEOUT SUBMITTALS**
- .1 Provide maintenance data for incorporation into manual specified in Section 01 00 50 - General Instructions.
- 1.4 DELIVERY, STORAGE AND HANDLING**
- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .3 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials in accordance with Section 01 00 50 - General Instructions.
- 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.
- 2.3 PIPE HANGERS**
- .1 Finishes:

- .1 Pipe hangers and supports: galvanized after manufacture.
- .2 Use electro-plating galvanizing process.
- .3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.
- .2 Upper attachment structural: suspension from lower flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut, carbon steel retaining clip.
 - .1 Rod: 9 mm UL listed.
 - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, MSS-SP69.
- .3 Upper attachment structural: suspension from upper flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, to MSS SP69.
 - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut FM approved.
- .4 Upper attachment to concrete:
 - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
 - .2 Concrete inserts: wedge shaped body with knockout protector plate, UL listed to MSS SP69.
- .5 Shop and field-fabricated assemblies:
 - .1 Trapeze hanger assemblies.
 - .2 Steel brackets.
- .6 Hanger rods: threaded rod material to MSS SP58:
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
 - .3 Do not use 22 mm or 28 mm rod.
- .7 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.
- .8 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.
- .9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
- .10 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 or galvanized, with formed portion plastic coated.
- .11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.
- .12 Cushioned pipe clamps: Steel clevis style clamp with top bolt. Insulating rubber cushion to prevent damage to pipe. Stainless steel where used outdoors.
- .13 Insulated pipe clips: Designed for use with strut system. Plastic clips with snap locking mechanical that secure pipe on outside of insulation.

2.4 RISER CLAMPS

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

2.5 INSULATION PROTECTION SHIELDS

- .1 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.

2.6 CONSTANT SUPPORT SPRING HANGERS

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

2.7 EQUIPMENT SUPPORTS

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

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.9 OTHER EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports from structural grade steel.
- .2 Submit structural calculations with shop drawings.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- .3 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to industry standards.
 - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: install below joint.
- .4 Clevis plates:
 - .1 Attach to concrete with [4] minimum concrete inserts, [one] at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .6 Use approved constant support type hangers where:
 - .1 Vertical movement of pipework is 13 mm or more,
 - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .7 Use variable support spring hangers where:
 - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
 - .2 Variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

- .1 Plumbing piping: to Canadian Plumbing Code, and authority having jurisdiction.

- .2 Copper piping: up to NPS 1/2: every 1.5 m.
- .3 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.
- .4 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	

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

3.4 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.
- .2 Adjustable clevis:
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
- .3 C-clamps:

- .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
 - .1 Hammer jaw firmly against underside of beam.

3.7 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 00 50 – General Instructions and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .3 Verification requirements in accordance with Section 01 00 50 - General Instructions, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-emitting materials.

3.8 CLEANING

- .1 Clean in accordance with Section 01 00 50 - General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.60-[97], Interior Alkyd Gloss Enamel.
 - .2 CAN/CGSB-24.3-[92], Identification of Piping Systems.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 13-2013, Standard for the Installation of Sprinkler Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
- .2 Submittals: in accordance with Section 01 00 50 - General Instructions.
- .3 Product data to include paint colour chips, other products specified in this section.
- .4 Samples:
 - .1 Submit samples in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 00 50 - General Instructions.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.
 - .2 Dispose of unused [paint] [coating] material at official hazardous material collections site approved by Departmental Representative.
 - .3 Do not dispose of unused [paint] [coating] material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

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] [white anodized aluminum], matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
 - .1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

- .2 Use maximum of 25 letters/numbers per line.
- .4 Locations:
 - .1 Terminal cabinets, control panels: use size # 5.
 - .2 Equipment in Mechanical Rooms: use size # 9.
- .5 Identification for PWGSC Preventive Maintenance Support System (PMSS):
 - .1 Use arrangement of Main identifier, Source identifier, Destination identifier.
 - .2 Equipment in Mechanical Room:
 - .1 Main identifier: size #9.
 - .2 Source and Destination identifiers: size #6.
 - .3 Terminal cabinets, control panels: size #5.

- .3 Equipment elsewhere: sizes as appropriate.

2.3 EXISTING IDENTIFICATION SYSTEMS

- .1 Apply existing identification system to new work.
- .2 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 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Pictograms:
 - .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend:
 - .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- .4 Arrows showing direction of flow:
 - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
 - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
 - .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 Other pipes: pressure sensitive [plastic-coated cloth] [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
** Add design temperature		
++ Add design temperature and pressure		
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Waste water	Green	WASTE WATER
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT

2.5 IDENTIFICATION DUCTWORK SYSTEMS

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
- .2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.6 VALVES, CONTROLLERS

- .1 Brass tags with 12 mm stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.7 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.

2.8 LANGUAGE

- .1 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 Provide ULC CSA registration plates as required by respective agency.

3.4 NAMEPLATES

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

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

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

3.6 VALVES, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively.

3.7 CLEANING

- .1 Proceed in accordance with Section 01 00 50 - General Instructions.
- .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 SUMMARY

- .1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 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-2005.
 - .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.

1.3 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.

1.4 EXCEPTIONS

- .1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 START OF TAB

- .1 Notify Departmental Representative 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.

- .4 Application of weatherstripping, sealing, and caulking.
- .5 Pressure, leakage, other tests specified elsewhere Division 23.
- .6 Provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air systems:
 - .1 Duct systems clean.
 - .2 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .3 Correct fan rotation.
 - .4 Fire, smoke, volume control dampers installed and open.
 - .5 Access doors, installed, closed.
 - .6 Outlets installed, volume control dampers open.
 - .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.

1.10 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 5 %, minus 5 %.

1.11 ACCURACY TOLERANCES

- .1 Measured values accurate to within plus or minus 2 % of actual values.

1.12 INSTRUMENTS

- .1 Prior to TAB, submit to Departmental Representative list of instruments used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

1.13 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit, prior to commencement of TAB:

- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 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.

1.15 TAB REPORT

- .1 Format in accordance with referenced standard.
- .2 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .3 Submit 6 copies of TAB Report to Departmental Representative for verification and approval, in English in D-ring binders, complete with index tabs.

1.16 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.

1.17 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.

1.18 COMPLETION OF TAB

- .1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

1.19 AIR SYSTEMS

- .1 Standard: TAB to most stringent of TAB standards of AABC.
- .2 Do TAB of [systems, equipment, components, controls specified Division 23.
- .3 Qualifications: personnel performing TAB qualified to standards of AABC or NEBB.

- .4 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC or NEBB.
- .5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .6 Locations of equipment measurements: to include as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
- .7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.20 FIRE DAMPER TESTING & VERIFICATION

- .1 Testing of Fire Dampers, Ceiling Fire Stops and/or Fire/Smoke Dampers
 - .1 General
 - .1 Test and verify operation of all fire dampers and ceiling fire stops.
 - .2 Test shall include manually releasing fusible link; allowing damper to close to ensure that it has tight-fit closing operation without binding; opening fire damper and/or closing ceiling fire stop and resetting fusible link connection.
 - .3 All fire dampers and/or ceiling fire stops that have been identified as being faulty shall be corrected, and re-tested until such time that results are satisfactory.
 - .2 Identification of Fire Dampers and Ceiling Fire Stops
 - .1 At all fire dampers and ceiling fire stops, supply and install tags as approved by the DCC Representative.
 - .2 Tags shall be mechanically fastened to duct fire damper access door, or onto or on structure near fire dampers or ceiling fire stops which have no connecting ductwork.
 - .3 After each fire damper has been tested and has been proven to operate satisfactorily as noted in previous clause, label unit number and mark date and signature on tag.
 - .3 Test Report for Fire Dampers and Ceiling Fire Stops
 - .1 Provide a report summarizing the results of testing. The report shall include following for each fire damper:
 - .1 Verification that the unit is fully accessible.
 - .2 Verification that the unit has been successfully tested.
 - .3 Verification that the unit has been reset.
 - .4 Name of tester.
 - .5 Date that the unit tested successfully.

- .6 Location schedule of all dampers i.e. each damper must be labelled.
- .2 Submit report to DCC Representative, and include copies in the operations and maintenance manual.

1.21 OTHER TAB REQUIREMENTS

- .1 General requirements applicable to work specified this paragraph:
 - .1 Qualifications of TAB personnel: as for air systems specified this section.
 - .2 Quality assurance: as for air systems specified this section.

1.22 POST-OCCUPANCY TAB

- .1 Measure DBT, WBT (or %RH), air velocity, air flow patterns, NC levels, in occupied zone as directed by DCC Representative.
- .2 Participate in systems checks twice during Warranty Period - #1 approximately 3 months after acceptance and #2 within 1 month of termination of Warranty Period.

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 ANSI/ASHRAE/IESNA 90.1-13, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 ASTM International Inc.
 - .1 ASTM B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .2 ASTM C335-10e1 Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C411-15, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C547-15, 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 C795-08(2013), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .9 ASTM C921-10(2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .4 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC 2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.
- .5 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36-00, Commercial Adhesives.
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-A2010, Adhesive and Sealant Applications.
- .7 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
- .8 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

- .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
- .4 Samples:
 - .1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.
 - .2 Mount sample on 12 mm plywood board.
 - .3 Affix typewritten label beneath sample indicating service.
- .5 Manufacturers' Instructions:
 - .1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, cleaning procedures.

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 00 50 - General Instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address [and ULC markings].
- .3 Packaging Waste Management: in accordance with Section 01 00 50 - General Instructions.

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.
 - .1 Recycled content: (Post-Consumer + Post-Industrial) in accordance with Section 01 35 21 - LEED Requirements.
- .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

- .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: compatible with insulation.
 - .1 Maximum VOC Content: 70g/L (less water) as per SCAQMD Rule 1168

2.4 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
 - .1 Maximum VOC Content: 70g/L (less water) as per SCAQMD Rule 1168
- .2 Indoor Vapour Retarder Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.
- .4 ULC Listed Canvas Jacket:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .5 Outdoor Vapour Retarder Mastic:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.

- .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².
- .6 Tape: self-adhesive, aluminum, reinforced, 50mm wide minimum.
- .7 Contact adhesive: quick-setting
 - .1 Maximum VOC Content: 80g/L (less water) as per SCAQMD Rule 1168
- .8 Canvas adhesive: washable.
 - .1 Maximum VOC Content: 80g/L (less water) as per SCAQMD Rule 1168
- .9 Tie wire: 1.5 mm stainless steel.
- .10 Banding: 19 mm wide, 0.5 mm thick stainless steel.
- .11 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 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.4 DUCTWORK INSULATION SCHEDULE

- .1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
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Rectangular cold and dual temperature supply air ducts	C-1	yes	50
Round cold and dual temperature supply air ducts	C-2	yes	50
Rectangular warm air ducts	C-1	no	25
Round warm air ducts	C-1	no	25
Supply, return and exhaust ducts exposed in space being served	none		
Exhaust duct between dampers and louvres	C-1	no	25
Acoustically lined ducts	none		

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

TIAC Code	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

3.5 CLEANING

.1 Clean in accordance with Section 01 00 50 - General Instructions.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Thermal insulation for piping and piping accessories in commercial type applications.

1.2 REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1-13, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).
- .2 American Society for Testing and Materials International (ASTM)
 - .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE/IESNA 90.1-13, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
 - .2 ASTM International Inc.
 - .1 ASTM B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .2 ASTM C335-10e1 Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C411-15, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C547-15, 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 C795-08(2013), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .9 ASTM C921-10(2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
 - .3 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 Canadian General Standards Board (CGSB)

- .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts
- .4 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.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-11, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702-09, Thermal Insulation, Mineral Fibre, for Buildings
 - .4 CAN/ULC-S702.2-09, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 00 50 - General Instructions. Include product characteristics, performance criteria, and limitations.
 - .1 Submit [two] copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 00 50 - General Instructions.

- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 00 50 - General Instructions.
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
- .4 Samples:
 - .1 Submit samples in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
 - .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.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
- .2 Installer: specialist in performing work of this Section, and have at least 3]years successful experience in this size and type of project.

1.6 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 00 50 - General Instructions.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions required by manufacturer.
- .3 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.
 - .2 Place excess or unused insulation and insulation accessory materials in designated containers.

- .3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
- .4 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.

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 without factory applied vapour retarder jacket.
 - .1 Mineral fibre: to ASTM C547.
 - .2 Maximum "k" factor: to ASTM C547.
- .4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to ASTM C547.
- .5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to ASTM C547.
- .6 TIAC Code A-6: flexible unicellular tubular elastomer.
 - .1 Insulation: with vapour retarder jacket.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: 0.036 W/mK to ASTM C 177 or C 158.
 - .4 Certified by manufacturer: free of potential stress corrosion cracking corrodants.
- .7 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
 - .1 Insulation: to ASTM C533.
 - .2 Maximum "k" factor: 0.063 W/mK at 149 C to ASTM C335.
 - .3 Design to permit periodic removal and re-installation.

- .8 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C547.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to ASTM C547.

2.3 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.
- .4 Tie wire: 1.5 mm diameter stainless steel.
- .5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

- .1 Thermal insulating and finishing cement:
 - .1 Air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

- .1 Water based, fire retardant type, compatible with insulation.
 - .1 Maximum VOC Content: 70g/L (less water) as per SCAQMD Rule 1168

2.6 INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 Colours: by DCC Representative.
 - .3 Minimum service temperatures: -20 degrees C.
 - .4 Maximum service temperature: 65 degrees C.
 - .5 Moisture vapour transmission: 0.02 perm.
 - .6 Thickness: 0.5 mm.
 - .7 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.
 - .8 Special requirements:
 - .1 Outdoor: UV rated material at least 0.5 mm thick.

- .2 Canvas:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
 - .2 Lagging adhesive: compatible with insulation.
 - .1 Maximum VOC Content: 70g/L (less water) as per SCAQMD Rule 1168

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 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

- .1 Application: at valves, primary flow measuring elements, flanges and unions at equipment.
- .2 Design: to permit periodic removal and replacement without damage to adjacent insulation.
- .3 Insulation:
 - .1 Insulation, fastenings and finishes: same as system.
 - .2 Jacket: high temperature fabric.

3.5 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.

- .2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-1.
 - .1 Securements: Tape at 300 mm on centre.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code 1501-H.
- .3 TIAC Code: A-3.
 - .1 Securements: integral flap on jacket.
 - .2 Seals: Factory applied pressure sensitive adhesive.
 - .3 Installation: TIAC Code: 1501-C.
- .4 TIAC Code: A-6.
 - .1 Insulation securements: adhesive.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code: 1501-CA.
- .5 TIAC Code: C-2 with vapour retarder jacket.
 - .1 Insulation securements and seal: vapour barrier tape.
 - .2 Installation: TIAC Code: 1501-C.
- .6 TIAC Code: A-2.
 - .1 Insulation securements: stainless steel wire at 300mm on centre. Wrap with fibreglass cloth and secure with fibreglass thread.
 - .2 Refer to CETO document include as Appendix.
- .7 Thickness of insulation as listed in following table.
 - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
 - .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp degrees C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)										
			2 1/2 to 4	5 to 6	8	up to 175	[A-1]	38	50	65	75	90	90
Run out	to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8	up to 175	[A-1]	38	50	65	75	90	90
Domestic HWS	[A-1]	25	25	25	38	38	38						
Refrigerated Drinking Water	[A-3]	25	25	25	25	25	25						
Domestic CWS	[A-3]	25	25	25	25	25	25						
Domestic CWS with	[C-2]	25	25	25	25	25	25						

vapour retarder																			
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- .1 Exposed indoors: canvas jacket.
- .2 Exposed in mechanical rooms: canvas.
- .3 Concealed, indoors: canvas on valves, fittings (PVC acceptable on fittings on systems with temperatures below 60C). No further finish.
- .4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
- .5 Outdoors: water-proof jacket.
 - .1 Steam and condensate in SIT: refer to Appendix.
- .6 Finish attachments: SS bands or screws, at 150 mm on centre.
- .7 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.7 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 00 50 - General Instructions, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-emitting materials.

3.8 CLEANING

- .1 Proceed in accordance with Section 01 00 50 - General Instructions.
- .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 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International
 - .1 ASTM A480/A480M-12, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A635/A635M-09b, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
 - .3 ASTM A653/A653M-11 Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-12, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .4 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 00 50 - General Instructions.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 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

- .2 Seal classification:
 - .1 Class C: transverse joints and connections made air tight with gaskets, sealant tape or combination thereof. Longitudinal seams unsealed.
 - .2 Unsealed seams and joints.

2.2 SEALANT

- .1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 7 degrees C to plus 93 degrees C.

2.3 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
 - .1 Rectangular: centreline radius: 1.5 times width of duct.
 - .2 Round: five piece, centreline radius: 1.0 times diameter.
- .3 Mitred elbows, rectangular:
 - .1 With single thickness turning vanes.
- .4 Branches:
 - .1 Rectangular main and branch: with 45 degrees entry on branch or radius on branch 1.5 times width of duct.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
 - .1 As indicated.

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 Fire stopping material and installation must 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 and as specified.

2.7 HANGERS AND SUPPORTS

- .1 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 SMACNA.
 - .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.

3.2 GENERAL

- .1 Do work in accordance with SMACNA and as indicated.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
 - .1 Insulate strap hangers 100 mm beyond insulated duct.
- .3 Support risers in accordance with SMACNA.
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 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 SMACNA.

3.4 WATERTIGHT DUCT

- .1 Provide watertight duct for:
 - .1 Fresh air intake.
 - .2 As indicated.
- .2 Form bottom of horizontal duct without longitudinal seams.
 - .1 Weld joints of bottom and side sheets.
 - .2 Seal other joints with duct sealer.
- .3 Slope horizontal branch ductwork down towards hoods served.
 - .1 Slope header ducts down toward risers.

3.5 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.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .
 - .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 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 00 50 - General Instructions.
- .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 01 00 50 - General Instructions 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 [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.

2.4 TURNING VANES

- .1 Factory or shop fabricated single thickness with trailing edge, to recommendations of SMACNA and as indicated.

2.5 BACKDRAFT DAMPERS

- .1 Round duct collars, spring loaded.

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.

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:
 - .1 Size:
 - .1 300 x 300 mm for servicing entry.
 - .2 150 x 150 mm for viewing.
 - .3 As indicated.
 - .2 Locations:
 - .1 Fire and smoke dampers.
 - .2 Control dampers.
 - .3 Devices requiring maintenance.
 - .4 Required by code.
 - .5 Reheat coils.
 - .6 Elsewhere as indicated.
- .3 Turning Vanes:
 - .1 Install in accordance with recommendations of SMACNA and as indicated.
- .4 Backdraft dampers:
 - .1 Install in accordance with manufacturer's recommendations.
 - .2 Damper opening pressure to be compatible with system in which it is installed.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .
 - .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 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 00 50 - General Instructions.
- .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 00 50 - General Instructions.
- .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 01 00 50 - General Instructions 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 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.

2.3 MULTI-BLADED DAMPERS

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height: 100 mm.
- .4 Bearings: self-lubricating nylon.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

Part 3 Execution

3.1 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.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S112-10, Standard Test Method of Fire Test of Fire Damper Assemblies.
 - .2 CAN/ULC-S112.2-07, 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 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for fire dampers and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate the following:
 - .1 Fire dampers.
 - .2 Smoke dampers.
 - .3 Fire stop flaps.
 - .4 Operators.
 - .5 Fusible links.
 - .6 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 00 50 - General Instructions.
- .2 Operation and Maintenance Data: submit operation and maintenance data for fire for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 Replace defective or damaged materials with new.

Part 2 Products

2.1 FIRE DAMPERS

- .1 Fire dampers: arrangement Type B, bear label of ULC, meet requirements of authorities having jurisdiction. Fire damper assemblies fire tested in accordance with CAN/ULC-S112.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
 - .1 Fire dampers: 1-1/2 hour fire rated unless otherwise indicated.
 - .2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.
- .3 Top hinged: multi-blade hinged type; sized to maintain full duct cross section.
- .4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .5 40 x 40 x 3mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.
- .6 Equip fire dampers with steel sleeve or frame installed disruption ductwork or impair damper operation.
- .7 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.
- .8 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.
- .9 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition or floor slab depth or thickness.
- .10 Unless otherwise indicated, the installation details given in SMACNA Install Fire Damp HVAC and in manufacturer's instructions for fire dampers shall be followed.

Part 3 Execution

3.1 EXAMINATION

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

- .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 in accordance with NFPA 90A and in accordance with conditions of ULC listing.
- .2 Maintain integrity of fire separation.
- .3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .4 Install access door adjacent to each damper.
- .5 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.
- .6 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 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C423-09a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - .2 ASTM C916-[85(2007)], Standard Specification for Adhesives for Duct Thermal Insulation.
 - .3 ASTM C1071-[12], Standard specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
 - .4 ASTM C1338-[08], Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
 - .5 ASTM G21-[09], Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- .3 North American Insulation Manufacturers Association (NAIMA)
 - .1 NAIMA AH116-2002, Fibrous Glass Duct Construction Standards.
- .4 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
 - .1 SMACNA, HVAC Duct Construction Standards, Metal and Flexible-2005.
 - .2 SMACNA IAQ Guideline for Occupied Buildings Under Construction-2007.
- .5 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, 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 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for duct liners and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Operation and Maintenance Data: submit operation and maintenance data for duct liners for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 Replace defective or damaged materials with new.

Part 2 Products

2.1 DUCT LINER

- .1 General:
 - .1 Mineral Fibre duct liner: air surface coated mat facing.
 - .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with CAN/ULC-S102.
 - .3 Fungi resistance: to ASTM C1338 and ASTM G21.
- .2 Rigid:
 - .1 Use on flat surfaces.
 - .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 0.74 (m². degrees C)/W for 25 mm thickness when tested in accordance with ASTM C177, at 24 degrees C mean temperature.
 - .5 Maximum velocity on faced air side: 30.5 m/s.

2.2 ADHESIVE

- .1 Adhesive: to NFPA 90A and NFPA 90B.
- .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.

2.3 FASTENERS

- .1 Weld pins 2.0 mm diameter, length to suit thickness of insulation. Metal retaining clips, 32 mm square.

2.4 JOINT TAPE

- .1 Poly-Vinyl treated open weave fiberglass membrane 50 mm wide.

2.5 SEALER

- .1 Meet requirements of NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68 degrees C to plus 93 degrees C.

Part 3 Execution

3.1 GENERAL

- .1 Do work in accordance with SMACNA HVAC Duct Construction Standard and as indicated.
- .2 Line inside of ducts where indicated.
- .3 Duct dimensions, as indicated, are clear inside duct lining.

3.2 DUCT LINER

- .1 Install in accordance with manufacturer's recommendations, and as follows:
 - .1 Fasten to interior sheet metal surface with 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.
- .2 In systems, where air velocities exceeds 30.5m/s, install galvanized sheet metal nosing to leading edges of duct liner.

3.3 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 edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
 - .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.
 - .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 Home Ventilating Institute (HVI)
 - .1 HVI Publication 916-2015 – Air Flow Test Procedure

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .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.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Submit in accordance with Section 01 00 50 - General Instructions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 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, static pressure, bhp orW, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
 - .3 Fans: statically and dynamically balanced.

- .4 Performance ratings: tests to be certified by HVI, and bear the HVI Tested/Certified Performance seal.

2.2 FANS GENERAL

- .1 Motors:
 - .1 For use with variable speed controllers.
 - .2 Sizes as indicated.
- .2 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.
- .3 Vibration isolation: to Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.
- .4 Flexible connections: to Section 23 33 00 - Air Duct Accessories.

2.3 INLINE CENTRIFUGAL FAN

- .1 Fan wheels:
 - .1 Polycarbonate construction.
 - .2 Backward inclined blades, as indicated.
 - .3 Direct driven.
- .2 Housings:
 - .1 Formed polycarbonate thermoplastic.
 - .2 Single piece casing with welded seams.
- .3 Motor:
 - .1 Permanent split capacitor type, external rotor, Class B insulation.
 - .2 Self lubricating bearings.
 - .3 Automatic reset thermal overloads.
 - .4 Rated for continuous duty.
- .4 UL listed.

Part 3 Execution

3.1 FAN INSTALLATION

- .1 Install fans in accordance with manufacturer's recommendations and as indicated, complete with resilient mountings, flexible electrical leads and flexible connections.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.

-
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCES

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .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.
 - .6 Mounting details.

1.3 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 00 50 - General Instructions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 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, pressure drop, terminal velocity, throw, noise level, neck velocity of basis of design product indicated.
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board.
 - .3 Concealed fasteners.
 - .4 Security fasteners, where indicated.
- .3 Concealed manual volume control damper operators, where duct mounted dampers are not indicated.
- .4 Colour: off white, unless others indicated.

2.3 MANUFACTURED UNITS

- .1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

2.4 SUPPLY GRILLES AND REGISTERS

- .1 Type S-1: medium security grille with integral sleeve. 14-ga steel louvres, 0-degree deflection with 10-ga steel wire mesh behind. 14-ga steel sleeve, stitch welded. 4-sided mounting frame.

2.5 RETURN AND EXHAUST GRILLES AND REGISTERS

- .1 General: with opposed blade dampers, unless dampers are provided in duct.
- .2 Type R-1 & R-2: aluminum, 19 mm border, 5 x 5 mm egg crate type face bars.
- .3 Type R-3: medium security grille with integral sleeve. 14-ga bent steel louvres, 45-degree deflection with 10-ga steel wire mesh behind. 14-ga steel sleeve, stitch welded. 4-sided mounting frame.

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.

3.2 INSTALLATION

- .1 Install in accordance with manufacturers instructions.
- .2 Install with flat head screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.
- .4 Install security grilles following manufacturer's recommendations.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.
 - .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 Definitions:
 - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- .2 Reference Standards:
 - .1 CSA Group
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
 - .2 CAN3-C235-83(R2010), 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 SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in 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 one copy of drawings and product data to authority having jurisdiction.
 - .6 If changes are required, notify Departmental Representative of these changes before they are made.
- .4 Certificates:
 - .1 Provide CSA certified equipment and material.

- .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.
- .3 Submit test results of installed electrical systems and instrumentation.
- .4 Permits and fees: in accordance with General Conditions of contract.
- .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
 - .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
 - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
 - .4 Post instructions where directed.
 - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
 - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 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 labels for control items in English.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide equipment and material in accordance with Section 01 00 50 - General Instructions.
- .2 Equipment and material to be CSA certified. Where CSA certified equipment and material are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of the Departmental Representative.
- .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 Identify electrical equipment with labels as follows:
 - .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. [_____]" as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

2.7 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 5 kV	Blue	
Telephone	Green	
Fire Alarm	Red	
Other Security Systems	Red	Yellow

2.9 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint indoor switchgear and distribution enclosures light gray.

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.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 conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 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: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 300 mm.
 - .5 Fire alarm stations: 1200 mm.
 - .6 Fire alarm bells: 2100 mm.
 - .7 Television outlets: 300 mm.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.8 EXISTING PANELBOARDS.

- .1 Existing panelboards shall be retrofitted to accommodate new sprinklers. Provide mechanically fastened custom drip hoods for all surface mounted panelboards. Seal existing conduit and wiring penetrations for all surface mounted panelboards. All work shall be conducted in accordance to approved methods by the authority having jurisdiction.

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 00 50 - General Instructions.
 - .1 Circuits originating from branch distribution panels.
 - .2 Lighting and its control.
 - .3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .4 Systems: fire alarm.
 - .5 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.10 SYSTEM STARTUP

- .1 Instruct Departmental Representative in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.

- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

- .1 Provide product data in accordance with Section 01 00 50 - General Instructions.

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.

2.2 TECK 90 CABLE

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper, size as indicated.
- .3 Insulation:
 - .1 Cross-linked polyethylene XLPE.
 - .2 Rating: , 600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking galvanized steel.
- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .7 Fastenings:
 - .1 One hole straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
 - .2 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight approved for TECK cable.

2.3 ARMOURED CABLES

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel strip.
- .4 Type: ACWU90 jacket over thermoplastic armour and compliant to applicable Building Code classification for this project wet locations.

- .5 Connectors: anti short connectors.

2.4 CONTROL CABLES

- .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath : thermoplastic jacket.

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 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductor length for parallel feeders to be identical.
- .3 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .4 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .5 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .6 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

- .1 Group cables wherever possible on channels.
- .2 Install cable exposed/concealed, securely supported by straps.

3.5 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible on channels.

3.6 INSTALLATION OF CONTROL CABLES

- .1 Install control cables conduit.
- .2 Ground control cable shield.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 CSA Group
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for connectors and terminations and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Operation and Maintenance Data: submit operation and maintenance data for connectors and terminations for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 connectors and terminations from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

- .1 Copper compression connectors to CSA C22.2 No.65 as required sized for conductors.

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 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 00 50 - General Instructions.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .4 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 41mm, 2.5 mm thick, surface mounted or suspended.

Part 3 Execution

3.1 INSTALLATION

- .1 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .2 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.
- .3 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .4 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.
- .5 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.
- .6 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

- .7 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .8 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .9 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.
- .10 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 C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 - General Instructions.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.

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 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .5 Extension and plaster rings for flush mounting devices in finished plaster and tile walls.

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

- .1 Cast FS or FD boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.6 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 - General Instructions.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.

- .3 Identify cables for exclusively dc applications.

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal steel.
- .6 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 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 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.
Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.5 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 and in unfinished areas.

- .3 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.
- .4 Use rigid pvc conduit underground.
- .5 Use flexible metal conduit for connection to motors in dry areas and connection to recessed incandescent fixtures without prewired outlet box.
- .6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .7 Use explosion proof flexible connection for connection to explosion proof motors.
- .8 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
- .9 Minimum conduit size for lighting and power circuits: 21 mm
- .10 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .11 Mechanically bend steel conduit over 21 mm diameter.
- .12 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .13 Install fish cord in empty conduits.
- .14 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .15 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

- .1 Locate to suit reinforcing steel.
 - .1 Install in centre one third of slab.

- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.
 - .1 Use cold mastic between sleeve and conduit.
- .5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.7 CLEANING

- .1 Proceed in accordance with Section 01 00 50 - General Instructions.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.29-11, Panelboards and Enclosed Panelboards.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards 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 Include on 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 00 50 - General Instructions.
- .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 Section 01 00 50 - General Instructions 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 panelboards 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 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.
- .3 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .4 Minimum of 2 flush locks for each panel board.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Copper bus with neutral of same ampere rating of mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Trim and door finish: baked enamel.
- .10 Isolated ground bus.
- .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.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

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 as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.
- .5 Circuits supplying Patient Care Areas must be entered in circuit directory with Bold Font.

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 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.
- .6 Where panels of different systems (i.e. Standard and Vital Power) supply a common patient care area, ground busses in panels to be interconnect with a minimum #6 AWG ground conductor.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions .
 - .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 panelboards installation.

END OF SECTION

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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.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55-M1986(R2008), Special Use Switches.
 - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .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 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wiring devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 SWITCHES

- .1 15 A, 120 V, single pole, three-way switches to: CSA C22.2

- .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 Colour to match existing.
- .3 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
 - .1 Urea moulded housing, colour to match existing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
 - .1 Urea moulded housing, colour to match existing
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Stainless steel, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.4 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Install GFI type receptacles as indicated.
- .3 Cover plates:
 - .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates:
 - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
 - .1 Production certificate of origin must be submitted to Departmental Representative for approval.
 - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
 - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
 - .4 Production certificate of origin must contain:
 - .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
 - .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.
 - .3 Contractor's name and address and person responsible for project.
 - .4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions with manufacturer's written instructions.

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store circuit breakers off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 .

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Circuit breakers, ground-fault circuit-interrupters: to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation.
- .3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation.
- .4 Common-trip breakers: with single handle for multi-pole applications.
- .5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .6 Circuit breakers with interchangeable trips as indicated.
- .7 Circuit breakers to have minimum 10kA symmetrical rms interrupting capacity 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.

2.3 OPTIONAL FEATURES

- .1 Include:
 - .1 Shunt trip.
 - .2 Auxiliary switch.
 - .3 Under-voltage release.
 - .4 On-off locking device.
 - .5 Handle mechanism.

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 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 CSA Group
 - .1 CAN/CSA-C22.2 No.4-04(R2009), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).
 - .2 CSA C22.2 No.39-13, Fuseholder Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for disconnect switches - fused and non-fused and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 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 Non-fusible, disconnect switch in CSA enclosure.
- .2 Mechanically interlocked door to prevent opening when handle in ON position.
- .3 Quick-make, quick-break action.
- .4 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 and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.
 - .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 ANSI C82.4-02(R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International)
- .5 ICES-005-07, Radio Frequency Lighting Devices.
- .6 Underwriters' Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Departmental Representative.
- .3 Quality assurance submittals: provide following in accordance with Section 01 00 50 - General Instructions.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.3 QUALITY ASSURANCE

- .1 Provide mock-ups in accordance with Section 01 00 50 - General Instructions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions.

- .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.

Part 2 Products

2.1 LED FIXTURES

- .1 LED fixtures as per luminaire schedule.

2.2 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.3 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.4 LUMINAIRES

- .1 As indicated in luminaire schedule.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling.

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

- .1 Clean in accordance with Section 01 00 50 - General Instructions.

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 CSA International
 - .1 CSA C22.2 No.141-10, Emergency Lighting Equipment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for emergency lighting and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 00 50 - General Instructions.
- .2 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 00 50 - General Instructions 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 emergency lighting from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.5 WARRANTY

- .1 For batteries in this Section 26 52 00 - Emergency Lighting, 12 months warranty period is extended to 120 months.

Part 2 Products

2.1 EQUIPMENT

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120 V, AC.
- .3 Output voltage: 12 V DC.

- .4 Operating time: 30 minutes.
- .5 Battery: sealed, maintenance free.
- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: solid state, for 'AC Power ON'.
- .10 Lamp heads: integral on unit and remote, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED, 6 W, minimum 540 lumen minimum output.
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .12 Finish: as indicated
- .13 Auxiliary equipment:
 - .1 Test switch.
 - .2 Battery disconnect device.
 - .3 AC input and DC output terminal blocks inside cabinet.
 - .4 Cord plug connection for AC.

2.2 WIRING OF REMOTE HEADS

- .1 Conduit: in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Conductors: in accordance with Section 26 05 21 - Wires and Cables (0-1000 V], sized in accordance with manufacturer's recommendations.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for emergency lighting 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 unit equipment and remote mounted fixtures.

- .2 Direct heads.
- .3 Connect exit lights to unit equipment.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 00 50 - General Instructions.
 - .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 00 50 - General Instructions.
- .3 Waste Management: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.
 - .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 emergency lighting installation.

END OF SECTION

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Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.141-02, Unit Equipment for Emergency Lighting.
 - .2 CSA C860-01(December 2002), Performance of Internally-Lighted Exit Signs.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 101-2006, Life Safety Code.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 50 - General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Quality Assurance Submittals: submit following in accordance with Section 01 00 50 - General Instructions.
 - .1 Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.

Part 2 Products

2.1 STANDARD UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: cold rolled steel minimum 1.0 mm thick, satin aluminum enamel finish.
- .3 Face and back plates: die formed cold rolled steel.
- .4 Pictogram Style.
- .5 Face plate to remain captive for relamping.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits.
- .3 Connect emergency lamp sockets to emergency circuits.
- .4 Ensure that exit light circuit breaker is locked in on position.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 00 50 - General Instructions.
- .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 SUMMARY

- .1 Section Includes:
 - .1 Automatic alarm initiating devices.
 - .2 Ancillary devices.

1.2 REFERENCES

- .1 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-2006, Standard for the Installation of Fire Alarm Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 00 50 - General Instructions.
 - .1 Shop drawings: stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
 - .2 Include:
 - .1 Layout of equipment.
 - .2 Zoning.
 - .3 Complete wiring diagram, including schematics of modules.
- .2 Quality assurance submittals: submit following in accordance with Section 01 00 50 - General Instructions.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .3 Manufacturer's Field Reports: manufacturer's field reports specified.
- .3 Closeout Submittals:
 - .1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 00 50 - General Instructions in accordance with ANSI/NFPA 20.
 - .2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.
 - .3 Submit to Authority of Jurisdiction approved submittals and drawings immediately after approval but no later than 15 working days to prior to final inspection.
 - .4 Submit following:
 - .1 Manufacturer's Data for:
 - .1 Control panel modules.
 - .2 Open-area smoke detectors.

- .3 Electro-magnetic door holder-releases.
- .4 Wiring.
- .5 Conduit.
- .6 Outlet boxes.
- .7 Fittings for conduit and outlet boxes.
- .8 Submit 1 original for each item and clear, legible, first-generation photocopies for remainder of specified copies.
- .2 System wiring diagrams:
 - .1 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.
 - .2 Show modules, relays, switches and lamps in control panel.
- .3 Design data: Power Calculations:
 - .1 Submit design calculations for existing system and new work specified to substantiate that battery capacity exceeds supervisory and alarm power requirements.
 - .2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.
 - .3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output.
- .4 Schedules:
 - .1 Conductor wire marker schedule.
- .5 Test Reports:
 - .1 Open-area 2-wire smoke detectors.
 - .2 Preliminary testing:
 - .1 Final acceptance testing.
 - .2 Submit for inspections and tests specified under Field Quality Control.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in fire alarm system installations approved by manufacturer with 5 documented years of experience.
- .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.

- .4 To Canadian Forces Fire Marshal approval.
- .4 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 00 50 - General Instructions.
- .5 Maintenance Service:
 - .1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Departmental Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 00 50 - General Instructions.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse or recycling in accordance with Section 01 00 50 - General Instructions.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section 01 00 50 - General Instructions.

2.2 MATERIALS

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Smoke detectors: to CAN/ULC-S529.

2.3 CONTROL PANEL

- .1 Fire Alarm Control Panel is existing.

2.4 AUTOMATIC ALARM INITIATING DEVICES

- .1 Open-Area Smoke Detectors: provide detectors designed for detection of abnormal smoke densities by ionization or photoelectric principle to match existing.
 - .1 Detectors: to match existing.
 - .2 Provide necessary control and power modules required for operation integral with control panel.
 - .3 Detectors and associated modules: compatible with control panel and suitable for use in supervised circuit.

- .4 Malfunction of electrical circuits to detector or its control or power units to result in operation of system trouble signals.
- .5 Equip each detector with visible indicator lamp that will flash when detector is in normal standby mode and glow continuously when detector is activated.
- .6 Each detector: plug-in type with tab-lock or twist-lock, quick disconnect head and separate base in which detector base contains screw terminals for making wiring connections.
- .7 Detector head: removable from its base without disconnecting wires. Removal of detector head from its base to cause activation of system trouble signals.
- .8 Screen each detector to prevent entrance of insects into detection chamber(s).
- .2 Locate detectors minimum 300 mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.
- .3 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by NFPA 70, are approved for such locations.
- .4 Provide detectors with terminal screw type connections.
- .5 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.5 ELECTRO-MAGNETIC DOOR HOLDER-RELEASES

- .1 Provide as indicated shown.
- .2 Mount armature portion on door. Armature complete with adjusting screw for setting angle of contact plate.
- .3 Mount electro-magnetic release on wall or in wall recess behind door.
- .4 Activation of fire alarm system to release doors on circuit to close.
- .5 Total projection of door holder-release not to exceed 100 mm.
- .6 Door holders: not require battery backup power.

2.6 CONDUIT

- .1 Install Conduit in accordance with Section 26 05 34 – Conduit, Conduit Fastenings and Conduit Fittings

2.7 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 75 degrees C minimum with nylon jacket.
- .6 Colour code wiring.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install systems in accordance with CAN/ULC-S524.
- .2 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .3 Connect alarm circuits to main control panel.
- .4 Locate and install door releasing devices.

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 Check annunciator panels to ensure zones are shown correctly.
 - .2 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.
 - .3 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.
 - .4 Class B circuits.
 - .1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
 - .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
 - .2 Manufacturer's Field Services:

- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .3 Verification requirements in accordance with Section 01 00 50 - General Instructions, include:
- .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

3.4 TRAINING

- .1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 00 50 - General Instructions.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION